OIL PRICE DYNAMICS AND STOCK MARKET RETURNS IN NIGERIA

By

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CERTIFICATION

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DEDICATION

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ABSTRACT

Stock market is a major source of finance for investors and firms. However, its ability to perform this role may be hindered by risk from Oil Price Dynamics (OPD) which makes stock returns uncertain. This risk is pronounced in Nigeria because derivative markets are still underdeveloped. The OPD either undervalues or overvalues the actual stock price and results in liquidity challenges to portfolio investors and firms. Sectoral analysis tends to unmask and pin-down the exact relationship between each sectoral's stock return and OPD. While existing studies have investigated the impact of OPD on Firms' Stock Returns (FSR) at aggregate level, little attention has been devoted to sectoral analysis. This study was, therefore, designed to investigate the effects of OPD on FSR at sectoral and aggregate levels in Nigeria.

The Arbitrage Pricing Theory provided the framework. A Nonlinear Auto-Regressive Distributed Lag econometric model that captures OPD (positive and negative oil price change) was explored. Eleven sectors on the Nigerian Stock Exchange (NSE) were considered: Agriculture, Consumer Goods (CG), Construction, Finance, Oil & Gas (OG), Information and Communication Technologies (ICT), Conglomerates, Health, Services, Industrial and Natural Resources (NR). The OPD and other determinants of FSR (Exchange Rate-ER, World Market Risk-WMR, Lag of Firms' Stock Return-LFSR and Domestic Market Liquidity-DML) were explored. The FSR was measured by logarithm difference of two successive closing periods of stock price. Sectoral and aggregate models were estimated both in the short-run (SR) and long-run (LR) using daily data from January 6th, 2007 to December 31st, 2017. Data were obtained from Central Bank of Nigeria statistical bulletin, NSE annual report and Energy Information Administration annual energy outlook. All estimates were validated at $\alpha \leq 0.05$.

The SR estimates showed that positive OPD increased returns of financial (0.19; Pe=0.02) and conglomerates (0.10; Pe=0.05) sectors, but reduced that of CG (-0.04; Pe=0.02). When negative OPD decreased by 1%, it reduced stock returns of financial (-0.14; Pe=0.05), CG (-0.08; Pe=0.02), health (-0.06; Pe=0.03) and industrial (-0.05; Pe=0.02) sectors, but improved that of OG (0.06; Pe=0.02) sector in the SR. In the LR, when OPD increased by 1%, stock returns of OG (2.38; Pe=0.01), conglomerates (5.97; Pe=0.05), financial (3.837; Pe=0.00), CG (1.309; Pe=0.01) sectors gained values but that of construction lost (-2.94; Pe=0.04). The estimates also showed that 1% decrease in negative OPD led to reduction in returns of CG (-39.59; Pe=0.03), financial (-18.81; Pe=0.02), OG (-1.73; Pe=0.01), health (-0.29; Pe=0.01) sectors, while construction (2.46; Pe=0.04) and conglomerates (9.39; Pe=0.01) sectoral returns gained. In the aggregate, an increase in positive and negative OPD by 1% results in (-0.11; Pe=0.01)% and (-0.10; Pe=0.02)% reduction respectively in the stock returns of the NSE in the SR. In the LR, positive OPD improved returns by (5.13; Pe=0.04), while stocks lost value (-25.4; Pe=0.02) due to a percentage drop in negative OPD.

Oil price dynamics had differential impact on sectoral stock returns in Nigeria. Thus, managers need to design better strategies to protect respective sectoral's returns from oil price shocks.

Keywords: Oil price dynamics, Sectoral stock returns in Nigeria, Arbitrage Pricing Theory

Word count: 492

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LIST OF ABBREVIATIONS

3FFF:	Fama and French Three Factor
AIC:	Akaike Information Criterion
APT:	Arbitrage Pricing Theory
ASCE:	ABUJA Securities and Commodity Exchange
ASEA:	African Securities Exchanges Association
AseM:	Alternative Securities Market
ASI:	All Share Index
ATS:	Automated Trading System
BDC:	Bureau De Change
BEKK:	Baba –Engle-Kraft-Kroner
BOT:	Balance of Trade
CA:	Current account
CAPM:	Capital Asset Pricing Model
CBN:	Central Bank of Nigeria
CF:	Capital Formation
CONGEP:	Confederation of Garment Exporters of the Philippines
CSCS:	Central Security Clearing System
DAS:	Dutch Action System
DPR:	Department of Petroleum Resources
DSDP:	Direct Sales Direct Purchase
ECA:	Excess Crude Account
EGRP:	Economic Recovery Growth Plan
EIA:	Energy Information Administration

E-IPO: Electronic Initial Public Offer

EMH: Efficient Market Hypothesis

FEITW: Foreign Exchange Inter-bank Trading Window

FEM: Foreign Exchange Market

FF: Fama French

FFEM: First-tier Foreign Exchange Market

FSMCAP: Financial service Market Capitalization

GARCH-ARJI: Generalized autoregressive Conditional Jump Intensity Model

GARCH-JUMP: Generalized Autoregressive Conditional Heteroscedasticity-JUMP

GCC: Gulf Cooperation Council

GDP: Gross Domestic Product

GMM: General Method of Moments

HML: High Book-to-Market Equity

ICT Information Communication Technology

IDSL: Integrated Data Services Limited

IFEM: Inter-Bank Foreign Exchange Market

IMF: International Monetary Fund

IOSCO: International Organization of Securities Commissions

ISA: Investments and Securities Act

IV: Instrumental Variable

LEXR: Real Effective Exchange Rate

LGMR: Log of Global Market Risk

LSTR: Sectoral Stock Returns in Nigeria

MCAP: Market Capitalization

MG: Mean Group

MKL: Stock Market liquidity

MLE: Maximum Likelihood Estimation

MS: Markov-Switching

MSCI: Morgan Stanley Capital International index

MS-VEC: Markov-Switching-Vector Error Correlation

NARDL: Nonlinear Autoregressive Distributed Lag Model

NEEDS: National Economic Empowerment and Development Strategy

NETCO: National Engineering and Technical Company Limited

NFA: Net Foreign Assets

NGC: Nigerian Gas Company Limited

NNOC: Nigerian National Oil Corporation

NNPC: Nigerian National Petroleum Corporation

NPDC: Nigerian Petroleum Development Company Ltd

NPIMS: National Petroleum Investment Management Service

NPV: Net Present Values

NSE: Nigeria Stock Exchange

OGIC: Oil and Gas reform Implementation Committee

OLS: Ordinary Least Square

OPA: Off shore Processing Arrangement

OPEC: Organization of Petroleum Exporting Countries

PDOLS: Panel Dynamic Ordinary Least Squares

PEF: Petroleum Equalization Fund

PIA: petroleum industry Act

PIGB: Petroleum Industry Governance Bill

PMG: Pooled Mean Group

PMS: Premium Motor Spirit

POLS: Panel Ordinary Least Squares

RDAS: Retail Dutch Auction System

RPEA: Refined-Product Exchange Agreement

SAP: Structural Adjustment Programme

SEC: Security and Exchange Commission

SFEM: Second-tier Foreign Exchange Rate Market

SIC: Schwarz Information Criterion

SIR: Societe Ivoirienne de Reffinage

SMB: Small Size Capitalization

SML: Security Market Line

SRO: Self-Regulatory Organization

SSE: Shanghai Stock Exchange

SVAR: Structural VAR

SWFs: Sovereign Wealth Funds

TASI: Tadawul All Share Index

TR: Total Reserves

USA: United States of America

VAR: Vector Autoregressive

VARMA-GARCH: Vector Autoregressive Moving Average Generalised Autoregressive Conditional Heteroscedasticity .

VNM: John von Neumann and Oscar Morgenstern

WDAS: Wholesale Dutch Action System

WFE: World Federation of Exchanges

WTI: West Texas Intermediate

CHAPTER ONE
INTRODUCTION

1.1: Background to the Study

Crude oil has continued to be an important commodity and plays influential role in the world economy. Hence, the effect of oil price fluctuations on stock market returns has become a prominent issue in recent decades due to surge (dip) in energy prices[1] and associated risks. Several theoretical justifications have evinced negative relationship between oil price variation and stock returns using stock valuation theory of price (Jones and Kaul, 1996). Masih et al. (2011) logically and succinctly argued that oil price fluctuation results in a decline in economic activity as energy becomes more expensive: This raises the production costs of goods and services. The higher cost reduces company's cash flow and profit. The decline in profit results in drop in stock prices and stock returns and then retards economic growth. Although, oil price risk may be ineffective or slowly affected stock market returns in an inefficient stock market of some countries (Mujahid et al., 1998).

More recently, new strand of study emerges which highlights the fact that sectoral disaggregation is imperative in understanding the importance of oil price on stock returns. They opined that the effects of oil price risks should vary considerably across different sectors (firms) even in the same economy and this depends on their production and consumption of oil (see: Broadstock and Filis, 2014; Phan, Sharma and Narayan, 2014). These varying views generally bring to the fore that response of stock returns to oil price variation (risk) depends on the position of country's net oil export and extent of oil consumption/utilization by sectors (firms) in the country.

[1] Although, June 2014, brought to an end a four-year period of high and stable prices and, perhaps, with a moderate increase since December, 2017.

Nigeria holds interesting features given her peculiarity in the crude oil production and consumption. Nigeria has the largest world proven oil reserves in Africa after Libya estimated at 37.2 billion barrels. It is ranked the highest oil producing country in Africa with an average of 2.4 million barrel per day (mbpd) and over 90% of the amount is exported. Crude oil export contributes 95.8% of foreign exchange earnings while oil proceeds generate more than 75% of total revenue in the country over the period of 2000 – 2015 (OPEC, 2016). Conversely, due to the inept situation of domestic refineries, Nigeria imports more than 70% of its petroleum products for domestic use, costing about N15.97 trillion from 2010-2016 (NNPC , 2017). This statistics ranks Nigeria among the world's top 15 countries where fuel importation comprise large share of total imports. However, oil is notably the bedrock of the Nigerian economy for over three decades and consequently, the government budget is always projected based on oil price benchmark.

Nigeria Stock Exchange (NSE) began to attract interest after financial system restructuring in 2006. Following this, NSE rating positively changed and market capitalization, volume of activities and number of listed companies surged. The NSE is pivotal for economic development of Nigeria as it provides listed companies and investors with a platform to raise long term capital and investment opportunities, respectively. Recently, NSE is rated one of the best in Africa (NSE Annual Report, 2015). Although, performance of stock prices has been characterized with incessant fluctuation and it appears that changes in world oil price is connected to the stock price fluctuations as a result of Nigeria's dependency on crude oil price. Fluctuations in oil prices could beattributed to events that impose restriction on the demand or supply of oil such as changing oil usage among key oil consuming countries, new oil exploration (U.S. shale production), supply disruption (terrorism and militia activities) and government activities[2]

In December, 2007, the Brent spot price was $90 per barrel (pb) while NSE All Share Index (ASI) and Market capitalization (MCAP) were 56,863.4 and N9.98trillion respectively. However, when oil price increased to $141 pb by July, 2008, MCAP rose to N10.03trillion while ASI decreased. Within the next four months, oil price moved down to

[2] E.g. Iranian oil entering the world market after a prolonged embargo period.

$35 pb while ASI and MCAP declined to 33, 530.7 basis point (bp) and N7.39t respectively. In June, 2014, global supply glut began to push oil price downwards; and by January, 2016, world crude oil price plummeted to $27 pb, ASI and MCAP lost 6.5% and 6.6% respectively from their 2015 values. Other macroeconomic indicators were also affected by the oil price variation over the period[3].

However, the swings and high cost of world oil products necessitated Nigerian government to subsidize the product in order to keep domestic prices low. Fuel subsidy has continued to impose challenge on the nation's economic management and development given the huge amount spent on the fuel subsidy. Nigeria spent about N10 trillion on subsidies from 2006-2015 (Vanguard, 2016). The fluctuation (increase) in crude oil price leads to fluctuation (increase) in subsidy burden of the government and the cost crowd out other developmental projects of the government such as infrastructure, transportation, employment, agriculture, education; and discourage private investors from investing in oil sectors as they feared they might not break even in such an artificial low price structure.

Given the fact that Nigeria relies so much on oil for its revenues, prompting stock market to respond to variations in oil prices (with the attendant risk); each sector absorbs varying proportion of the risk given its oil utilization. This stems from the fact that sectors differ in their utilization of oil in production process which depends on the nature of their product as oil serves as production input to most of these companies. Hence, investors ought to understand the impacts of oil price dynamics across sectoral stocks in order to make optimal portfolio decisions. It is against this backdrop that this study intends to study how different sectoral equity stocks respond to oil price risk in Nigeria.

1.2 Statement of the Problem

World oil market is characterized by incessant price fluctuations mainly arising from either demand or supply distortions. Brent crude oil price averaged $77 pb in September, 2010 and rose to $112 pb in June, 2014. Oil price dipped to $35 pb by December, 2015, cumulating to 68.7% drop. One month later, oil price fell to $27 pb; and by June, 2016,

[3] See table 2.2

the price rose to $48 pb i.e. about 77% increase. Fluctuations in oil price results in foreign exchange liquidity challenges and financial imbalances as domestic currency faces exchange rate pressure and it affects capital market through portfolio investment (NSE, 2017 Q3[4]). This link is specifically possible especially in an oil exporting country like Nigeria where federal revenue base is hinged on petro-dollars. In Nigeria, episode of oil price variation (such as continuous decrease in oil price) results in dwindling of government income (revenue base). Reduction in government income leads to depletion of country's foreign reserve[5] as government strives to cover her public expense; this often triggers foreign portfolio divestment as domestic investment opportunity looks fragile and unpromising. As investors are pulling out their investment, it forces exchange rate to depreciate [as the domestic currency (naira) is chasing few foreign currency (dollar)]. The depreciation in exchange rate leads to crash in portfolio investment. When faced with such occurrences, investors and households see all products price as unfair price including assets' price. Then, stock prices respond to such unfair pricing which results in reduction in domestic stock prices and ultimately fall in stock returns.

According to CBN annual report (2016), when price and quantity of oil dropped in 2015, NSE All Share Index (ASI) declined by 8.25 percent, dropping from 31,217.77 bp at end-December, 2014, to 28,642.25 bp at end-December, 2015. The Market Capitalization (MCAP) of the 190 listed equities also fell by 14.1% the same period. Consequently, NSE industrial Index, NSE Banking Index, NSE 30 Index, NSE Consumer Index and NSE Insurance Index Plunged by 15.8%, 21.53%, 18.03%, 17.88%, and 2.11% respectively. While aggregate equity stock returns dipped by 8.54% in 2015. Other macroeconomic variables also responded negatively during the period. External reserve dropped by about 16.5% in 2015 from $36.67 billion in 2014 while naira exchange rate depreciated by about 60% the same period. Nigeria external debt rose to $29.03 billion from $24.76 billion, amounting to about 17.2% increases. While portfolio investment declined by 69.81% in

[4] Q3 implies third quarter

[5] One of the fundamental purposes of conserving foreign exchange reserve is to hedge the country against risks and thus enhances the confidence of investors on the monetary policies of the government including capital markets.

2015 resulting from oil price fluctuation at that period. Most of the sectoral market indices performed poorly in 2016 as oil price slumped further.

The above description[6] revealed that quoted firms in NSE could be exposed to oil price risk. Therefore, it is expected that firms in the NSE should be able to hedge the risks emanating from oil price fluctuations (exposure) using financial derivatives[7] such as forward[8], options and futures[9] contracts. Unfortunately, due to the fact NSE is still developing and probably segmented from the global stock market, the use of such financial instruments have not been well developed to hedge for firm's and sectoral's specific and common risks. Hence, there is likelihood that oil price risk (premium) may be embedded in stock prices in Nigeria. This prompted the monetary authority[10] to create 'Market Makers' in 2011 to enhance the flow of liquidity in equity market[11]. The use of derivatives was also introduced by NSE in 2017 in order to manage risk emanating from changing dynamics on operating environment of the securities like oil price risk exposure.

Further, even when oil price risk is valued in the stock market, the use of aggregate market indices to ascertain the extent of the risk exposure may not unmask the true response of equity stock returns to oil price variations. The rationale behind this is that firms and sectoral stocks respond differently to the changes in oil price. These differential responses stem from the fact that different sectors appear to have different market structures[12] and are also heterogeneous. Oil price movement is therefore expected to impact firm's stock returns in different sectors differently. The transmission mechanism of oil price changes to

[6] Link between oil price changes and stock market performance

[7] Derivatives are financial instruments for hedging against market risk and unfavorable business environment whose value depends on the values of other, more basic, underlying variables. NSE announced the use of derivative in 2017 in its history

[8] Forward contract is an agreement to buy or sell an asset at a certain future time for a certain price

[9] Futures contract is an agreement between two parties to buy or sell an asset at a certain time in the future for a certain price. Unlike forward contracts, futures contracts are normally traded on an exchange. To make trading possible, the exchange specifies certain standardized features of the contract

[10] Central Bank of Nigeria (CBN) and Nigeria Stock Exchange (NSE)

[11] Market Makers involves ten companies, selected and registered by Securities and Exchange Commissions who are licensed to ensure the liquidity of the market; by mopping up and offloading stocks when it over floods the market and otherwise.

[12] Which includes managerial ability of company, size of the firm, firm's policies, cooperate structure of the company etc.

industries is equally a defining factor. It is expected that the behaviour or responses of small firms to oil price exposure will be different from the big firms' behaviour - size effects. Therefore, using aggregate stock prices to unravel the interaction between the variables may not show the true relationship and policy arrived therein may be deceptive.

Instructively, data from Central Securities Clearing System - CSCS (2017) revealed that when oil price rose from $31.8 per barrel to $40.8 in April, 2016, Conglomerates, Construction, Consumer goods, Banking, Insurance, Health, ICT, Industrial goods, Oil & Gas, Services and Aggregate stock returns closed in a negative note. In contrast, Agricultural and Health sectors' stocks appreciated. After one month (May 9th, 2016), oil price increased by 12.7%, during which Agriculture, Insurance, Health, ICT and Industrial equity stocks had negative returns while the other seven sectoral stocks appreciated in value but the aggregate market stock returns ended negatively. This revealed that the value of aggregate stock depends on the industry and sectoral performance. Aggregate stock may show that stocks have lost value by recording negative returns while some sectoral stock returns may have actually gained. Such conclusion could be deceptive and may not have revealed the true performance of industry or sectoral stock value.

Equally an important concern in oil price-stock returns dynamics is the issues of whether stock returns react to positive-oil price changes (upward movement) in the same direction and magnitude it responds to negative-oil price changes (downward movement). In this wise, the concepts of asymmetries and non-linearity become critical in conceptualizing and understanding oil price-sectoral stock returns nexus. Since firms differ in their utilization of energy and market structures, oil price increase or decrease may therefore appears to have different magnitude effect on the individual firms and thus their output. This study is essential because of Nigeria's peculiar structure where oil export contributes about 90% of total export revenue and oil import share to total import is about 20%. This is an economy where federal budget is created based on projections of oil prices; causing activities in the international oil market to affect her capital market and economy generally. Hence, identifying the level of sensitivity of various sectors to oil price risk will enable the investors to minimize risk associated with oil volatility. It is against this backdrop that this study wants to answer the following research questions: what is the relationship between oil price asymmetry and sectoral stock returns in Nigeria? Does firm's size determine how oil price risk affects firm's stock returns in Nigeria?

1.3 Objectives of the Study

The overall objective of the study is to examine the role of oil price dynamics on stock returns in Nigeria. The specific objectives are to:

(i) Determine the effect of oil price asymmetry on sectoral stock returns in Nigeria

(ii) Test the size effects of oil price risk on firm's stock returns.

1.4 Justification for the Study

Several studies had analyzed the response of macroeconomic fundamentals to the fluctuations in the world oil price. Recently, attention has moved to the effect of oil price fluctuations on stock market behaviour. Therefore, the justification for this study is rested on the theoretical, methodological and empirical gaps in the literature.

Capital Asset Pricing Model (CAPM) of Sharpe (1965) and Arbitrage Pricing Theory (APT) propounded by Ross (1976) have been the dominant theoretical framework often used on studies relating to stock market and other financial asset risks. Both theories show how systematic risk affects stock returns. However, the CAPM recognizes market risk as the only factor that affects stock returns (Linter, 1965; Mossin, 1966; Fama, 1965). The CAPM concluded that expected return of an asset depends solely on risk premium paid by investor that arises from a single factor called market risk. This abnormal conclusion gave rise to the APT which argued against using market risk as the only risk (factor) that determines securities' return. Hence, the APT proposed that any macroeconomic factor which impact on investor's returns can be incorporated into asset risk-return relationship as risk factor (Huberman, 1982; Chen, 1983; Lehmann and Modest 1988). The APT splits systematic risk into smaller components and argues that assets return can be explained by many factors such as economic, political, supply and demand side shocks and speculations as long as it impacts on assets' returns.

Having established the fact that oil price risk can impact on securities returns through portfolio investment and exchange rate in Nigeria[13], it implies that oil price exposure can enter into the APT model as one of the pervasive risk factors that predict equity returns in Nigeria capital market. This is made possible given the fact the APT accommodates macroeconomic variables[14] into the system unlike CAMP and Fama and French three factor (3FFF) theories that focused on market risk(s) that is (are) more or less microeconomic factor(s). The literature reviewed shows that APT framework was applied by some prior studies (see: Adeleke, 2010; Salisu and Isa, 2017; Pablo et al. 2014) but difficult to find studies that have used it on sectoral level especially in Nigeria. Therefore, the APT was modified to accommodate oil price risk exposure and how it explains asset returns on sectoral level in Nigeria. The study adopted the APT as it is regarded as the efficient model for security's behaviour based on its flexibility to incorporate nth-factor in predicting larger variation of asset returns. It is seen as a general asset pricing theory because it can easily be restricted or augmented to single theory (CAMP) or other factor theories given its nth-factor framework. One distinction of the APT over other portfolio theories (Efficient Market Hypothesis, CAPM, Factor model etc.) is that it is a multi-period model unlike others that focus on single period analysis. However, the APT does not specify factors that affect each asset or to be incorporated in the model.

Few studies had been done in Nigeria that studied the impact of oil price distortions on stock returns (see: Salisu and Isa, 2017; Gil- Alana and Yaya, 2014; Fowowe, 2013; Babatunde, Adenikinju and Adenikinju, 2012, Adeleke, 2010). Fowowe (2013) adopted Generalized Autoregressive Conditional Heteroscedasticity-JUMP (GARCH-JUMP) framework while Babatunde et al. (2012) and Adeleke (2010) employed Vector Autoregressive (VAR) model respectively using quarterly data from the NSE. Despite that the above studies used aggregated observations (All Share Index) of the stock market; they equally adopted linear specification in computing asymmetry[15]. One of the problems against linear method adopted by Babatunde et al. (2012) in capturing asymmetries is that it can only account for long run asymmetries while short run asymmetries cannot be

[13] See page 4, 1st paragraph
[14] Hence environmental factors can as well enter APT model
[15] Though Salisu and Isa (2017) employed nonlinear specification on cross country analysis

captured with it. In such a linear decomposition, the variance of the error term stands to be high which violates the features of a good estimate. Hence, linear specification of oil price-stock returns may not be the appropriate functional form. Gil- Alana and Yaya, (2014) adopted fractional cointegration (FC) approach on monthly data of composite index (ASI) of the NSE. However, the FC focuses on establishing weather long run relationship exist between series. It does not account for nonlinearity (asymmetries) which has been associated with oil price-stock returns relations. As regards to Salisu and Isa, (2017), the study applied Nonlinear Autoregressive Distributed Lag Model (NARDL) but on a cross country analysis while Adeleke (2010) used VAR framework without looking at asymmetric impact of oil price-stock returns relationship and also the study was done on aggregated level.

The present study differentiates its self from the aforementioned studies methodologically by adopting NARDL approach to study the nexus between oil price risk and stock returns on sectoral basis. Studies that had used the NARDL to study the oil price-stock returns nexus on sectoral level in Nigeria are not found in the literature to the best of the researcher's knowledge. The efficiency of the NARDL as propounded by Shin et al. (2014) lies in its ability to use partial sum in decomposing positive and negative of oil price fluctuation which is evident in the observed oil price data rather than net oil price decomposition as used in VAR framework of Babatunde et al. (2012). It is also an improvement over GARCH and VAR model because of its ability to capture long run and short run asymmetries in the same model. Another crucial advantage of the NARDL over the VAR, GARCH and FC is that the NARDL can be used in the presence of mixed order of integration of not more than I(1)[16] i.e. I(0) or I(1) series unlike VAR, GARCH and FC that use either I(0) or I(1). More so, the NARDL tends to achieve minimum variance and its estimates are well fitted when compared to the VAR and GARCH model. It is difficult to find study that has employed the NARDL in examining oil price-stock returns relation on disaggregated level in Nigeria.

Application of the NARDL framework will enrich the present study given that oil price observations contain both positive and negative oil price changes. This dynamics will

[16] See Pesaran et al., 2001

enable us to decompose it and form an asymmetric observation which is the cornerstone of the NARDL. This aided the study to determine if the response of sectoral stock returns to positive oil price movement is the same with negative oil price movement. The NARDL is best suited for handling such analysis more than any other techniques because it was specifically developed for such data series where the data points are neither predominantly positive nor negative as observed in the study's data series.

Empirically, extant literature on oil price-stock returns relation in Nigeria have focused on the effect of oil price on the aggregate stock market level (Fowowe, 2013; Gil-Alana and Yaya, 2014; Adeleke, 2010). It could be either that these studies intuitively assumed that firms and indeed sectors making up the stock market are homogenous or there was no adequate data on sectoral stock returns during the period. This study contended that because different sectors have different market structures and thus heterogeneous, changes in oil price are likely to affect firm's returns in different sectors differently. Moreover, this leveraged on the publication of adequate sectoral stock returns data since 2007. The published sectoral stock returns data covers the period 2007 till date (11 years), which is good enough for the disaggregated analysis conducted in this study. The study followed the NSE classification to examine if oil price risk is priced across 11 sectors listed on the NSE.

Certainly, a lot of changes had taken place in Nigeria stock market after the financial system restructuring and recapitalization exercise in 2005. This has attracted increasing awareness in Nigeria stock market and sees more people investing in equity market. This is evidenced in increasing volume of trade and size of companies present today in the NSE. It is imperative to know if the size of the firm contributes in determining how oil price risk affects its returns. Some prior studies had argued that big firms insulate risks than small firms (Narayan and Sharma, 2011; Phan et al., 2014). The differences in returns of small firms and large firms may stem from factors such as economic of scales, efficiency and productivity of these firms. Therefore, this study finds it very significant to examine the size effect of these firms as regards to the impact oil price risk exposure has on their stock returns, which was overlooked in prior studies in Nigeria.

Generally, Nigeria is one of the oil producers in the world and a very strong member of Organization of the Petroleum Exporting Countries (OPEC). A shock in Nigeria oil production certainly affects OPEC production and thus world oil price and production. Moreover, Nigeria is an open economy, it feels and responds to the global commodity market especially world oil market. Hence, Nigeria is a very good context to study the nexus between oil price fluctuations and its stock market.

1.5 Scope of the Study

This study focuses on the effect of oil price dynamics on sectoral stock market returns in Nigeria using daily data covering January, 6th, 2007 to December, 31st, 2017. The choice of the period – 2007 to 2017 rested on the fact that prior to 2007; most of the firms were not quoted on The Exchange so there was no comprehensive information about most of these firms. For example, Zenith Bank and Sky Bank were quoted late 2006. So, in order to have uniform and less missing observations, 2007 becomes appropriate period that yielded consistent observations for the study. The study covered 100 companies across 11 sectors, namely: agriculture, consumer goods, construction, finance, oil and gas, ICT, conglomerates, health, services, industrial and natural resources.

To achieve objective 2 of the study, the sectors were collapsed into 100 firms that constitute these sectors. These firms were divided into four groups (see appendix A3) based on the respective firm's market capitalization. Hence, the study investigated if firm's size is a determinant on how its stock returns respond to oil price fluctuation risk.
However, financial sector was split into banking and non-banking due to relative large number of firms in that sector. This division gave us huge information as regards the response of banking to oil price changes as banks play bigger role and contribute up to 40% of market capitalization in the NSE (NSE, 2017). Observations for stock returns are sourced from Central Security Clearing System (CSCS) of the NSE. Data for oil price was obtained from the Energy Information Administration (EIA), USA and Brent crude oil spot price was used.

1.6 : Outline of the Report

The remaining part of the thesis is partitioned in the following order: chapter two contains literature review and background to the study. The literature review is sectioned into theoretical, methodological and empirical review. Also in this chapter is the detailed analysis of the nexus between changes in crude oil price and dynamics of the stock market especially in Nigeria. Chapter three covers the review of the related literature and data sources. Data analysis and result interpretation are presented in the fourth chapter. While the last chapter contains summary of major findings, conclusion and policy recommendations as well as suggestions for further research.

CHAPTER TWO

LITERATURE REVIEW

2.0 Overview

This section is devoted to review the theoretical, methodological and empirical literature on the interaction between crude oil price changes and stock market returns. The section essentially pointed out the theoretical advances made on the issue and the quantitative instruments that have been employed to measure the nature of the correlation between the two variables. The discussion starts with theoretical literature which outlined some prominent theories that connects oil price and financial securities. The section also shows some transmission mechanisms upon which this relationship exist. Further, it considered methodological issues used in the oil-stock relationships and concluded by documenting prior empirical findings reviewed in the work.

2.1 Theoretical Literature Review

This section commences with the discussion of the theoretical literature reviewed. The first theory reviewed is investors risk preferences under uncertainty: which was discussed using expected utility theory. The next theory is the efficient market hypothesis which was explained using fair game theory. We discussed two variants of fair game theory: sub-martingale and random walk theory. The third is the modern portfolio theory which is generally anchored on capital market equilibrium theory. The four variants of capital market equilibrium theory were discussed namely: capital asset pricing model (CAPM), Fama-French three factor model (3FFF), Fama-French five factor model and Arbitrage pricing theory (APT). Following this is the cash flow theory of stock valuation. The section also examined the theoretical perspective that connects stock market and oil price variation. This section concludes with transmission mechanisms between the two variables.

2.1.1 Theory of Investors Risk Preferences under Uncertainty

The theory which was propounded by Farrer (1962) and extended by Kahneman and Tversky (1979) opined that every trading and decision made in the stock market is virtually under uncertainty. The theory assumes that an investor is faced with the problem of evaluating gamble (uncertainty) considering its preference in order to minimize risks. Adequate Knowledge of investors' risk preferences will help to reveal if oil price risk is reflected in the expected return of stocks. Expected utility theory has been one of the strong foundations used to develop basic properties of preference and choice in the presence of uncertainty (Jonathan, 2006).

The theoretical framework of expected utility model was formally developed by John von Neumann and Oscar Morgenstern–VNM (1944) in their book -*Theory of Games and Economic Behaviour*. The theory described a standard way to represent investor's (agent's) preferences over uncertain outcomes or gambles. The basic idea of VNM is that individuals (investors) are confronted with choices over uncertain risky alternatives, at which a given list of outcomes will occur. However, the outcome that will occur is unknown to the agent before making his choice. Hence, the agent's preferences over those outcomes (probability distributions) are described by assigning preference numbers which is geared towards maximizing utility (returns/payoffs). The model outlined certain axioms an individual's preferences must satisfy as follows:

Axiom of completeness: This implies that for any set (X) containing different alternatives say x and y ; an agent can make a choice between the two outcomes. For example, an agent can prefer an outcome x over y (i.e $x \succ y$)[17] or y is preferred over x ($y \succ x$) or the agent is indifferent (i.e. $x \sim y$).This axiom implies that an investor can compare any two alternative (investment) choices and decide if x is preferred to y or y is preferred to x or indifferent between the alternatives.

Axiom of transitivity: For all x, y and z in X. if $x \succ y$ and $y \succ$ z, then $x \succ$ z. This axiom says that if an investor prefers an outcome x to y, and outcome y is preferred to z

[17] The symbol $(\succ)$ implies a preference notation rather than famous mathematical inequality notation

then, it implies that the investor would prefer outcome x to outcome z. Alternatively, if an agent is indifferent between outcomes x and y, and also indifferent between y and z, it is expected that an agent will be indifferent in choosing outcome x and z. Transitivity axiom is needed for investors preference maximization.

Axiom of independence: Given any two distributions (gambles) x and y with probability b, being the chances of outcome x occurring and probability of 1-b, being the chances of y occurring. This axiom states that $y \succ x$ if and only if by + (1-b)z $\succ bx$ + (1- b)z for all b€(0,1) and all z. The axiom implies that if an agent preferred an outcome y to x, then the agent would as well preferred the outcome set up between y with probability b and a mutually exclusive outcome, z, and a second outcome, set up between x, with a probability of b and the same mutually exclusive outcome, z.

Axiom of continuity: for all x, y and z in set X, if ($x : x >= y$) and ($x : x \prec y$) are closed set. It follows that (x: $x \prec y$) and ($x : \prec y$) are open set. Then if y is strictly preferred to z and if x is closed enough to y, then x is strictly preferred to z.

The proposition of the axioms is that if the preference ordering is complete, transitive, continuous and independence, then it can be represented by a continuous preference function. The VNM theorem of completeness, transitivity, continuous preferences over probability distributions of gambles that satisfy the 'independence axiom' can be vividly represented by the maximization of expected utility. The two major difference of the VNM theory from the classical theory of choice under certainty are: the VNM theorized that outcomes are now probability distributions over a specified set of certain outcomes that are less preferred among the set of the probability distribution. Secondly, the VNM theory imposes a specific restriction on preferences especially on the independence axiom. The independence axiom indicates that the preference function over probability outcomes that individual maximizes is linear in the probabilities. It implies that an individual does not need to know the outcome (choice under uncertainties) before choosing it. Hence, this is the strongest of the VNM axioms.

There are two striking properties of the VNM utility function; first, it preserves order as shown in axioms of transitivity and completeness. This implies that if utility of x bundle is higher than the utility of y bundle, i.e. U(x) > U(y), it simply means that x bundle is always preferred to y i.e. (x > y). Secondly, expected utility can be used to rank combinations of risky alternatives as shown in independence axiom. This is represented mathematically as:

$$U\left[G\left(x,z:\beta\right)\right] = \beta U\left(x\right) + \left(1-\beta\right)U\left(y\right) \tag{2.1}$$

Equation 2.1 states that the utility of z is equal to the utility of x, multiply by its probability plus the probability of y multiply by the utility of y. Eqn. 2.1 shows expected utility that expresses linear combination of the utilities of observations. In summary, VNM utility function shows in a convenient way how information contained in the individual's preference relation can be used in making choices. This is applicable to investors in the stock market where investors choose or rank securities depending on the expected utility (maximum returns or minimum risks). According to Copeland et al. (2005), expected utility is the proper ranking function for risky alternatives. Just like the way expected utility of alternative outcomes can be represented, expected utility of the agent's expected utility of wealth can as well be represented which is expressed as:

$$E\left[U(W)\right] = \sum_i P_i\left(W_i\right) \tag{2.2}$$

Equation 2.2 says that expected utility of wealth of an agent is equal to the summation of all agents' alternative utility of wealth. Given the axioms, expected utility reflects rational investor's behaviour. Hence, investors would always prefer more wealth than less wealth. This assertion rested on the notion that investors will always want to maximize their expected utility of wealth. This implies that investors usually calculate the expected utility of wealth for all alternative choices and an outcome that maximizes their expected utility of wealth will be chosen (Adeleke, 2010).

Uninterestingly, recent studies after VNM revealed that individuals consistently violate expected utility theory especially when face with the risky alternatives. The violation is of two kinds: One is nonlinearity of the preference function in the probabilities, which is when the independence axiom is violated. Secondly, they also observed that dependence of preference over probability distributions on source is also violated. In reaction to this, many studies have been undertaken on what is known today in the literature as non-expected utility theories, with the purpose to better the experimental evidence of VNM utility theory. The theories include: weighted-utility theory [Chew and MacCrimmon (1979), Chew (1983)], Implicit Expected utility [Chew (1989), Dekel (1986)], disappointed aversion [Gul (1991)], Rank-dependent utility theories [Quiggin (1982), Segal (1987, 1989), Yarri (1987)], and Prospect theory [Tversky and Kahnemen (1992)].

2.1.2 The Efficient Market Hypothesis (EMH)

The theoretical underpinning of the EMH is anchored on Fair game (Expected return) theory. To understand the EMH, fair game theory will be used. The narration moves a step further to consider two special cases of fair game theories that were built around EMH to test market efficiency. These are: the Sub-martingale model and Random Walk model. But first, we gave a brief overview of the EMH.

The EMH rested on the premise that the stock markets fully, accurately and instantaneously incorporate all available information into market prices (Lo, 2005). It presupposes that stock prices fully reflect all the available and relevant information in the stock market. Fama (1970) stated that the hypothesis contained three information processing efficiency - the weak, the semi- strong, and the strong forms efficiency. The weak-form claims that current prices on traded assets like stocks are solely determined by past movement of the asset’s prices which is made public and available for investors by analysts. The semi-strong form affirms that all public available information and stock price history are being reflected in the current price of assets. While the strong-form efficiency concludes that prices instantly reflect even the hidden or special information by people who involve directly in the company not just public information. This implies that, with strong form efficiency, expected returns of an asset or its corresponding risk must represent its true market value.

One of the general criticisms of the EMH lies on the assumption that capital markets are efficient in processing information. However, the critics stand on the premise that today's stock price is not influenced by yesterday's price. They claim that individual security price movement follows random occurrence and efficient markets lack memory (See: Samuelson, in Jung and Shiller, 2005).

2.1.2.1 Fair Game or Expected Return Theory

Expected return theory is anchored on the premise that expected returns on financial assets are generated only from returns and risks. This implies that for an investor to achieve higher expected returns in his investment, he has to incur additional risk. Fama (1970) asserted that efficient market presents the investor with two prices and they are prices arising from interest rate (price of time) and price from risk. Generally, the basic assumption of the model is that the market equilibrium can only be achieved in terms of expected returns and risks. Therefore, if it's really true that stock prices fully reflected available information in the market, then, these prices (price of time and price of risk) must react instantaneously, and in an unbiased manner to the new information. This implies that no investor can achieve return that is more than the average market returns. It is obvious that from the preceding statement that fair game theory ruled out the possibility of various kinds of trading. Generally, a stochastic process X_t is a fair game if its expectation as well as the covariance conditional on information set I_t is zero.

In clear term, two basic assumptions of fair game theory are:

(i) The market equilibrium can be stated in terms of the condition of expected returns and risks

(ii) To achieve the equilibrium expected returns as well as current price, the market must use all available information set (I).

Therefore, given the above description, fair game or expected return theories can be represented notationally as follows:

$$E(P_{j,\,t+1}/I_t) = \left[1 + E(r_{j,\,t+1}/I_t)p_{j,t}\right] \qquad (2.3)$$

Where E = expected value operator; $P_{j,t}$ = the price of security j at time t; $P_{j,t+1}$ = the price of security j at time t+1; $r_{j,\,t+1}$ = one period percentage return $\frac{(P_{j,t+1} - p_{j,t})}{p_{j,t}}$,1_t = any set of information that is assumed to be „fully reflected" in the price at time t

It should be recalled that $P_{j,t+1}$ and $r_{j,\,t+1}$ are stochastic variables at time t + 1 and the value of the equilibrium return projected on the basis of information $\{E(P_{j,t+1}/I_t\}$ would be determined from the particular expected return at hand. The conditional expectation notation expressed in equation (2.3) implies that the information in 1_t is fully utilized in determining equilibrium expected returns as regards to whatever expected returns equation 2.3 applies. Therefore, since the excess market value and excess return are zero according to fair game model, it implies that $P_{j,t+1}$ and $r_{j,\,t+1}$ respectively are fair games with respect to the information sequence $\{1_t\}$.

The assumption that the equilibrium expected return must depend on the stock price reflecting all the available information set in the market has an empirical and mathematical implication in the EMH. This implies that any expected returns in excess of equilibrium expected return is impossible given the information set. The model of EMH was developed by Fama (1970) which was derived from fair game property for expected returns and expressed as thus below:

$$x_{j,t+1} = p_{j,t+1} - E(p_{j,t+1}/I_t) \qquad (2.4)$$

Then,

$$E(x_{j,t+1}/I_t) = 0 \qquad (2.5)$$

Where $x_{j,t+1}$ means excess market value of security j at time t + 1, $p_{j,t+1}$ denotes the observed (actual) price of security j at time t + 1, $E(p_{j,t+1}/I_t)$ implies expected price of security j that was projected at time t, conditional on the information set 1_t

Equation 2.4 states that the sequence x_{jt} is a fair game given the information sequence (1_t). Then, equation 2.5 implies that the expectation of the excess market value of the security j given the (market) information set (1_t) is zero. Hence, eqn. 2.5 is a fair game.

Equivalently, let

$$Z_{j,t+1} = r_{j,t+1} - E(r_{j,t+1}/I_t) \qquad (2.6)$$

Then

$$E(Z_{j,t+1}/I_t) = 0 \qquad (2.7)$$

Equation 2.6 states that the sequence $Z_{j,t}$ (security's return) is a fair game with respect to the information set (I_t). Equation 2.7 shows that the expectation of the excess returns on security j on the basis of information set (1_t) is zero. The sequence ($Z_{j,t}$) is also a "fair game" with respect to the information sequence (I_t).

The above description shows that $\{x_{i,t+1}\}$ is the difference between the observed price and the expected value of the price that was projected at t on the basis of the information (1_t). Similarly, $\{Z_{j,t+1}\}$ is the return at t + 1 in excess of the equilibrium expected return projected at time t. The description also shows that the expectation of the excess price and returns of the security given the information set is zero.

Let's assume

$$\lambda(I_t) = \left[\lambda_1(I_t),\ \lambda_2(I_t)\ ,...,\ \lambda_n(I_t)\right] \qquad (2.8)$$

Equation 2.8 is any trading system based on 1_t which tells the investor the amounts of funds $\lambda_j(I_t)$ available at time t that are to be invested in each of the n available securities. The total excess market value at time t + 1 that will be generated by such a system is

$$U_{t+1} = \sum_{j=1}^{n} \lambda_j (I_t) \ \left[r_{j,t+1} - E(r_{j,t+1} / I_t) \right] \qquad (2.9)$$

Eqn. 2.9 reveals that the total available funds for the investor is the summation of the difference between the observed amount of funds and the expected available funds given the information set in the market.

Recall eqns. (2.5) and (2.7) with 'fair game' properties, its expectation becomes,

$$E(U_{t+1}/ I_t) = \sum_{j=1}^{n} \lambda_j (I_t) \ E(Z_{j,t+1}/ I_t) = 0 \qquad (2.10)$$

Equation 2.10 supports that the expectation of excess returns in the market on security j follows a fair game model if the summation of the return as projected on the basis of information set (1_t) is equal to zero. This implies that the market security also exhibit fair game principle. This means that no investor in the stock market can achieve returns in excess of the average market returns given the information set available.

Fair game theory is divided into the sub-martingale model and random-walk model. The two classifications of fair game theory were discussed below.

2.1.2.2 The Sub-Martingale Model

The Sub-martingale model is a form of Fair Game theory but with slight adjustment in the expected return. Here, the expected return in the sub-Martingale model is considered to be positive unlike in Fair game where expected return is believed to be zero. The adjustment rested on the premise that securities prices are expected to increase over time. Hence, the returns on investments are projected to be increased given the available risk inherent in capital investment. The Sub-martingale model can be represented as follows:

$$E(r_{j,t+1} / I_t) \geq 0 \qquad (2.11)$$

Or Equivalently

$$E(p_{j,t+1} / I_t) \geq \ p_{i,t} \qquad (2.12)$$

Equation (2.11) says that the expected return is a sub-martingale, if the expected return, given the available information, is equal to or greater than zero. Otherwise it will be meaningless in forecasting stock price. Equation (2.12) implies that the price sequence for security j follows a sub-martingale given the information sequence. If the expected value of next period's price, as projected on the basis of the information set (1_t) is greater than or equal to the current price. This implies that expected returns conditional on information set are non-negative directly. The implication of the sub-martingale model is that no trading rule can have greater expected returns than a policy of buying and holding the security during the future period in question as long as it is based only on the information set in the market.

2.1.2.3 The Random Walk Model

Expected return model of Fama (1970) was later extended to random walk model which rests on ideology of the EMH. Efficient market signifies that for company's future performance to be evaluated, assets prices must incorporate all available information in the market; and if that condition holds, market price of share must be equal to its intrinsic value. Thus, in an efficient market, price changes must be a response only to new information. Since information arrives randomly, share prices must also fluctuate unpredictably. Random walk connotes that the successive share price changes must be independent and identically distributed as long as expected price changes is none-zero. The equation below shows the mathematical representation of Random Walk model:

$$p_{t+1} = p_t + e_{t+1} \qquad (2.13)$$

Where p_{t+1} = share price at time t + 1; p_t is the price of share at time t; e_{t+1} means random error with zero mean and constant variance.

Equation (2.13) shows that the price of a share at time t + 1 is equal to the price of a share at time t plus a value that depends on the new information (unpredictable/random) arriving between time t and t + 1. In other word, the change in price, $e_{t+1} = p_{t+1} - p_t$ is independent of past price changes which is a random walk.

Or equivalently,

$$E(r_{j,t+1}/I_t) = E(r_{j,t+1}) \qquad (2.14)$$

Equation (2.14) indicated that the mean of the distribution $r_{j,t+1}$ is independent of the available information (1_t) at time t.

Clearly, the fair game model shows that the market equilibrium can only be determined by the expected returns while the random walk model indicate that market equilibrium returns follows the stochastic process. This stochastic generating return process include macroeconomic environment which can affect stock returns. Due to the detailed analysis of random walk theory, a lot of empirical studies have been carried out to test its validity (inter alia: Emenuga, (1994); Adeleke, 2010)

2.1.2.4 Synthesis of the three models of EMH

Fair game is anchored on the premise that the expected returns of a security, conditional on the information set available must be zero as well as its covariance. Sub-martingale theory indicates that expected return of a given distribution, conditional oninformation set must be equal or greater than zero. While Random walk theory states that expected return of an asset is independent of available information but a random walk process. It further argues that whether the expected return of an asset is zero or non-zero, the outcome is a product of stochastic generating process.

One of the criticisms of EMH lies on the assumption that capital market is efficient in processing information. However, the critics stand on the premise that today's stock price is not influenced by yesterday's price. They claimed that individual security price movement follows a random occurrence and efficient market lacks memory. The EMH is much interested in maximizing individual investor's security (micro efficient), how then would security managers optimize the wealth of existing and prospective investor's portfolio? To answer this puzzle gave room to Modern Portfolio Theory.

2.1.3 Modern Portfolio Theory (MPT)

The modern portfolio theory (MPT) was developed by Markowitz in 1952 and it is an umbrella of the Asset pricing model. The MPT model is an investment strategy that gears towards optimizing portfolio investment by considering the relationship between variance (risk) and mean (return) of asset portfolio. The MPT rests on the premise of mean-variance efficiency: an idea that investors are rational and also risk-averse, who always wants to maximize returns and minimize risks on their investment. The risk-averse-investors are not only concerned about the profitability on the investment but also the probability of its occurrence, therefore, a risk-return trade-off becomes an important goal for an investor.

The model argued that rational investors are expected to accept or reject investments option(s) given the degree of weight they attach to the likelihood (risk) of their desired returns since the efficient market has no memory and individual security price movements are random. Hence, the decision rule will depend on mean-variance efficiency - implying that investors should target maximum expected return or minimum risk. Therefore, rational investors in reasonable efficient markets usually weigh the likely profitability of individual corporate investments. This is achieved by statistical weighting their expected returns using normal distribution. Thus, the Markowitz approach is often called a mean-variance model. There are three options used when managing investment portfolios by investors as outlined by Markowitz. These options depend on the performance of respective components of investment alternatives using mean-variance efficiency criteria: (i) to trade (buy or sell) (ii) to hold (do nothing), (iii) to substitute (for example, shares for loan stock).

The theory opines that the risk-return profile (history) of a specific stock is inadequate criteria by which true (intrinsic) value of an asset should be determined. However, it should be determined in relation to how the specific stock's price (investment portfolio) varies relative to the market portfolio. This implies that the correlations or covariance between all pairs of assets being considered need to be estimated. Modern portfolio theory shows that a mixture of diverse assets will significantly reduce the overall risk of a portfolio. Risk, therefore, has to be seen as a cumulative factor for the portfolio as a whole and not as a simple addition of single risks. Lack of correlation among different securities is what helps a diversified portfolio of assets to have a lower total risk, measured by standard deviation than the simple sum of the risks of each asset. Diversifying investment looks attractive and profitable because the respective risk-return profile has a negative relationship with the respective timing. When one investment is bad, the other is likely to be good, hence diversification minimizes risk. Although, the model concludes that market risk is not diversifiable; but rational investors can eliminate specific risk by diversifying their portfolio until it is equal to the market portfolio, which reflects the risk-return features for every available financial security

The mathematical derivation of the concept of diversification of investment was later developed by Markowitz. The diversification of investment is aimed at selecting a number of investment options that have relatively lower risk than any other individual asset. In this model, expected returns assumed to be random variables; expected returns and Volatility are proxies representing reward and risk respectively. An individual investment choice is efficient only when expected return is maximized through expected cash flows and minimizes the risk (variance) of the return.

Two assets case was developed by Markowitz, where a company has funds to invest in two viable projects - A and B. where x and $(1-x)$ are different proportions invested in project A and B respectively.

$$R(p) = xR(A) + (1-x)R(B) \qquad (2.15)$$

Equation (2.14) implies that the expected return from a portfolio R(P) is simply a weighted average of the expected returns from two projects, R(A) and R(B), where the weights are the proportional funds invested in each.

While the risk of the portfolio represented by variance of the portfolio is given by;

$$VAR(p) = x^2 VAR(A) + (1-x)^2 VAR(B) + 2x(1-x)\,COV(A,B) \qquad (2.16)$$

Percentage risk is then measured by the portfolio standard deviation (i.e. the square root ofthe variance):

$$\sigma(p) = \sqrt{VAR(P)} = \sqrt{[x^2 VAR(A) + (1-x)^2 VAR(B) + 2x(1-x)\ COV(A,B)]} \qquad (2.17)$$

The covariance represents the variability of the combined returns of individual investments around their mean. So, if A and B represent two investments, the degree to which their returns (r_iA and r_iB) vary together is defined as:

$$COV(A,B) = \sum_{i=1}^{n} \{[(r_i A - R(A)]\ [(r_i B - R(B)]\ P_i\} \qquad (2.18)$$

i.e $COV(A,B) = \dfrac{COV(A,B)}{\sigma A \sigma B}$

From equations (2.16) and (2.17), the covariance entered into the portfolio risk calculation twice and is weighted because the proportional returns on A vary with B and vice versa. Hence, in a real world situation where individual returns are independent and it is expected that whatever happens to the return of one project affects the other in opposite direction. Therefore, risks can be reduced by diversification without affecting the overall return.

Given the difficulty in deriving variance-covariance matrix calculations of portfolio returns, Markowitz work has been heavenly criticized. Apart from that, the policy prescription of the framework only concerns risky portfolios. Hence, Tobin (1958) extended the MPT of Markowitz by adding a risk-free asset to the analysis. Tobin showed that a portfolio beyond efficient risk asset can be constructed or achieved. Tobin asserted that since investors could borrow at a risk-free rate and invest more in portfolio using the borrowed funds, therefore, an investment can be achieved that that is beyond efficient risk asset. This implies that initial efficient portfolios of the Markowitz may no longer be desirable as risk–free rate is introduced because with borrowing (leverage) at risk-free rate, there are always better investment options in the financial market that guarantees higher returns given the same risk.

We borrowed from eqn. (2.14) where expected return arising from the two-asset portfolio R(P) is the weighted average of expected returns from two investments - R(A) and R(B), where the weight are the proportional funds invested in each.

$$R(P) = xR(A) + (1-x)R(B) \tag{2.19}$$

To incorporate portfolio/investment that includes a combination of risky and non-risk (risk-free), equation (2.14) is adapted,

$$r_p = xr_m + (1+x)r_f \tag{2.20}$$

where, r_m and r_f are risk return and free-risk return respectively

Giving the fact that capital market line (CLM) is a simple linear regression line, therefore, it has a constant slope (α_m) measured as

$$\alpha_m = (r_m - r_f)/\alpha_m \tag{2.21}$$

The expected return for any portfolio on the capital market line (r_p) would also be written as:

$$r_p = r_f + \left[\frac{(r_m - r_f)}{\sigma_m}\right]\sigma_p \tag{2.22}$$

where r_f denotes the intercept, σ_p is equal to zero, r_m implies the return on market portfolio while market risk and portfolio specific risk are represented as σ_m and σ_p respectively. The core objective of portfolio diversification lies on its ability to identify and select investment opportunities that have minimum portfolio risk without affecting the total return.

The major flip of the MPT is that even with the inclusion of risk-free asset (unsystematic risk), which is assumed to be eliminated through efficient diversification (while systematic or market risk cannot), it is still the systematic risk that affect the overall risk of the investment. Therefore, critics were quick to claim that introduction of risk-free asset by MPT is not relevant in portfolio's expected returns since it does not attract any premium, so focus should be on the systematic risk of the individual securities. MPT is an asset pricing model based on equilibrium with agents having mean-variance preferences. Hence, MPT is often times referred to capital market equilibrium theory in finance literature. Capital Market Equilibrium theory (MPT) is made up of four approaches namely: capital asset pricing model, Fama-French three factor model, five factor model of Fama-French and Arbitrage Pricing Theory.

2.1.3.1 Capital Asset Pricing Model (CAPM)

The theoretical work of Markowitz (1952) in determining asset portfolio selection triggered a paradigm shift in the theory of finance; and no doubt, led to the foundation of modern capital market theory. Markowitz theory which was anchored on mean-variance efficiency (maximizing expected returns and minimizing risks) in determining investor's preference in portfolio selection had two major drawbacks. First, it is based on single-period portfolio selection. Second, its approach and treatment of portfolio was viewed to be normative by right wing economists. Sharpe (1965), Linter (1965) and Mossin (1966) developed capital asset pricing theory in order to investigate the implications of the normative Markowitz theory.

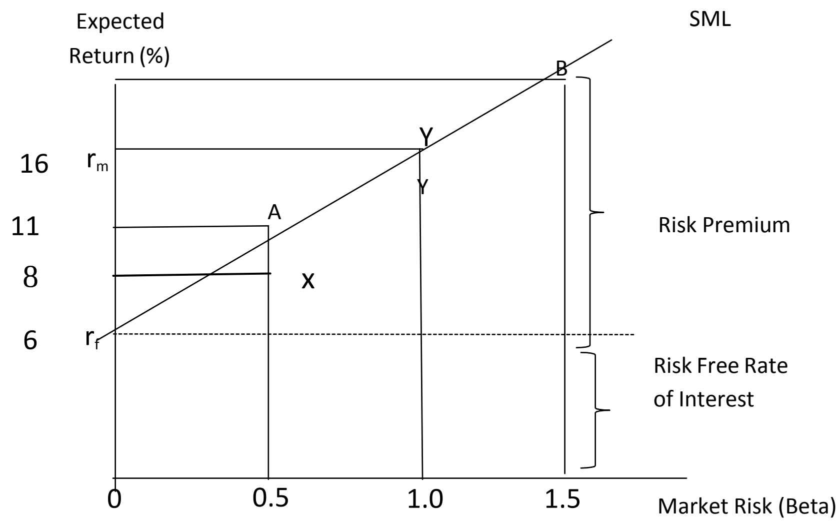
According to Sharpe (1965), there are two types of risk any respective investment will contain. The first one is called systematic or market risk - a risk that affects the overall risk of a portfolio and it is undiversifiable e.g. interest rates. The other is unsystematic (specific risk) which is the risk specific to individual stocks and it's diversifiable as an investor increases the number of stocks in his or her portfolio. The proponents of CAPM showed that it is only systematic risk that is capable of affecting security's expected return. Therefore, Sharpe, opined that it is vital for security managers to construct portfolios that always differentiate systematic risk (market risk) from unsystematic risk (specific risk).

The CAPM developed a way to measure the systematic risk using beta factor given that it is the only risk, investors pay a premium. It divided systematic risk into individual risk-return and portfolio (overall) risk return. In order to determine the expected returns of a security or portfolio, investors need to relate the individual or portfolio risk return to the market risk return (beta factor). The authors asserted that when the relationship between the price of portfolio risk and beta factor are closer, there is higher likelihood that the expected return will be greater. Thus, returns on assets can easily be predicted with less bias once the beta factor of a security is known.[18] The CAPM shows that what should be important to investors is the information about individual stock risk-return relative to the market risk-return. The CAPM uses security market line (SML) to show how beta factor measure optimum portfolio returns that is used for portfolio selection

As figure 2.1 illustrated, the expected risk-return of market risk (r_m) from a balanced market portfolio (m) corresponds to a beta value of one, since the portfolio cannot be more or less risky than the market as a whole. The expected return on risk-free investment (r_f) obviously exhibits a beta value of zero. It is interesting to know that in the market portfolio, the SML is always the optimum portfolio which lies on the efficient frontier. A specific amount of portfolio can be lent from any point between r_f and Y in the SML which must contain a mixture of risk and risk-free securities. But above Y, any additional security can only be borrowed at risk-free interest rate since beta factor cannot be more than one. Hence, point B is a borrowing portfolio.

Suppose an investor wants to invest in the security represented as X on the graph below with corresponding expected return and beta coefficient of 8% and 0.5 respectively. From the figure, it is observed that the return is too low for the risk involved and that the security is overpriced because X is located below the SML. Consequently, rational investor that wants to sell his security would need to reduce their price and increase the return (yield) until it corresponds to the SML at point. Going by the slope of the SML, a risk free rate is 6% while market return shows 16 per cent from a risky balanced portfolio. Figure 3.1 shows that the intersection of rate of return A and a beta coefficient of 0.5 becomes the new equilibrium point with value of 11%.

[18] An expected risk return (r_m) from market portfolio corresponds to a beta value of one. The expected return on risk-free investment (r_f) exhibit a beta of zero.



Source: adapted from portfolio theory and financial analyses of zainbook on line, 2017

Figure 2.1 The nexus between CAPM and SML

The formula can be expressed as

$$R_s = R_f + \beta\,(R_m - R_f) \tag{2.23}$$

Where R_s = Stock returns; R_f = Risk free asset; β = a premium that depends on the market risk; R_m = Market risk

Equation (2.24) states that the expected return on a specific asset equals the risk-free rate plus a premium that depends on the asset’s beta (β) and the expected risk premium on the market portfolio. The idea that asset beta is the only factor that can predict variations in portfolio returns is what made CAPM to be famously known as single-factor model.

The connection between expected returns and market risk is expressed as:

$$E(R_s) = R_f + \beta(E(R_m) - R_f) \tag{2.24}$$

Going by CAPM, fluctuation in individual stock price in relation to the overall stock market fluctuation can only be measured by beta factor (β). The beta identifies the amount of compensation that financial investors need while incurring an additional risk (premium). Thus, by knowing the beta, an investor could ascertain if the current price of a stock is viable regarding its payback.

Some assumptions that connect risk and return are spelt out below:

(i) All investors are risk-averse individuals, who maximize the expected utility of their end of period wealth.

(ii) The investors are price takers and have homogenous expectations about asset returns that have joint normal distribution.

(iii) There exists a risk-free asset such that investor may borrow or lend unlimited amounts at the risk-free rate.

(iv) The quantity of asset are fixed, also all assets are marketable and perfectly divisible.

(v) Assets markets are frictionless and information is costless and simultaneously available to all investors.

(vi) There are no market imperfections such as taxes, regulations, or restrictions on other sales.

CAPM has been criticized for lack of justification that security expected returns is only affected by systematic risk. The assumption of perfect market may not be attainable in reality because stock market is regulated in reality.

2.1.3.2 Fama-French Three Factor Model

The theoretical anomaly of CAPM concerning factors that determine expected return of asset portfolio gave rise to three factor model of Fama-French (1993, 1995)[19] – known as the 3FFF. The CAPM has been criticized against using beta as the only factor that has ability to explain variations in securities expected returns. Fama and French (FF) (1993) therefore proposed an alternative model to CAPM known as three factor model (3FFF). The 3FFF model contains three factors[20] (as against a single factor in the CAPM) namely: market excess rate of return, size related factor and book-to-market equity ratio.

According to the empirical argument of 3FFF model, market factor alone cannot account for all variations experience in the equity rate of returns. Fama added two additional variables which increased the explanatory power of CAPM in accounting for changes in the securities' rate of returns. Through this approach, many studies had been carried out using the same state factors as in the 3FFF to test the explanatory power of the 3FFF theory on expected returns (inter-alia Basu, 1983; Bhandari, 1988). Most of the researchers have found that only beta factor cannot predict all the variations in the return of assets but additional factors are needed. The additional factors included by FF as proxies for risk factors that affect rate of return are size of the market and book-to-market equity ratio. They put forward the regression formula below to show some common factors that affect variation in stock returns in the capital market.

[19] See FAMA and Macbeth (1973)
[20] FF added two more factor in addition to the market factor (beta) used by CAPM in order to explain stock valuation.

$$E(R_{pi}) - R_f \;=\; \lambda_{0i} + \;\; \lambda_{im}[E(R_m) - R_f] \;\;+\;\; \lambda_{is}[E(SMB)] \;\;+\;\; \lambda_{il}[E(HML)] + e_p \qquad (25)$$

Where: $R_{pi} - R_f$ = difference between the rate of return of portfolio and the risk-free rate (portfolio risk premium)

$R_m - R_f$ is the market risk premium.

SMB = difference between the rate of return on the small market value portfolio and the rate of return on big market value portfolio References

HML = difference between the rate of return on the high book-to- market portfolio and rate of return on the low book-to-market portfolio.

λ_{im}, λ_{is}, λ_{il} means factor sensitivities of the state variables or slopes of the time series regression

λ_{0i} and e_p capture the intercept and error term of the regression respectively.

The 3FFF model outlined how the state variables were measured: (i) Rate of return of market risk premium is measured by the difference between market return and risk-free rate. (ii) Equity market value is measured by the number of shares outstanding multiplied by the market price per share. (iii) Book-to-market equity, which is measured by the book value of equity divided by market value of equity. The 3FFF model has attracted a lot of follow up empirical studies both in developed (see Halliwell, Heaney and Sawicki, 1999; Harvey and Liu, 2016) and developing countries (Naceur and Ghazouani, 2007) and most of the studies found that the state variables used in 3FFF model predicts asset returns than single factor model of CAPM.

However, despite the simplicity and extension of the frontier of knowledge of the 3FFF model, some critics had refuted the model, especially as regards to the power of SMB and HML to explain equity stock behaviour. For instance, Vishny (1994) and Haugen (1995) documented that the SMB and HML occur due to investor’s overreaction rather than compensation for risk bearing. They claimed that investors systematically overreact to recent corporate news, unrealistically extrapolating high or low growth rate into the future. This in turn, leads to under-pricing the value of stocks. Furthermore, Perold (2004) argued that the small size capitalization (SMB) and high book-to-market equity (HML) factors are not explicitly about risk; but they could be proxies for risk. For instance, the SMB factor cannot be risk factor that affects expected returns, since small firms could simply combine to form large firms. Another criticism of the 3FFF model is that their value effect is based on giving equal weight to small and large firms and is much stronger than observed in capitalization-weighted value indexes. Hence, until the risks that underlie the 3FFF model are identified, the predictive power of the model will continue to be in doubt and its application will be hampered (Perold, 2004).

2.1.3.3 Arbitrage Pricing Theory

Due to the criticisms attracted by the 3FFF model, researchers strove to evaluate the efficacy of Fama-French theory in explaining asset returns, and even some researchers modified the traditional 3FFF model. However, most of these adjustments did not readily go away from the basic framework of the capital asset pricing model (CAPM). One of these theories is known as the Arbitrage Pricing Theory (APT) as developed by Ross (1976) and later extended by Huberman (1982), Chen (1983) and Lehmann and Modest (1988) among many others. One of the fundamental tenets of CAPM and 3FFF is that they compare individual security expected returns in relation with market return (beta factor) for them to determine the optimum portfolio. However, the APT argues that, there is no coherent justification to believe that returns on security can only be influenced by systematic risk and it is also quite difficult for most investor to discover all the factors that influence the true market portfolio behaviour. The APT asserted that the price of securities should be in relation to each other rather than market portfolio. The APT faulted the single index (beta factor) used by prior pricing models which rested on linear relationship in computing expected returns of systematic risk.

The theory argued that there could be other pervasive factors that affect expected returns of portfolios other than the beta factors in the CAPM and 3FFF models. Therefore, the APT broke systematic risk into smaller components, that cannot be compared in relation to market returns (beta factor) but among each other and proposed multivariable factor which include macroeconomic factors in order to fully predict asset's mean returns. According to

APT, any macro-economic factor, which impact upon investors' return may be incorporated into the APT as one of the risk factors. The APT is believed to be encompassing as regards to asset pricing; anchored on the premise that a whole lot of risk factors can impact on expected return of a security which could be macroeconomic, environmental, political variables and market indices. It affirmed that the factors are and must be linearly related to expected returns. Many studies have identified many macroeconomic factors that underlie the APT (see: Chan, 2010). Underlying the APT proposition is the acknowledgement that securities rate of returns could be affected by more than one systematic factor. It proposes that return on stocks depend on a number of expected and unexpected events which may occur during the time the stock is held by the investor in his portfolio.

The APT model for expected return on an asset is given by n-factor model:

$$R_i = E(R_i) + \Phi_{i1}\Re_1 + \Phi_{i2}\Re_2 + \ldots + \Phi_{in}\Re_n + e_i \qquad (2.26)$$

Where, R_i = the actual rate of return on asset i in a given period. $E(r_i)$ is the expected rate of return on asset i. Φ_i denotes sensitivity of the stock or security to each factor. $\Re$ = common risk factor (risk premium[21]) that influences all assets rate of return with zero mean. Note that the weighty variable (Φ_i) in APT has the same function and interpretations as beta (β) in CAPM.

However, this theory does not specify the factors for particular stock or asset; because, in practice, one stock might be more sensitive to one factor than another. Dhrymes, Friend and Gultekin (1984) concluded that when the number of portfolio constituents increases, there is likelihood that the number of factors that can be infused into the APT model increase also. The APT model is a multifactor version of the CAPM single factor model with an assumption of zero arbitrage profits and approximately linearity between the

[21] Risk premium is the extra return required to induce a risk-averse individual (investor) to engage in a risky project. If the expected risk premium on a stock were lower than the calculated risk premium using the formula above, then investors would sell the stocks. If the risk premium is higher than the calculated value, then investors would buy the stock until both sides of the equation are balanced.

expected returns on the assets and factor loadings, i. e. the betas. Hence, following the condition above,the APT can be modeled econometrically as:

$$E(R_i) = \Re_0 + \Phi_{i1}\Re_1 + \Phi_{i2}\Re_2 + \ldots + \Phi_{in}\Re_n + e_0 \qquad (2.27)$$

Where $\Re$'s = common risk premia that affect assets returns. Note, assuming there is risk free rate on assets, $r_f = \Re_0$ (r_f is risk free return; $\Re_0$ is intercept). E(R_i) = expected return on assets. Φ_i = the betas that reflect the sensitivity of the pervasive factor

The APT allows selection of factors that affect the stock price largely and specifically; hence, it is called a multi-factor model. As a multi-factor based model, the APT placed emphasis on the covariance between asset returns and exogenous factors, unlike the CAPM that placed emphasis on the covariance between asset returns and endogenous factors. Another crucial advantage of the APT is that it is operational in multi-period cases as against the CAPM which is suitable for single period cases only.

One of the fundamental arguments against the APT model is that it proposes n-factors to be impacted on stock returns without specifying the factors. Listing all factors can be a difficult task and in some cases, important factor might be ignored to incorporate in the model which mars the predictability of returns by the factors. Also, the risk of correlations may exist among the factors which may create another econometric problem. However, Ross (1980) responded by stating that the derived macro variables to be included in the APT framework should be the fundamental macroeconomic aggregates such as GDP and Exchange rate. Afterwards, researchers examined the explanatory power of some macroeconomic factors on asset returns and they found that economic variables have high predictable strength on equity returns (see, Chen, Roll and Ross, 1986, Emenuga, 1994). The argument for this is that economic variables affect expected dividends and the discount rate, the discount rate is determined by the interest rate and risk premium. While dividends could as well be influenced by inflation rate, GDP and fluctuations in oil price. Through this, macroeconomic (environmental) variables such as oil price enter into stock returns-risk model as pervasive factors that predict equity returns in Nigeria stock market.

2.1.3.4 Five Factor Model of Fama-French

After 22 years Fama and French published the famous 3FFF, the authors came up with the five factor model in 2015. The five factor model is an augmented version of the 3FFF, with profitability and investment factors being added in the factor loadings. Fama and French (2015) argued that much of the variations on average return as related to profitability and investment were left unexplained by the three-factor model. This prompted them to examine a model that adds profitability and investment factors to the market, size, and Book-to-market factors of the FF three-factor model. Fama-French (2015) applied dividend-discount model to show how profitability and investment are part of explanatory variables to stock's average returns. Dividend-discount model says that the market value of a share of stock is the discounted value of expected dividends per share which is expressed statistically below.

$$m_t = \sum_{\rho-1}^{\infty} E(d_{t+\rho})/(1+r)^{\rho} \qquad (2.28)$$

Where m_t = share price at time t, $E(d_{t+\rho})$ = expected dividend per share at period t+ρ, r = long term expected stock return or internal rate of return on expected dividends.

According to Miller and Modigliani (1961), at time t, total market value of the firm's stock implied by (2.28) is,

$$m_t = \sum_{\rho=1}^{\infty} E(Y_{t+\rho} - dB_{t+\rho}) \big/ (1+r)^{\rho} \qquad (2.29)$$

where $Y_{t+\rho}$ = total equity earnings at time t+ρ; $dB_{t+p} = B_{t+p} - B_{t+p-1}$ which denotes change in total book equity.

Dividing eqn. (2.29) by time t, book equity, yields

$$\frac{m_t}{B_t} = \sum_{\rho=1}^{\infty} \frac{E(d_{t+\rho} - dB_{t+\rho})/(1+r)^{\rho}}{B_t} \qquad (2.30)$$

Equation (2.30) states that m_t/B_t is a noisy (ineffective) proxy for expected return because the market capitalization (m_t) also responds to forecasts of earnings and investment.

The decomposition of cash flows in eqn. (2.30) implies that each stock's expected return is determined by its price-to-book ratio and expectation of its future profitability and investment. The rationale for augmenting the 3FFF model is rested on the assumption that the expected return is the same for all horizons, therefore, the valuation equation (eqn. 2.30) implies that the expected returns is determined by the combination of current prices and expectations of future dividends.

The time series regression of 5FFF is formed by adding profitability and investment variable to the 3FFF which is presented below:

$$R_{it} - R_{ft} = \alpha_i + b_i(R_{mt} - R_{ft}) + {}_{si}SMB_t + {}_{hi}HML_t + {}_{ri}RMW_t + {}_{ci}CMA_t + e_{it} \qquad (2.31)$$

RMW_t is the difference between the returns on diversified portfolios of stocks with robust and weak profitability, and CMA_t is the difference between the returns on diversified portfolios of the stocks of low and high investment firms while other variables remain as defined above. Five-factor model was applied to portfolio model formed on size, book to market equity, profitability, and investment by Fama and French (2015) and also tested if it performs better than the three-factor model when used to explain average returns. The 5FFF model did not outperform the 3FFF model due to insensitive of the way the variable were defined, hence, it was unable to predict stocks of low average returns.

Generally Equilibrium models are all involve either explicitly or implicitly with the following assumptions:

1) All investors are single-period expected utility of terminal wealth maximizers who choose among alternative portfolios on the basis of mean and variance of return[22].

2) All investors can borrow or lend an unlimited amount at an exogenously given risk free rate of interest R_f and there are no restrictions on short sales of any asset.[23]

[22] Note that representing preferences in terms of mean and standard deviation yields identical results to those obtained with a mean-variance representation

[23] Sharpe (1965) is an exception, since he deals with the case where no short sales are allowed.

3) All investors have identical subjective estimates of the means, variances, and covariances of return among all assets.

4) All assets are perfectly divisible and perfectly liquid, i.e., all assets are marketable and there are no transactions costs.

5) There are no taxes.

6) All investors are price takers and the quantities of all assets are given.

2.1.4 Cash Flow Theory of Stock Valuation

A Cash-flow theory was founded on the principle that the value of the stock is the present value of the future net cash flows. And this net cash-flow is the cash-flow between the firm and its stockholders. The theory which originated from corporate finance as developed by Gordon (1959) argues that cash flow is a necessary factor in an investment decision because they provide liquidity to the firms and any factor that alters firm's liquidity, certainly must affect stock valuation of the firm.

According to Jones and Kaul (1996) oil price changes spill over to stock market through future cash flow of companies and subsequently cause stock prices to change. Indeed, the value of stock in theory equals discounted sum of expected future cash-flows. These discounted cash-flows reflect economic conditions (e.g., inflation, interest rates, production costs, income, economic growth, and investor and consumer confidence) and macroeconomic events that are likely to be impacted by oil shocks. More so, there are large volume of works that investigated the nexus between oil prices and economic variables. Majority of these studies have shown significant effects of oil price fluctuations on economic activity for several developed and emerging countries (Hamilton, 2003; Balaz and Londarev, 2006; Lardic and Mignon, 2008).

To understand this vividly, we consider these two equations: first, stock returns $(R_{i,t})$ is defined as the first logarithm-difference of current and previous stock prices as shown in Eqn. 2.32:

$$R_{i,t} = \log\left(P_{i,t}/P_{i,t-1}\right) \qquad (2.32)$$

where $P_{i,t}$ represents the stock price of i's firm at time t.

Second, according to Huang et al. (1996) and following economic theory, it is opined that discounted future cash flows of a given stock is always reflected in the present stock prices as shown in eqn. 2.33

$$P_{i,t} = \sum_{n}^{N} t+1\left(\frac{E(CF_n)}{[1+E(r)]^n}\right) \qquad (2.33)$$

where CF_n, implies the cash flow at time n. The discount rate is r while E(·) means the expectation operator. Eqns. 2.32 and 2.33 brings to the fore that any factor that could affect expected cash flows or discount rate, can as well affect security's returns. The statement above signified positive or negative impact of oil price on firm's cash flow which will depend on whether the firm is an oil-user (oil-consumer) or oil-producer (see Oberndorfer, 2009; Mohanty and Nandha, 2011). Consequently, oil price volatility may equally impact on the discounted expected future cash flows of corporations by inducing augmented expenditures for affected corporations and may induce hedging costs for companies which impact on assets valuation. One of the major criticisms is that the model assumes constant rate of return. A constant rate of return assumption implies that the wealth of the investors is not optimized.

Given the limitations of most of the theories reviewed[24], they are not often used in academic literature. As regards to the modern portfolio theory,[25] CAPM and APT framework are prominently used in the stock market and finance literature because of the shortcomings of the other variants of MPT. However, the differences among the

[24] Especially Efficient market hypothesis, cash flow theory of stock valuation
[25] CAMP, Three factor model of Fama-French and APT, 5FFF

components of MPT lies in the fact that CAMP acknowledges only one factor (systematic risk) while the 3FFF recognized three microeconomic factors to be the only factor(s) that affect assets return. The APT, in addition to the systematic factors considered by CAMP and 3FFF shows that many other risks could affect the returns on security including macroeconomic risks. Therefore, the APT has been taken as a general specification of CAMP and 3FFF of asset pricing theory. The APT model can capture variations of CAMP and 3FFF and other factor models that fall outside these two categories such as five and six factor extension model of Fama and French (2015) and (2018) respectively. This implies that APT framework can be restricted or augmented in order to capture CAPM, 3FFF or other factor models. Hence, researchers have found other macroeconomic risks that can affect stock returns, thereby making the APT more suitable for such multi factor analysis. The present study adopted APT as the most suitable theory for the analysis because it allowed us to throw in oil price risk as one of the pervasive (macroeconomic) factor into the theory.

2.1.5 Stock Market Returns and Oil Price Fluctuations: Theoretical Perspective

This sub-section showed the transmission mechanisms through which oil price changes influence stock market returns. These transmission mechanisms are categorizes into two namely: direct channel and indirect channel. Direct channels show how changes in oil price affect stock market without connecting to other variables or factors while indirect channels imply that oil price fluctuations need to operate or link to other factors before stock market responds.

2.1.5.1 Direct Channel

- **Monetary Channel**

This is a situation where the expected discount rates of future cash flows are affected by changes in oil price through changes in interest rate. Discount rate is divided into expected inflation and expected real interest rates (see: Mohanty and Nandha , 2011). All things being equal, when oil price increases, cost of production rises also. This cost is usually borne by the consumers through increase in product pricing; hence, creating more expected inflation. During such inflationary period, short run interest rate is usually increased to curb the presumed inflation by the central bank. This policy results in two outcomes; firstly, commercial bank borrowing rates (discount rates) will increase and this affect future investment given that firms' borrowing costs have risen. Secondly, as cost of borrowing increases, firms' cash flow will reduce which will undoubtedly affect net present value of projects negatively. In such situation, stock prices certainly shed value either as a result of higher discount rates and/or lower cash flows.

Mohanty and Nandha (2011) asserted that the extent of the two effects depend largely on the efficiency of the central bank to stabilize inflation. It was hypothesized that a credible central bank will strive to achieve its inflation target; and its inflation expectation will remain stable despite the oil price change. However, this is in contrast with low credible central bank where oil price increase could lead to volatile and larger change in inflation expectation thereby impacting negatively on stock market prices. Hence, monetary channel yield varying results in the economy depending on the central bank credibility.

- **Uncertainty Investment Channel**

Brown and Yucel (2002) developed the uncertainty channel. They observed that increase in oil price is usually associated by uncertainty in the real economy as consumption, inflation, output and other macro and micro-variables are affected. They outlined the channel of transmission as thus: as oil price increases, it ushered in uncertainty, which retard demand for investments vis-à-vis expected cash flows for firms. Consequently, for the households, the uncertainty negatively affects their consumption of durable goods or investment. Interestingly, Chuku et al. (2010) admitted that increase in uncertainty resulting from oil price changes leads to increase in the rate of postponement of both investment and consumption decisions. And when the incentive to invest is low, investment and economic growth are negatively affected which ultimately hampers stock market returns.

According to Hamilton (1988), increase oil prices retard economic activity directly, and falling oil prices stimulate economic activity directly, but the costs of adjusting to changing oil prices also retard economic activity. Rising oil prices would present two negative effects for economic activity. Falling oil prices would present both negative and positive effects, which would tend to be offsetting. Adjustment costs could arise either from sectoral imbalances, coordination problems between firms, or because the energy-to-output ratio is embedded in the capital stock.

Consequently, the growth of output and productivity are affected. The decline in productivity growth causes real wage growth to reduce and enhances the unemployment rate at which inflation propagate. If consumers expect the rise in oil prices to be temporary, or if they expect the near-term effects on output to be greater than the long-term effects, they will attempt to smooth out their consumption by saving less or borrowing more which boosts the equilibrium real interest rate. With slowing output growth and an increase in the real interest rate, the demand for real cash balances falls, and for a given rate of growth in the monetary aggregate, the rate of inflation increases (Brown and Yucel, 2002). Therefore, rising oil prices reduce stock market returns and boost real interest rates and the measured rate of inflation.

Indirect Channel

- **Fiscal Channel**

The framework for the fiscal channel is focused basically on oil-exporting economies whose both their physical, social and economic infrastructures are financed with oil income. (see: Farzanegan 2011). In such economy, when there is increase in oil price, there is a corresponding increase in government revenue base resulting from transfer of wealth from their oil trading partners. This positively affects government expenditure. Increase in government revenue base correspondingly increased government purchases, assuming all things being equal. As government expenditure rises, household income increases which will inadvertently raise household consumption, especially when consumption and government expenditure are complementary. In such scenario, firms' cash flows will increase as well as their profitability. Such developments will push stock market unto bullish level resulting from higher stock prices. In contrast, if government expenditure and consumption are regarded as substitutes; then the effect of rising oil price tends to have opposite impact on household income. Stock markets will respond negatively to such developments, as the substitution effect will drive out the most productive private capital of the economy.

Direct-Indirect Channel

- **Output Transmission Channel**

It is well documented in the literature that oil price changes affect aggregate output in the economy (Salisu and Isa, 2017; Killian, 2008). Positive oil price changes are expected to lead to changes in aggregate output as a result of both income and production cost effect. First, the production cost effect suggested that when oil price increases, it is expected to have a corresponding increase in the production costs especially for oil-consuming firms. The price increase in turn reduces profit margins and future cash flows of these firms (see: Filis et al., 2011). Conversely, for oil-producing industries, positive change in oil price will positively affect cash flow and profit margin. Intuitively, oil consuming firms is expected to experience reduction in the value of their securities, whereas the reverse is the case for oil-producing firms. This is direct channel via output transmission.

As regards to the income effect, when oil price increases, there is likelihood that cost of living increases which tend to lower household income, due to direct positive impact on the prices of goods and services (Killian, 2009). Reduction in income brings about reduced consumption, reduced investment, which worsens aggregate output and unemployment ratio in an economy. Such unfavorable condition will negatively affect Stock markets which finally push stock market into bearish period. Output channel exhibits indirect effect here. The experience and impact of changes in oil price for all economies is usually determined if the economy is oil-importing or oil-exporting. The outlined channel above holds for an oil-importing economy. Although, rising oil price will also lead to high production cost in oil-exporting economy. However, the country would benefits from rising oil price revenue, which is income effect, (depending on the credibility of the domestic institutions), this will definitely cause aggregate demand and output to increase. The increase in the aggregate demand will occur only if the income effect is such that can offset the negative production cost effect. If that occurs, stock markets will be positively affected through increase in the firm's cash flow.

2.1.6 Transmission channels and the Nigeria Experience

Oil price fluctuation affects Nigeria stocks majorly through Output channel, although, fiscal transmission channel cannot be entirely ruled out. Output transmission channel comprises both direct and indirect channels. The output-direct transmission channel occurs when cost structure of firms increased as a result of expected inflation associated with oil price increase. Although, the final impact depends on if the firm is oil-producing or oil-consuming firm. For oil-consuming firms, the rise in firm's cost of production negatively affect firm's cash flow and profits, then, stock return reduces. However, for oil-producing firms, oil price increase positively impact on cash flow and profits. Hence, stock return is expected to increase in value. Generally, in Nigeria, there are 170 equity companies quoted on the floor of NSE. Less than 15 companies are oil related firms. The market capitalization of the oil & Gas sector contributed 8.3% in 2016 and when the mean market capitalization of the sector was takenfrom 2000 to 2016, Oil & Gas sector contributed less than 8.3%. This implies that overall impact of positive oil price on stock returns in Nigeria through output-direct-transmission channel could be negative.

Furthermore, output-indirect transmission channel can be explained using income effect. Oil price increase using income effect could lead to a lower household income due to the positive changes in retail prices of goods and services. When goods and services are expensive, income is reduced, consumption, investment, and aggregate output will drop, and unemployment is aggravated. Reduction in aggregate demand will result in a fall in investment and expected cash flow which negatively affects stock prices and returns Conversely, output-indirect transmission channel using income effects can unarguably impact positively on the national revenue when oil price increases. The positive income effect results from trading of oil in the world oil market. The rise in the national revenue stimulates government spending and this positively affect household consumption, investment and GDP. The rise in investment and GDP impact on stock market positively and therefore leads to increase in stock returns.

Generally, for oil-exporting-importing nation like Nigeria where share of oil imports expenditure to oil export revenue is about 75.6% from 2011 to 2015 (OPEC, 2016), it is expected that oil import spending will offset the huge amount of revenue accrue from oil export thereby leaving the country (Nigeria) with small amount of net export benefit.
Therefore, to determine the final effect of output channel in the Nigeria Stock Market (either arising from production cost or income effect), the increased aggregate demand from income effect (arising from oil export revenue) needs to offset the negative aggregate demand of the households (arising from higher retail prices of products) and higher production costs for firms (arising from expected inflation). From the above scenario, the negative impact of oil price increase will outweigh the positive effect in an oil-exporting-importing economy like Nigeria, hence, stock market returns is expected to respond negatively to oil price increase.

Gap in Theory

The theories reviewed including the pricing theories assume linearity between oil price-stock returns nexus. However, the impact of systematic risk has been adjudged to have direct and linear effect on stock returns in all the theories reviewed. The extent of the[26] effect on cost structure depends on the firm's market structure and its transmission channels. Following this, stock returns may not respond equivalently to decrease in systematic risk just as an increase in systematic risk; hence, any linear specification thereof may not be the appropriate functional form. Furthermore, the expectation that changes in risk factor (increase or decrease in oil price) should have varied impact on stock returns also justifies asymmetries in oil price-stock returns relation. The CAPM and APT models proposed symmetric relationship between systematic risk factors and stock returns.

To fill this theoretical gap, the present study will infuse oil price risk into APT theory using asymmetries. This involves using Shin et al. (2014) partial sum decomposition to show nonlinearity in oil price and stock returns parameters. Pricing theories assume that information is costless and perfect in the capital market. This assumption is erroneous in

[26] For example, oil-marketing firm (total) is expected to behave differently from non-oil-marketing industry (UAC) during oil price changes.

the present realities, given a lot of regulations going on in the capital market. Hence we will relax this assumption and show that there is no perfect information in the capital market.

2.2 Methodological Literature

Prior to the burgeoning literature on the relationship between oil price changes and stock market returns, existing literature focused attention on oil price volatility and macroeconomic activity and other variables such as inflation, interest rates, labor markets, exchange rates and government fiscal behaviour (Hamilton, 1983; Lardic and Mignon, 2008; Adeniyi, 2010). Recently, stocks market dynamics have become the focus of many studies that deal with oil price movement especially in developed countries due to the surge in energy prices. The rationale for the possible nexus of oil price-stock returns stems from the fact that oil, being a major input production, directly affects the cost structure of firms. The increased cost, ceteris paribus, will result in smaller profit (or loss) which will negatively affect the expected earnings and this depresses aggregate stock prices (Arouri and Nguyen, 2010; Nandha and Faff, 2008).

In studying oil price-stock returns relationship, different frameworks have been adopted by different researchers as well as the model specification, estimation techniques and scope. Most prominent methodologies adopted include: Vector Autoregressive (VAR) framework, Generalised Autoregressive Conditional Heteroscedasticity (GARCH) model and its extensions, Markov-Switching (MS) model, Copula Approach and Time Varying framework. Additionally, some authors have combined two different approaches to achieve their objectives such as Markov-Switching-Vector Error Correlation (MS-VEC) framework and vector autoregressive moving average GARCH (VARMA-GARCH).

However, in this methodological review, the study categorizes prior research work on oil price and stock returns relation into three categories. First, studies that utilized linear framework (symmetric) in their methodology using composite index on aggregate level. Second, studies that adopted symmetric framework at the sector or disaggregated level. The third categorization involves related studies that applied nonlinear (asymmetric) methodology. The reason for partitioning the literature into these categories is given by the evidence in the literature that linear and symmetric specifications sometimes misrepresent the form of interaction that exist between oil-stock prices nexus. This strand of researchers claimed that different industry sector respond heterogeneously to oil price changes (see: Broadstock et al. (2014); Aloui and Jammazi (2009); Chiou and Lee (2009); Chen (2010); Lee and Chiou (2011).[27]

2.2.1 Symmetric/Linear Approach to Oil Price-Stock Market Relationship on Composite Stock Index

In the pioneer work, Jones and Kaul (1996) attempted to highlight the practical importance of oil price shocks in explaining the fluctuations in stock markets in four civilized countries using quarterly data between 1947–1991. The countries are Canada, Japan, UK and US. Based on a standard present value model, their work reflected that stock return are possible to vary across countries depending on their oil production and consumption level and concluded that stock markets are affected by oil price changes through the impact of such changes on cash flows.

Thereafter, researchers identified that most of the recessions in 1970s and 1980s in the United States preceded oil price swings and tight monetary policy aimed at controlling inflation (Hamilton, 1983). This prompted an increasing number of studies to focus on the long run relationship between oil price fluctuation and other variables including stock market returns using VAR approach and its variants. Although, the study identified a study that applied Ordinary Least Square (OLS) technique in examining long-run relationship between oil price changes and stock returns. However, OLS is criticized due to the incessant changes of oil price and stock prices, hence result obtained from OLS may be misleading. Miller and Ratti (2009) in their OLS framework employed vector error correction model to analyze the long-run relationship between the world price for crude oil and international stock markets between 1971 and 2008.

The VAR framework has featured prominently in oil price-stock returns nexus. Filis (2010) examined the relationship between macroeconomic factors (customer price index and industrial production), stock exchange and oil prices spanning 1996-2008 using VAR

[27] However, Nandha and Faff 2008; Park and Ratti, 2008 do not support this finding

model. Cong et al. (2008) invoked VAR framework while investigating the interactive relationships between oil price shocks and Chinese stock market. The data spanned from 1996 to 2007. The impact of global oil price shocks on the Lebanese stock market was examined by Dagher and El Hariri (2013). The author adopted VAR method and covered the period of October 16, 2006 – July 10, 2012. West Texas Intermediate (WTI) spot price was used as proxy for international oil prices while unrestricted VAR technique was adopted. Fayyad and Daly (2011) also adopted VAR model to examine the relationship between oil price and stock market returns in seven countries (Kuwait, Oman, UAE, Bahrain, Qatar, UK andUSA) between 2005-2010.

Due to the weakness inherent in VAR framework to identifying the sources of these shocks, structural VAR (SVAR) was employed by researchers to identify the sources and structures of these shocks. In doing that, most of the studies classified the countries (oil exporting and oil importing countries) and shocks (aggregate demand shock, supply shock and speculative shocks) into various components. The SVAR goes beyond just establishing long-run relationship between oil price oil price and stock market returns.

Gupta and Modise (2013) used structural VAR methodology to examine if the source of oil price shocks matter for South African stock returns using monthly data running from January, 1973 to July, 2011. Their study applied unrestricted structural VAR technique in a dynamic simultaneous equation form in modeling the structural VAR. Using structural VAR in a linear form in nine (9) oil importing countries (US, Japan, Germany, France, UK, Italy, China, Korea and India) and seven (7) oil exporting countries (Saudi Arabia, Kuwait, Mexico, Norway, Russia, Venezuela and Canada) from 1999 to 2011 on monthly data was documented by Wang et al. (2013). The author studied the relationship between Oil price shocks and stock market activities in these countries.

There have been criticisms against SVAR methodology in estimating the true coefficient of oil price fluctuation and stock market. In spite of the relative simplicity in estimating SVAR model, the results of many Structural VAR methods are sensitive to the identification restriction, and as such makes estimation of variation in time of oil price change and stock market difficult to estimate. Moreover, shocks recovered from structural VAR may reflect variables omitted from the model, if these omitted variables correlate with the included variables, the estimated economic shocks become biased. Therefore, some researchers have argued that estimated error variance obtained from VAR and SVAR method may not be efficient (Hamma et al., 2014; Malik and Ewing, 2009).

Hence, GARCH framework was proposed to take care of time-varying features between oil price changes and stock returns. Most of the studies that applied GARCH to examine oil shocks and stock market performance account for the time-varying relationship between the two variables by using either multivariate GARCH approach (like Dynamic Conditional Correlation of Engle (2002), BEKK[28] by Baba et al. (1991) and probability theory[29] approach). However, GARCH framework, whether in static (e.g. VAR GARCH) or time varying framework (e.g. GARCH-BEKK, DCC, Diagonal BEKK) assumes minimum error variance. This study documents below works that adopted GARCH framework and its variants in oil price and stock return relations.

Broadstock and Filis (2014) considered oil price shocks and stock market returns: New evidence from the United States and China. In the analysis, Structural VAR and Scalar-BEKK model were used on monthly data starting from January 1995 through to July 2013 on aggregate US and Chinese stock market indices (NYSE and Shanghai Composite index, respectively) and also on selected industrial sector indices from both countries. Sectors covered are Banks, Metals & Mining, Oil & Gas, Retail and Technology.

Fowowe (2013) explored jump dynamics in investigating the nexus between oil prices and the stock Market in Nigeria using GARCH-jump models. For robustness, the study specifically combined the two approaches (constant intensity jump model and GARCH autoregressive conditional jump intensity model and (GARCH-ARJI)) using daily data of Nigeria Stock Exchange All-Share Index from December 12, 2001 – August 31, 2011

[28] BEKK means Baba –Engle-Kraft-Kroner
[29] Probability or Copula theory is a statistical tool in econometrics that measures the dependence between many random variables developed by Sklar (1973). It is often used in financial market analysis.

GARCH and DCC-GARCH were employed by Mollick and Assefa (2013) to examine the relationship between United States stock returns and oil prices spanning 1999-2011. Sadorsky (2012) investigated the volatility spillover between oil prices and the stock prices of clean energy companies and technology companies covering the period 2001 – 2010. The paper adopted four multivariate GARCH models (BEKK[30], Diagonal, CCC[31] and DCC[32])

Jouini (2013) evaluated return and volatility interaction between oil prices and stock markets in Saudi Arabia using VAR-GARCH process. The author utilized weekly data from Saudi Arabia stock exchange spanning from January 10, 2007 to September 28, 2011. Zhang and Chenn (2011) evaluated the impact of global oil price shocks on Chinese stock returns using ARJI(-ht)-EGARCH model[33]. The model is applied to 2965 observations from June 1, 1998, to November 30, 2010, with daily data on Shanghai Stock Exchange. The paper decomposed shocks into expected, unexpected and negatively unexpected component of oil price fluctuations. They applied EGARCH process to China's stock returns, combined with the Autoregressive Conditional Jump Intensity (ARJI) method rather than using traditional co-integration test, VAR or VECM model to examine impact of oil price on Shanghai Stock Exchange (SSE) Composite Index. Maximum Likelihood Estimation (MLE) technique was used in their estimation.

Sadorsky (1999) made use of VAR process with GARCH effect to study the links between US stock market and fuel oil price by controlling for the effects of the short-term interest rate and industrial production. Using monthly data, the author showed that the behaviour of the stock index depends significantly on oil price changes. Filis et al. (2011) used DCC-GARCH model to investigate the time-varying correlation between stock market prices and oil prices for oil importing and oil exporting countries covering 1997-2009. Hammoudeh et al. (2009) examined the dynamic volatility and volatility transmission of oil and stock markets in four GCC's economies (Kuwait, Qatar, Saudi Arabia and UAE). VAR–GARCH framework was employed in the study which spanned from 2001-2007.

[30] Full Paramerititization
[31] Constant Conditional Correlation
[32] Dynamic Conditional Correlation
[33] Autoregressive Conditional Jump Intensity –ht- Exponential Generalized Conditional Heteroscedasticity Model OR Extended Autoregressive Conditional Jump Intensity EGARCH model

Another recent strand of literature focuses attention on the examination of oil price effect on stock returns over various quintiles using Copula approach. Sukcharoen et al. (2014) applied Copula approach to examine the independence of oil prices and stock market indices in developed countries. The study utilized daily data which started from January 2, 1982 to December 31, 2007. World Texas Intermediate (WTI) price was used as a proxy for crude oil price. Time-varying copula model tends to identify the optimal dependency structure in a bivariate model.

In a related subject, Gregoriou et al. (2009) opted for the Seemingly Unrelated System to model the US stock prices in the short and long term over the monthly period, 1983–2004. They found that volatility only impacted the consumption and inflation equation given that the shocks of 1987, 1997 and post-September, 11th have been taken into account. The adoption of Seemingly Unrelated System was because the number of observation (n) is greater than time period (T)

2.2.2. Symmetric Approach of Oil Price-Stock Returns Nexus on Sectoral Level

This section presents studies that applied linear approach in their methodological framework on disaggregated level. Identifying the multi-scale impacts of crude oil price shocks on the stock market in China at the sector level was studied by Huang et al. (2015).The paper Adopted VAR regression approach on daily data from January 2005 – December, 2013 in 10 sectors (Energy, Consumption, Finance, Health, Industry, Information, Material, Optional Consumption, Utility and Telecommunication) in china.

Babatunde et al. (2012) used quarterly data covering the period 1995-2008 to examine the effect of oil price shocks and stock market behaviour in Nigeria. The study utilized VAR framework to unravel the link between changes in crude oil price and stock market returns in five sectors (Agriculture, Commercial, Financial, Manufacturing and Services) in Nigeria. The study adopted Hamilton (1983) linear framework decomposition of oil price in order to account for asymmetry. Such linear decomposition results in high variance of the error term, hence, estimates from such analysis do not converge to their true values.

Bouri et al. (2016) examined crude oil prices and sectoral stock returns in Jordan around the Arab uprisings of 2010. The authors adopted Cross correlation function derived from GARCH model methodology and daily data from December 18, 2001 – June 18, 2013. They accounted for Arab uprising by dividing the period into pre (Dec, 18 2004 to May, 15, 2007) and post uprising (Dec. 18 2010 to June 18, 2013). It also used Jordanian sectoral equity return and Brent crude as proxies for stock returns and crude oil prices respectively.

Hamma et al. (2014) studied the effect of Oil price volatility and effectiveness of hedging strategy in Tunisian stock market on sector-level. The analysis used weekly data from 7 sectors in Tunisia exchange market. The analysis utilized GARCH model with BEKK APPROCH. GARCH framework was applied by Phan et al. (2014) while investigating the effect of oil price on stock returns of crude oil consumers and producers. The paper used daily data for the top-20 firms and top-60 firms listed under the Confederation of Garment Exporters of the Philippines (CONGEP) sub-sector to form sub-sector specific indices of the oil-producer and oil-consumer countries.

Guglielmo et al. (2014) adopted VAR-GARCH to model Oil price uncertainty and sectoral stock returns in China between January 1997–February 2014. The study applied time-varying framework to analyse the effect of oil price volatility on stock returns of 10 sectors in china. Arouri et al. (2011) studied volatility transmission between oil and stock markets in Europe and the USA at the sectoral level using a multivariate vector autoregressive GARCH model, finding significant volatility spillover effects between oil and sectoral stock returns. Hammoudeh et al. (2010) used both standard GARCH and asymmetric power GARCH models to study the effect of oil price changes on sectoral stock return volatility. His findings show that returns of sectors that intensively use oil have a positive response when there is an increase oil price volatility, a negative effect for oil-related sectors and a negative and asymmetric effect for all sectors.

Malik and Ewing (2009) examined the volatility transmission between oil prices and five US sector indices using BEKK–GARCH (1,1) model. The sectors considered include Financials, Industrials, Consumer Services, Health Care, and Technology. The paper covered monthly data from January, 1992 to November, 2008. Reboredo and Rivera-Cashort runto (2013) considered daily data spanning from June 1, 2001 to July 29, 2011 using wavelet correlation framework to determine the impact of oil prices on stock returns on aggregate and sectoral stock market and crude oil price in USA and Europe.

The above review discussed oil price-stock returns relations using symmetric approach. Symmetric here implies that positive and negative oil price changes have the same magnitude of impact on stock returns. However, some studies have pointed out that a linear specification may not be reasonable to capture the nonlinear relationships that exist between the two variables, and attempt to do that will undermine the robustness of results obtained there in. (interalia: Aloui and Jammazi, 2009; Chiou and Lee, 2009; Chen, 2010; Lee and Chiou, 2011; Narayan and Sharma, 2011; Mork, 1989; Hooker, 1996). The methodologies reviewed above were different from the methodology used in this study because present study applied nonlinear model in order to capture oil price-stock return interaction.

2.2.3 Asymmetric Approach of Oil Price-Stock Nexus

In this section, we turn attention to studies that applied nonlinear framework on oil price/stock relationship. Following Moshiri and Banihashem (2012), the use of the nonlinearity model is based on the belief that rising oil prices may have a different impact on stock prices from falling oil price. In oil exporting countries, during favorable oil price change, income effect resulting from transfer of wealth from oil importing countries impact positively to stock market and government accumulates reserves inform of Sovereign Wealth Funds (SWFs) and Excess Crude Account (ECA) like in Nigeria. One of the objectives for foreign reserves is to use it to immune or stabilize the economy during economic adversities like falling oil price. When price of oil falls, the reserves are used to offset the possible negative effects the falling oil price tends to pose on the economy and by extension, stabilizes the stock market. Hence, stock prices (returns) may not be able to respond to oil price decrease the same way it responds to oil price increase in oil exporting countries like Nigeria. On sectoral level, asymmetric is being established given the fact that the response of all sectors or firms to oil price change is not expected to be the same across industries. Firms (sectors) differ in their policies, managerial expert and investment potentials, hence, the extent of internalization of oil price changes by various sectors will differ depending on these aforementioned factors above.

Salisu and Isa (2017) employed Nonlinear Autoregressive Distributed Lag (NARDL) model while studied the interaction between oil price and stock market in oil exporting and oil importing countries. The study covered five net oil exporting and eight net oil importing countries using monthly dataset of West Texas Intermediate and Brent oil price. The data set spanned from January 2000 to December 2015. Net oil importing countries used in the study are: Argentina, UK, Japan, Australia, France, Germany, USA and South Korea while net oil exporting countries include Nigeria, Kuwait, Saudi Arabia, Qatar and Indonesia.

Atil et al. (2014) used monthly spot closing prices for WTI crude oil, gasoline and henry hub natural gas to evaluate asymmetric and nonlinear pass-through of crude oil prices to gasoline and natural gas prices in France. The study employed NARDL approach and France data set running from January 1997 to September 2012. Ramos and Veiga (2013) traced Oil price asymmetric effects and its puzzle in international stock markets and adopted Generalized Autoregressive Conditional Heteroskedasticity models (GARCH) in its analysis. The paper used monthly data from stock market returns to examine 14 Oil importing and 5 oil exporting countries in America and Europe from December, 1988 to June, 2009. Greenwood-Nimmo and Shin (2013) looked at asymmetric adjustment of selected retail energy prices and stock market in UK. The paper considered asymmetric price transmission from crude oil products (kerosene, diesel, derv and unleaded petrol) to retail energy prices and equally used NARDL framework during the period of January 1999 – March 2013.

Nader and Al Dohaiman (2013) examined the nonlinear analysis among crude oil prices, stock markets return and macroeconomic variables in GCC countries. The paper applied Markov Regime-Switching model and Copulas model to study regime shifts in the Gulf Cooperation Council (GCC) using daily data from July 7, 2004 to November 10, 2011. Markov regime was used to generate regime probabilities for oil market variables. The study adopted 2 state Markov switching models: crises regime and non-crises regime. Markov regime switching model is a form of time varying model that is applied when comparing different time periods. Having documented the studies that used asymmetric framework on oil price-stock returns analysis, the study noticed that most of these prior studies adopted NARDL. Present study applied the same methodology but will differ from them by using firm level indices to analyze impact of oil price risk on stock market returns in Nigeria.

2.2.4 Structural Breaks

Structural breaks represent infrequent parameter shifts that are caused by policy regime shifts and significant geopolitical events such as the Asian crises of 1997, Global Economic crisis (2008), Arab spring (2011), and even the Niger-Delta militancy of 2011 in Nigeria. Ghosh and Kanjilal (2014) argued that structural breaks have been a potential characteristic in oil and stock markets. Hence, the review outlines a number of related studies that incorporate structural breaks in their analysis.

Sim and Zhou (2015) adopted structural VAR to uncover the structural shocks in oil prices and stock returns in USA, and dependency between their quantiles. The analysis used quantile-on-quantile (QQ) estimation technique to unravel structural shocks between the variables and monthly data spanning between January 1973 and December 2007 was utilized. Ghosh and Kanjilal (2014) with data ranging from January 2, 2003 – July 29, 2011, investigated co-movement of international crude oil price on Indian stock market using nonlinear cointegration test. The study employed nonlinear threshold cointegration methodology in investigating the long-run relationship which has undergone some structural break

The study used threshold cointegration of Gregory and Hansen (1996) and Hatemi-J (2008) to investigate possible endogenous regime shifts or nonlinearity in the relationship of stock market, oil price and exchange rate. Toda-Yamamato version of granger causality technique was used to test if there is long run relationship between international crude oil price and Indian stock returns and Brent was used as proxy for crude oil. Li et al. (2012) examined sectoral analysis of oil prices and stock market in china using panel cointegration with multiple structural breaks. Monthly data collected from July, 2001 to December, 2010 was applied to verify the long run equilibrium of oil price shock and stock prices at the sector level while considering structural breaks. Cointegration and granger causality framework were used in the analysis.

Lee and Zeng (2011) took cognizance of structural breaks while studying impact of oil price shocks on stock market activities using quantile regression. This is one of the few prior research works that combined both asymmetric and structural breaks in the same study but on aggregate level. The paper used G7-countries (Canada, France, Germany, Japan, Italy, United Kingdom and USA) monthly data in its analysis. Miller and Ratti (2009) examined the long term relationship between world crude oil prices and international stock exchanges using VECM and investigated the existence of structural breaks.

3.2.5 Gap in Methodological Literature Review

Having reviewed various methodological frameworks related to the study as used in the literature, it is noted that large volume of studies adopted symmetric approach on either composite or sectoral index of stock prices using different econometric modeling like VAR, GARCH and its variants (inter alia: Bouri et al. 2016; Babatunde et al. 2012; Jouini, 2013; Sadorsky, 1999). Studies that applied nonlinear approach on oil-stock returns relation focused on aggregate stock index (all share index or market stock) (see: Salisu and Isa, 2017; Nusair, 2016) which differs from this study that focuses on sectoral analysis. In the same vain, works that considered oil price and stock market in a nonlinear method that accounted for breaks, focus on aggregated level and outside Nigeria. (see Lee and Zeng (2011); Ghosh and Kanjilal; (2014)).

Few works that investigated oil price-stock returns relation in Nigeria (Babatunde et al. 2012; Fowowe, 2013) employed VAR and GARCH-Jump framework. This study constructed dynamic nonlinear ARDL propounded by Shin et al. (2014) to examine long run and short run asymmetric impact of oil prices fluctuation on disaggregated stock market returns in Nigeria.

2.3 Empirical Literature Review

In this section, review of empirical literature on oil price dynamics and stock market returns in Nigeria is presented. There have been a plethora of studies investigating the links between oil price and stock market in both developed and developing economies. In this study, prior empirical evidence linking oil price changes and stock market returns are classified into two categories, one at the market (aggregate) level and another at the industry (sector) level. The former was also divided into three (3), first, studies that classify countries into oil exporting and oil importing nation, second involves works that categorizes sources of oil price change: demand or supply instigated and lastly studies that adopted nonlinear analysis. Though, the study recognized some strand of literature where some countries are not affected by oil price shock due to the structural characteristics of the economy but that not the focus of this study (see: Lashtew, Ross and Werker, 2020).

2.3.1 Oil Price Changes and Aggregate Stock Market Returns

The research concerning the impact of oil price changes on stock markets was pioneered by Jones and Kaul (1996), who used 1947–1991 quarterly data for Canada, Japan, the U.K. and the U.S. to find that oil price, has negative impact on the aggregate stock returns. While Huang et al. (1996) adopt a vector autoregressive (VAR) model to identify the relationship between oil future prices and US aggregate stock returns. They discovered that oil future return did not have much impact on the broad-based market indexes such as the S&P 500. These two studies paved way for further research in this area. Dagher and El Hariri (2013) investigated the impact of global oil price shocks on Lebanese stock market returns using daily data over the period Oct, 16, 2006 to July 10, 2012. The study intended to find the dynamic interactions between daily Brent spot prices and Lebanese stock prices. The study used Beirut Stock Index and stocks from development and reconstruction sector in Lebanese. The study found evidence of oil prices Granger

Cause stock returns, but no evidence of the opposite relationship. They applied impulse response function to better understand how shocks in the oil market are transmitted to the stock market. It showed that the forecast errors of the stocks are largely attributable to their own innovations and the percentages do not change much with time. Only around 1% is attributable to oil shocks, increasing to around 3% after a few days andremaining at that level.

Fowowe (2013) evaluated the jump dynamics in the relationship between oil prices and the stock Market in Nigeria using daily data covering December 12, 2001 to August 31, 2011. The study utilized NSE All-Share Index as a proxy for market stock returns. Returns for both stock market and oil prices were calculated as logarithmic difference in price between trading days t and t-1, multiplied by 100.The findings showed a negative but insignificant effect of oil prices on stock returns in Nigeria. The relationship between oil prices and the Nigerian stock market was also investigated by Gil-Alana and Yaya (2014). Using monthly data from Nigeria Stock Exchange, the result indicated that previous behaviour of oil prices determined the behaviour of Nigeria Stock market. The proxy used in this study for stock returns and oil price are monthly NSE All Share Index and Brent Crude Oil Prices respectively. Both series span from January 2000 to December 2011 giving a total of 144 data points. Hence, the study established positive relationship between the two variables which contradicted Fowowe (2013).

Jouini (2013) enquired on the return and volatility interaction between oil prices and stock markets in Saudi Arabia. The data used for stock index are from Tadawul All Share Index (TASI) and five sectoral stock prices of Telecommunications and Information Technology, Industrial Investment, Insurance, Energy and Utilities, and Banks and Financial Services. The empirical findings showed evidence of return and volatility transmission between oil price and stock sectors. However, the spillover effects are unidirectional from oil to stock returns, but bidirectional for volatility patterns with more apparent links from stocks to oil.

Arouri, et al. (2011) examined the return and volatility transmission between world oil prices and stock markets of the GCC countries (Bahrain, Saudi Arabia, Kuwait, Qatar, Sultanate of Oman and United Arab Emirates) between June 7, 2007 and February 21, 2010. Daily returns of stocks are calculated from daily price data by taking the natural logarithm of the ratio of two successive prices while Brent spot prices are used to represent the international crude-oil Market. The results showed the existence of substantial return and volatility spill over between world oil prices and GCC stock markets.

Gil-Alana and Yaya (2014) evaluated the relationship between oil prices and the Nigerian stock exchange market using fractional cointegration model. The study focused on identifying if long run relationship exists between oil price fluctuation and returns on the stock market. The proxy used for the two variables were monthly NSE All Share Index and Brent Crude Oil Prices respectively. Both series spanned from January 2000 to December 2011 giving a total of 144 data points. The results obtained showed significant evidence of a positive relationship between oil price and stock market though with a short memory effect. This relation was, however, significant only during the three months the shock occurs. Instructively, the two series did not show any long run relationship.

Fayyad and Daly (2011) used Weighted Equity Market Indices to study the impact of oil price shocks on stock market returns by comparing GCC countries with the UK and USA. The results informed the conclusion that the predictive power of stock returns increased after a rise in oil prices from September 2005– February 2007 during the Global Financial Crises. This implies that oil shocks affect stock returns of these countries.

Cong, et al. (2008) reviewed the relationships between oil price shocks and stock market in China with data spanning over the period January 1996–December 2007. The study used real oil price which is a product of Brent oil price and exchange rate deflated by the CPI of China. Real stock returns are defined as the difference between the continuously compounded return on stock price and the log difference in the consumer price index. Logarithm was defined as log(1+r/100). Stock price data are from Shanghai stock exchange and Shenzhen stock exchange. The study concluded that most oil price shocks do not show significant impact on the real stock returns except for manufacturing and some oil companies.

Hammoudeh, et al. (2010) examined the dynamic volatility and volatility transmission of oil and stock markets in four GCC's economies (Kuwait, Qatar, Saudi Arabia and UAE) covering the period 2001-2007. The results suggested that past own volatilities matter more than past shocks and there are moderate volatility spill overs between the sectors within the individual countries, with the exception of Qatar.Miller and Ratti (2009) examined the long term relationship between world crude oil prices and international stock exchanges within the period 1971-2008. It was observed that stock market indices respond negatively to the oil shock in the long run, but this negative relationship disintegrated after September 1999. Their results suggested existence of structural breaks in the relationship.

Basher, Haug and Sadorsky (2011) evaluated oil price, exchange rates and emerging stock market using monthly data over the period January 2001-December 2008. In the study, oil price was measured using West Texas Intermediate crude oil. Emerging market stock prices were measured using the Morgan Stanley Capital International index (MSCI)[34]. The analysis revealed that stock prices respond negatively to a positive oil price shock, and a positive oil price shock leads to an immediate drop in the trade- weighted exchange rate in China.

[34] The MSCI emerging markets index is a free float-adjusted market capitalization index that is designed to measure equity market performance of emerging markets. MSCI classifies countries as emerging based on size and liquidity requirements and market accessibility criteria in US dollars

2.3.1.1 Review of Empirical Decomposition of Studies into oil Importing and Oil-Exporting Countries

Some researchers have favored disaggregation of countries between oil-exporting and oil-importing countries as they believe that such dichotomy will contribute to achieving robust estimates. Salisu and Isa, (2017) favors the idea that distinct analysis that covers the two categorizations should be carried out.

Sukcharoen, et al. (2014) evaluated the interdependence of oil prices and stock market indices on oil importing and exporting countries. The countries considered in the analysis include Canada, French, Germany, Hong Kong, Italy, Japan, Netherlands, Switzerland, United Kingdom, United States, China, Czech Republic, Finland, Hungary, Poland, Russia, Spain, and Venezuela. However, they excluded oil and gas sector effects from the stock market index series to remove the direct linkage. Findings from the studies suggested a weak dependence between oil prices and stock indices for most cases. Exceptions are for the stock index returns of large oil consuming and producing countries (United States and Canada), which were shown to have a relatively strong dependence with the oil price series.

Studying oil price asymmetric effects and answering the puzzle in international stock markets was done by Ramos and Veiga (2013) using 14 Oil importing and 5 oil sufficient or exporting countries in America and Europe from December 1988 to June, 2009. The study revealed that oil price volatility has a negative impact on stock markets of oil-importing countries and positive in oil-exporting countries. Filis, et al. (2011) conducted an empirical study to identify the time-varying correlation between stock market prices and oil prices for oil-importing and oil-exporting economies. Data from six countries were utilized; for Oil-exporting: Canada, Mexico, Brazil and Oil- importing: USA, Germany, and Netherlands. The results suggested that supply-side oil price shocks do not influence the relationship between the oil and stock markets, but lagged oil prices exhibit a negative impact on all stock markets.

Broadstock and Filis (2014) studied effect of oil price shocks of different types (aggregate demand shocks, supply-side shocks and oil market specific demand shocks) on stock market returns (of selected industrial sectors[35]) in United States and China using monthly data between 1995–2013. They found that oil shocks of different types showed substantial variations in their impacts upon stock market returns; and the effects of the shocks differ widely between industry sectors. The study concluded that China is seemingly more resilient to oil price shocks than the US on aggregate level.

Phan, et al. (2014) investigated how stock returns of oil producer and oil consumer industries are affected by oil price changes. Daily time-series observations for the top-20 oil producer firms and top-60 oil-consumer firms listed under the Confederation of Garment Exporters of the Philippines (CONGEP) sub-sector was used to form sub-sector specific indices. They found that stock returns of oil producers are affected positively by oil price changes regardless of whether oil price is increasing or decreasing. For oil consumers, oil price changes do not affect all consumer sub-sectors and where it did, this effect was heterogeneous. Additionally, they acknowledged that oil price returns have an asymmetric effect on stock returns for most sub-sectors.

Filis, et al. (2010) looked into Stock Price Indices of Oil-Importing and Oil-Exporting Countries and their relationship with macroeconomic factors (customer price index and industrial production). It was established that long term oil prices and stock exchange index have positive effect on customer price index. However, oil prices have negative effect on stock exchange of oil-exporting countries and oil prices did not have any effect on industrial production of oil. In the same way, no relationship was found between stock exchange and industrial production.

Wang, et al. (2013) sample 9 oil importing and 7 oil exporting economies to verify how oil price shocks affect stock market activities. The oil importing and oil exporting countries covered were US, Japan, Germany, France, UK, Italy, China, Korea, India and Saudi Arabia, Kuwait, Mexico, Norway, Russia, Venezuela, Canada respectively. The results confirmed that the magnitude, duration, and even direction of response by stock market in

[35] The study covered Banks, Metals & Mining, Oil & Gas, Retail and Technological industrial sector

a country to oil price shocks is highly depended on whether the country is a net importer or exporter in the world oil market, and whether changes in oil price are driven by supply or aggregate demand. The results also showed that the effects of aggregate demand uncertainty on stock markets in oil-exporting countries are much stronger and more persistent than in oil-importing countries. It was concluded that positive aggregate and precautionary demand shocks affect stock markets in oil-exporting countries, but not among those in oil-importing countries.

2.3.1.2 Decomposition of Oil Price Shocks via Demand, Supply or Speculative Driven Shocks

Killian (2009) criticized most of the earlier conventional studies because they treated oil price shocks exogenously. He argued that oil prices responded to factors that also affect stock prices and as a result, the aggregate oil price shock should be decomposed. Following Killian and Park (2009), the study distinguished between three types of shocks to the global oil market. First, oil supply shock - which reflects unexpected changes in the physical volume of oil. Second, the aggregate demand shock which corresponds to changes in the demand for industrial commodities that are driven by fluctuations in the global business cycle. Third, the speculative demand shock which captures changes in oil prices driven by speculative motives and forward-looking behaviour.

Taking this decomposition into account, Killian and Park (2009) found that US stock prices reacted negatively only to oil price increases driven by speculative demand, while oil production disruptions (supply shocks) have no significant impact on the US stock market. The study concluded that oil price shocks have a persistent positive effect on stock prices especially during an overall improvement in the global real economic activity. Gupta and Modise (2013) endogenously surveyed oil shock by decomposing the source of oil shock into three classifications (demand, supply and precautionary/speculative) and examined if the diverse source matters for South Africa stock exchange. The findings showed that unexpected increase in aggregate demand will result in a positive and persistent reaction of stock returns while supply shock and the speculative demand shocks affect stock returns negatively.

Zhang and Chenn (2011) investigated the impact of global oil price shocks on China's stock returns using EGARCH model. The study disaggregated oil price shocks into expected, unexpected and negatively unexpected component. The study used 2965 observations spanning from June, 1998 to November, 2010 sourced from Shanghai Stock Exchange. Stock return was defined in the study as 100 times the first difference in the logarithm of the closing day. Brent crude oil price was used as proxy for world oil price. The results revealed that there are jumps varying in time in China's stock market, and that China's stock returns are correlated with positive oil price changes unlike US, contrary to previous research in China which argued that world oil prices have a positive effect on Chinese stock returns.

2.3.1.3 Nonlinearity of Oil Price-Stock Returns Nexus at Composite Level

Recently, some researchers suggested that the linear relationship between oil prices and stock markets is not so evident in practice. Therefore, energy experts have advised that conventional approaches to address oil price changes and stock markets should be rethought (Chiou and Lee, 2009). Therefore, few studies have considered the existence of nonlinearity between the two variables on aggregate level.

In this wise, Salisu and Isa (2017) revisited the relationship between oil price and stock market using nonlinear form among eight (8) net oil importing and five (5) net oil exporting countries. The selected countries studied include; Argentina, Australia, France, Germany, Japan, South Korea, UK and USA being the net oil importing economies. While the net oil exporting countries include Saudi Arabia, Nigeria, Indonesia, Qatar and Kuwait. Monthly data that span from January 2000 to December 2015 was applied. The study poised to test if the stock prices of the two categories responded asymmetrically to changes in oil price. The results revealed that asymmetrical response was evidence in the stock returns of both oil exporting and oil importing categories. However, the response claims to be stronger in the oil importing countries than the oil exporting countries.

Atil, Lahiani and Nguyen (2014) examined the asymmetric and nonlinear pass-through of crude oil prices to gasoline and natural gas prices in France. They utilized monthly spot closing prices for WTI crude and gasoline from January, 1997 to September, 2012. It was reported that oil price shocks affected gasoline prices and natural gas prices in an asymmetric and nonlinear manner. But the transmission mechanism was not the same.

Ghosh and Kanjilal (2014) applied Toda–Yamamoto version of Granger causality tests using monthly data starting from January 2, 2003 to July 29, 2011 to examine the co-movement of crude oil price and stock market in India in a nonlinear form. The data span was subdivided into three phases; prior to 2007/2008 financial crises (phase I) and post financial crises (phase III) to most volatile phase (phase II) spanning from July 2, 2007 to Dec 29, 2008 in order to get better insight concerning oil price impact on stock returns in those periods. The findings of the tests rejected any long-run equilibrium relationship between crude oil price and stock market returns. It further revealed that international crude oil prices have impact on Indian stock market in phases II and III with no feedback effect spanning from July 2, 2007 to Dec 29, 2008 – the most volatile period.

Nader and Al Dohaiman (2013) conducted nonlinear analysis of crude oil prices, stock markets return and macroeconomic variables in GCC countries using daily data from July 7, 2004 to November 10, 2011. The first objective of the study was to estimate the impact of oil price change and volatility on stock market returns under regime shifts in the case of Gulf Cooperation Council (GCC) Countries, before and during the 2008 financial crisis. The OPEC spot price served as proxy for world oil price. The empirical results showed evidence that the relationships between oil price volatility and GCC stock market performance were regime-dependent. This indicated that there was extreme co-movement of the crude oil price and stock returns in GCC. Hence, oil price changes led to loss of equity values in GCC countries.

Chen (2010) also showed the effects of oil price shocks on the US stock market using time-varying, transition-probability Markov-switching approach. The study investigated whether a higher oil price pushes the stock market into bear territory. The results from monthly returns of stocks on the Standard & Poor's (S&P) 500 price index revealed that an increase in oil price led to a higher probability of a bear market emerging. This implies that increase in oil price results in bearish sentiment in US stock returns. Furthermore, their results exhibited nonlinear effects of oil price shock on stock returns.

Chiou and Lee (2009) developed a new method to study US stock market activity associated with oil price shocks. They applied an autoregressive conditional jump intensity (ARJI) model, which confirmed the existence of a negative and statistically significant impact of oil prices on stock returns. The findings also indicated that the US stock prices responded asymmetrically to oil price volatility.

Present study differs from the above reviewed under this sub-title by considering stock returns on sectoral level and in Nigeria context. The only study done in Nigeria used NSE ASI and focused on long run relationship of the two variables. But in the present study, we focused on asymmetric relationship and on disaggregated level of the two series.

Sim and Zhou (2015) examined the relationship between oil price and stock returns in United States and how they depended between their quartiles using data spanning from January, 1973 to December, 2007. Cognizance was taken for structural breaks in oil prices. The result revealed that negative oil price shocks affected the US stock market while the influence of positive oil price shocks was weak, which suggests that the relationship between oil prices on the US equities is asymmetric. Lee and Zeng (2011) examined the relationship between real oil price shocks and real stock returns in the G7 countries. The study considered the consequence of structural breaks while taking asymmetric between the two variables into account. The empirical results implied that oil price volatility influenced real stock returns especially under the extreme performance of stock markets but the responses of stock markets to oil price shocks were diverse among G7 countries. The results also highlighted the existence of structural breaks in the U.K. and Japan. Oil price shock influenced the behaviour of stock returns in the three countries.

2.3.1.4 Sectoral Empirical Review of Oil Price-Stock Nexus

Few studies have investigated the relationship between oil price and stock markets at sector level.[36] Cong, et al. (2008) had earlier encouraged further studies on the linkage between oil and stock markets in emerging and developing economies to focus on sectoral level. Jouini (2013) asserted that knowing the direction of spill over between oil price and stock returns may not provide the optimal hedge ratio for oil-stock portfolio holders especially when using aggregate or broad base level. In his work titled: Return and volatility interaction between oil prices and stock markets in Saudi Arabia, he concluded that optimal hedge ratios for oil-stock portfolio holdings were sensitive to the sectors considered, and as such allows for a better understanding of the links between sectoral stocks and oil price for investors who want to diversify their portfolios.

The impact of changes in crude oil prices on sectoral stock returns was examined in Jordan by Bouri, et al. (2016) during the Arab uprisings of 2010 using daily data from December 18, 2001–June 18, 2013. The empirical evidences indicated that the influence oil price change on stock returns was not uniform across the sectors in Jordan. The oil return shocks significantly impacted the Financial and the Services sectors, while the effect was insignificant on the Industrial sector. This result was more pronounced in the period that follows the Arab Uprising. In terms of risk transfer, the study also found that oil is a negligible risk factor. However, there is still significant evidence of risk transmission to the industrial's equity sector particularly during the Arab Uprising period.

Huang, et al. (2015) used daily data to identify multi scale impact of crude oil price shocks on sectoral stock market in China. The study covered ten sectors: Energy, Consumption, Finance, Health, Industry, Information, Material, Optional Consumption, Utility and Telecommunication. The empirical results showed that energy, information, material and telecommunication sectors responded to the Brent oil price negatively in the short term, but positive in the medium and long run. Moreover, consumption, finance, optional consumption and utility sectors responded positively in the short, medium and long term.

[36] Most of these studies focused on few developed countries such as the UK, US and Europe (see, Arouri et al., 2011).

Very instructive, industrial sector responded negatively in the short and long term but positive in the medium term. Based on these findings, the study concluded that there was strong evidence showing that Brent oil price shocks have various temporary and persistent effects on the stock market in China.

Cuestas and Tang (2015) conducted an empirical analysis of the asymmetric exchange rate exposure of stock market returns on Chinese industries between August 2006 and February 2015. The results showed that industry stock returns responded quickly to changes in the exchange rate due to oil shock and corrected the disequilibrium within a short time thereby making the long run exposure to be small or symmetric.

Guglielmo, et al. (2014) investigated oil price uncertainty and sectoral stock returns in China; using time-varying approach involving ten sectors. These sectors were: Healthcare, Telecommunications, Basic Materials, Consumer Services, Consumer Goods, Financials, Industrials, Oil and Gas, Utilities, and Technology with weekly data running from January 1997–February 2014. The study decomposed the source of oil shock into Demand-driven and Supply driven shocks. The empirical evidence showed that oil price volatility affected stock returns positively during periods characterized by demand-side shocks in all cases except the Consumer Services, Financials, and Oil and Gas sectors. The study also affirmed that the latter two sectors (Financials and Oil and Gas sectors) were found to exhibit a negative response to oil price uncertainty during periods with supply-side shocks instead.

Hamma, et al. (2014) considered the effect of oil price volatility on Tunisian stock market at sector-level and the effectiveness of hedging strategy in seven (7) sectors. The results indicated that the majority of relationships were positive and unidirectional from the oil market to Tunisian stock market. Babatunde, et al. (2012) examined the effect of oil price shocks and stock market behaviour with five industry sectors in Nigeria. The sectors covered were Agriculture, Commercial, Financial, Manufacturing and Services using quarterly data spanning from 1995-2008. The findings revealed that stock market returns exhibited insignificant positive response to oil price shocks but reverted to negative effects after a period of time depending on the nature of the oil price shocks. In addition, the asymmetric effect of oil price shocks on the Nigerian stock returns indices was not supported by statistical evidences.

Su Fang, et al. (2012) studied oil prices and stock market in China on sectoral level. The study covered thirteen (13) major sectors: Agriculture, Mining, Manufacturing, Utilities, Construction, Transportation, IT, Wholesale & Retail, Financials, Real Estate, Social services, Media and Conglomerates using monthly data ranging from July 2001-December 2010 were examined. The findings indicated that real oil price has a positive effect on all sectoral stocks in the long run. Reboredo and Rivera-Castro (2013) studied the impact of oil prices on stock returns using Aggregate and sectoral level of USA and Europe stock market price and Brent crude oil from 2000 to 2011. The results revealed that at both levels, with the onset of the financial crisis, the result contagion and positive interdependence between these markets. Since the onset of the financial crisis, oil price leads stock prices and vice versa for higher frequencies, whereas for lower frequencies oil and stock prices lead each other in acomplex way.

Cong, et al. (2008) used multivariate VAR model to investigate the responses of Chinese stock returns to oil price shocks and oil price volatility. The empirical findings revealed that oil price shocks did not exercise a statistically significant effect on the real stock returns of most Chinese stock market indices, except for manufacturing and some oil companies. Malik and Ewing (2009) examined volatility transmission between oil price and sectoral stock returns in USA. The study covered five sectors: Financials, Industrials, Consumer Services, Health Care, and Technology. The results showed evidences of shock and volatility dependencies between oil and the sectors' stock markets. The effect of oil price changes on stock return volatility in Egypt was studied by Hammoudeh et al. (2010). The reported estimates showed a positive effect of increases in returns for sectors that use oil intensively, a negative effect for oil-related sectors and a negative and asymmetric effect for all other sectors.

2.3.2 Summary and Conclusion of the Empirical Literature Review

This study identified that most of the previous studies focused on aggregate level and on developed and emerging economies. However, existing studies in this area on disaggregated level are mostly done outside Nigeria. Nevertheless, it is pertinent to acknowledge the study by Babatunde et al. (2012) that is empirically closest to this study but covered only five sectors in Nigeria: Agriculture, Commercial, Financial, Manufacturing and Services with quarterly data spanning from 1995-2008. This study is distinct from prior studies by using daily data covering eleven out of twelve sectors; which comprises 100 equity firms listed in Nigeria Stock Exchange. No study has been carried out on sectoral level in Nigeria that has used such volume of observations in oil-stock returns analysis. The present study employed daily equity returns of each 11 sectors covered in the study unlike prior studies in Nigeria that used composite index of All Share Index[37] in their analysis.

The major contribution to the empirical literature is that, it is difficult to come across studies that considered size effect of oil price risk on stock returns of various industries in Nigeria. Researchers have argued that the effect of oil price changes on stock returns varies across industries and this depends on how large or small the firm is (Phan et al., 2014). No work has decomposed the sectors into sub-sectoral on the basis of size of the firm to examine the asymmetric impact of oil price change on stock returns of these sub-sectors. To fill this gap, this study decomposed the industries into four quartiles using their market capitalization.

[37] ASI is not the same thing with stock returns, this implies that prior studies in Nigeria are using proxies for stock returns in their analysis

2.4 Background to the Study

2.4.0 Overview

This chapter covers the background to the study. The section commences with an overview of Nigerian oil industry. Following this are discussions on the components and analysis of crude oil and macroeconomic performance. We also look at the activities in the Nigeria Stock Market and show the interaction between crude oil price fluctuations, macroeconomic performances and development in the Nigeria Stock Exchange. The chapter ended with institutional policy as regards to oil industry and stock market in Nigeria.

2.5 Overview of Petroleum Industry in Nigeria

Petroleum industry has become the dominant industry in Nigeria since 1980 after Agricultural sector dominated the entire spectrum of the economy in the 1960s and 1970s. Crude oil is of strategic importance in the world as it is the most prominent sources of energy and the largest internationally traded commodity (OPEC, 2012). With maximum crude oil production capacity of 2.5 million barrels per day, Nigeria ranks as the African's largest oil producer and the sixth largest oil producing country in the world (NNPC, 2017).

Nigeria oil industry host a lot of multi-national companies engage in exploration and production of crude oil especially in Niger-Delta areas. The participants in the industry are categorized under: Joint venture capitals, production sharing companies, independent or sole risk companies and marginal fields; whereas NNPC controls and supervises oil activities on behalf of Nigeria Government. The multinational oil companies (Total, Chevron, Shell, Mobil) operate in partnership with NNPC under the joint venture capital (agreement) or production sharing contracts. While the indigenous oil companies like Niger Delta Petroleum Resources, Pillar oil, Nigerian Petroleum Development Company Ltd (NPDC) operate in partnership with international companies under the sole risk or marginal fields. The proved oil reserve in Nigeria has increased on the average from 14.8 million b/d in 1981-1990 to 37.2 million b/d from 2009-2016 (NNPC, 2017). Nigeria has about 980 oil wells, out of this number; total of 178 wells were drilled in 2005 compared to 138 wells in 2015 with production level of 918,660,619 barrels and 773,458,592 barrels respectively, resulting in about 18.7% decrease in production level.

Nigeria oil wells contain about 12 different crude types comprising Forcados blend, Bonny light, Bonny medium, Brass blend, Escravos light, Antan Blend, Odudu blend, IMA, Qua-Iboe light, Oso Condensate and other condensate, but Forcados blend and Bonny light are the dominant ones. With increased activities and huge foreign exchange earnings from oil, the Nigeria government was able to construct four (4) refineries located in Port Harcourt, Warri and Kaduna. These refineries were commissioned over the period of 1965-1989, with combined capacity to produce 445, 000 b/d. However, the combined capacity utilization of these refineries in 2006 and 2015 stood at 20.8% and 4.9% respectively there by making Nigeria to depend heavily on imported petroleum products.

2.6 Government Regulations and Legal Framework in Nigeria Oil Industry

The role of Nigerian Government in the oil industry has, over time, metamorphosed from regulatory and supervisory nature to direct involvement in oil exploration and development. Prior to 1960, the downstream oil and gas sector was initially market driven by the mechanism of demand and supply, with multinational oil and gas companies controlling the distribution and marketing of the product (Funsho, 2004). Government's initial interest was mainly on the making of statutory laws that guide and controlled the activities of the oil industry and also collection of royalties and other dues from the oil companies (Akinjide, 2001). This limited role was due to the insignificant contribution of oil to the economy prior to the mid-sixties, and the absence of locally trained personnel and expertise. By, 1970s, oil revenue has become very important to the economy.

In 1969, the first comprehensive law tailored towards administration of oil industryknown as petroleum industry Act (PIA) was enacted. The act provides for the "exploration of petroleum from territorial waters and the continental shelf of Nigeria and to vest the ownership of, and all on-shore and off-shore revenue from petroleum resources to the Federal Government". The PIA follows Article 21 of the African Charter which provides that all peoples shall have the right to freely dispose of their wealth and mineral or natural resources (Eghosa, 2016). The PIA is organized into five sections covering: Oil Exploration Licenses; Oil Prospection Licenses and Oil Mining Licenses; Rights of Pre-Emption; Repeals; and Transitional and Savings Provisions.

To strengthen the government control in the industry, Federal Government created Department of Petroleum Resources (DPR) from petroleum Division of the Federal Ministry of Mines and Power in 1970. The primary role of DPR was to advice the government on policy matters affecting the day to day management of the petroleum resources. Following the establishment of DPR and quest for active role by the government in oil industry, the Nigerian National Oil Corporation (NNOC) was established by decree in 1971 as an integrated oil company. It was also in that year that Nigeria joined the Organization of Petroleum Exporting Countries (OPEC) as the 11th member. The NNOC had responsibility for both upstream and downstream activities in the industry on behalf of the federal government. The consequence of the regulations and control of the oil industry by the government was characterized by acute product scarcity, hoarding, long queues, smuggling and inappropriate pricing. The unhealthy development degenerated into poor performance of the nation's refineries and excessive dependence on imports (Ehinomen and Adekeke, 2012). In 1973, government established Petroleum Equalization Fund (PEF) to tackle the cost differential problem associated with the delivery of the petroleum products.

Further, in 1975, the Department of Petroleum Resources (DPR) was made a full-fledged Ministry of Petroleum and Energy, and shortly renamed the Ministry of Petroleum Resources. The Ministry regulates and supervises the activities of all actors in the oil industry through DPR, which regulates the collection of royalties, taxes and rents from oil companies. The role of DPR covers setting standards for adequate control and operations in overall industry activities stretching from exploration, production and marketing of crude oil and refined petroleum products. In recent times, the role of government has progressed to direct involvement in exploration and distribution of oil in the Nigeria oil industry.

On April 1, 1977, a merger between the NNOC and the Ministry of Petroleum Resources created the Nigerian National Petroleum Corporation (NNPC). Both the commercial functions of the former NNOC and regulatory functions of the former Ministry of Petroleum Resources are now handled by the NNPC. NNPC is also entrusted with exclusive responsibility of upstream and downstream development as well as regulating and supervising the oil industry on behalf of the Nigerian government.

Today, government participation through joint Venture with multinational companies stands at 55% in Shell and 60% in Chevron, Texaco, ExxonMobil, AGIP, Elf, and Pan Ocean (NNPC, 2017).

More so, in 1985, the government restructured the NNPC into a parastatal, to cope with its intended commercialization in 1988 with five subsidiaries and twelve strategic business units. The five subsidiaries/semi-autonomous sectors are:

(1) Nigerian Petroleum Development Company (NPDC) – it is a commercial subsidiary of the NNPC which is engaged in profitable Petroleum Exploration and Production both nationally and internationally.

(2) National Petroleum Investment Management Service (NAPIMS) – its major role is to protect the nation's strategic interests in the upstream sector of the industry and promote maximum co-operation in communities of oil and gas producing areas as well as ensure that environmental protection standards are maintained.

(3) Integrated Data Services Limited (IDSL): It maintains joint venture relationships with several international service companies operating in Nigeria in the different areas of its services.

(4) The Nigerian Gas Company Limited (NGC) - It is charged with the development of an efficient gas industry to fully serve Nigeria’s energy and also export gas and its derivatives abroad.

(5) National Engineering and Technical Company Limited (NETCO) - it was established to provide an effective and reliable engineering base for the NNPC Group and the entire oil and gas industry.

However, one of the major issues bedeviling previous regulatory agencies has always been lack of clear and transparent regulatory framework. Hence, Nigerians and stakeholders in the oil industry identified some fundamental problems with the 1969 Act as: it grants all rights to decide by the Minister/president. The act fails to make provision for adequate consultation and protection of the host community of the oil resource. There is also no provision for transparency in granting of oil licenses and leases and accountability of the Act was also very weak. Thus, government economic reforms became imperative towards reviving the ailing downstream sector by deregulation.

The downstream oil and gas deregulation reforms as implemented under petroleum amendment Decree 1996 and petroleum (drilling and production Amendment) regulations in 1988, 2001, and 2003 implies removal of restrictions on the establishment of refineries and depots and reduce government control in the oil industry. The reforms were meant to achieve regular supply of petroleum products at reasonable prices and maintain self-sufficiency in refining of the product for Nigerians.

Furthermore, at the wake of nascent democracy in Nigeria, the Obasanjo administration in 2000 set up the first Oil and Gas reform Implementation Committee (OGIC) to recommend policy for reforming the sector. The committee's recommendation defined the need to separate the commercial institutions in the sector from the regulatory and policy-making institution. In 2007, the Yar'Adua government reconstituted another committee headed by Dr. Rilwan Lukman to use the provisions of the National Oil and Gas Policy to set up legal, regulatory and institutional structures for managing the oil and gas sector. The Lukman report formed the basis for the Petroleum Industry Governance Bill (PIGB).

The aim of the PIGB bill is to address most of the bottlenecks enshrined in the Petroleum Industry Act (PIA) 1969. This includes: removal of power to make regulations from the Minister and vesting of same in the Commission. Prohibiting any agency to first withdraw money for its funding needs from its generated revenue prior to remitting same to government coffers as was the case with NNPC among others. The Commission is expected to assume all the rights, interests, obligations and liabilities of the DPR and PPPRA[38], and would be run by a governing Board. However, there are various version of the Petroleum Industry Bill (PIB) since 2009-2017 with varying interpretations and have been met with resistance from the Federal Ministry of Commerce and Industry and other stakeholders[39]. Unfortunately, the bill is still with the National Assembly due to controversies surrounding it.

[38] Petroleum Products Pricing Regulatory Agency

[39] See http//petroleumindustrybill.com.

2.7 Nigeria Economy and Oil Dependency

Oil industry has been the backbone of Nigeria economy since the oil price surge of 1970s. It is the major source of government revenue and creates employment opportunities to millions of Nigerians. Oil revenue account for about 74% of total government revenue on the average from 1981-2016 and also a major contributor of the country's export earnings. During Post 1979 crises, oil accounts for about 64% of total revenue in Nigeria and later increased approximately to 73% in 1984 (see table 2.1). Following the drop in OPEC production in 1986 due to reduction in world energy demand, ratio of oil revenue to total revenue sank to 64% in 1986. The ratio picked again in 1987 and rose to 86% in 1992 due to inversion of Kuwait by Iran which increased oil price as a result of production shortfall. Oil revenue averaged 77% of the total revenue from 1990–1999. Similar share and even slightly higher was recorded in 2000-2009 where oil revenue averaged approximately 80%. Interestingly, share of oil revenue to total revenue in Nigeria peaked in 2006 with record value of 88.64%. This period coincided with era of high oil demand necessitated by geographical tensions in the Middle East which include Israeli-Lebanon crises and Iranian nuclear plan. Share of oil revenue to total revenue witnessed a halt during the global economic crises in 2008 and 2009. It began to sour again after 2009; hitting close to 80%, until 2014 when it dropped to 67% due to oil price crash in world energy market.

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Table 2.1: Indicators of oil dominance in Nigeria economy (1981-2016)

Years	Total Rev. (N' Billion)	Oil Rev. (N' Billion)	Oil Rev./ Total Rev. (%)	Total Export (N' Billion)	Oil Export (N' Billion)	Oil Export/ Total Exp (%)	Capital Formation (N' Billion)	Oil Rev./ Capital Formation (%)	Nig. proved oil reserve * (Millions barrels)
1981	13.29	8.56	64.41	11	10.7	97.27	18.22	46.98	16550
1982	11.43	7.81	68.33	8.2	8	97.56	17.15	45.55	16550
1983	10.51	7.25	68.98	7.5	7.2	96.00	13.34	54.37	16550
1984	11.25	8.27	73.51	9.1	8.8	96.70	9.15	90.38	16650
1985	15.05	10.92	72.56	11.7	11.2	95.73	8.80	124.10	16600
1986	12.6	8.11	64.37	8.9	8.4	94.38	11.35	71.44	16066
1987	25.38	19.03	74.98	30.4	28.2	92.76	15.23	124.96	15980
1988	27.6	19.83	71.85	31.2	28.4	91.03	17.56	112.91	16000
1989	53.87	39.13	72.64	58	55	94.83	26.83	145.87	16000
1990	98.1	71.89	73.28	109.9	106.6	97.00	40.12	179.18	17100
1991	100.99	82.67	81.86	121.5	116.9	96.21	45.19	182.94	20000
1992	190.45	164.08	86.15	205.6	201.4	97.96	70.81	231.72	20991
1993	192.77	162.1	84.09	218.8	213.8	97.71	96.92	167.26	20991
1994	201.91	160.19	79.34	206.1	200.7	97.38	105.58	151.73	20991
1995	459.99	324.55	70.56	950.7	927.6	97.57	141.92	228.68	20828
1996	523.6	408.78	78.07	1309.5	1286.2	98.22	204.05	200.34	20828
1997	582.81	416.81	71.52	1241.7	1212.5	97.65	242.90	171.60	20828
1998	463.61	324.31	69.95	751.9	717.8	95.46	242.26	133.87	22500
1999	949.19	724.42	76.32	1189	1169.5	98.36	231.66	312.71	22500
2000	1906.16	1591.68	83.50	1945.7	1920.9	98.73	331.06	480.79	31506
2001	2231.6	1707.56	76.52	1868.9	1839.9	98.45	372.14	458.85	34349
2002	1731.84	1230.85	71.07	1744.2	1649.4	94.56	499.68	246.33	35255
2003	2570.1	2074.28	80.71	3087.9	2993.1	96.93	865.88	239.56	31506
2004	3920.5	3354.8	85.57	4602.8	4489.5	97.54	863.07	388.70	34348
2005	5547.5	4762.4	85.85	7246.5	7140.6	98.54	804.40	592.04	35255
2006	5965.5	5287.57	88.64	7324.7	7191.1	98.18	1546.53	341.90	35873
2007	5727.5	4462.91	77.92	8309.8	8110.5	97.60	1936.96	230..41	37200
2008	7866.59	6530.6	83.02	10387.7	9861.8	94.94	2053.01	318.10	37200
2009	4844.59	3191.94	65.89	8606.3	8105.5	94.18	3050.58	104.63	37200
2010	7303.67	5396.09	73.88	12011.6	11300.5	94.08	4012.92	134.47	37200
2011	11116.85	8878.97	79.87	15236	14323.2	94.01	3908.28	227.18	37200
2012	10654.75	8025.97	75.33	15139.3	14260	94.19	3357.40	239.05	37139
2013	9759.79	6809.23	69.77	15262	14131.8	92.59	9666.00	70.45	37071
2014	10068.85	6793.72	67.47	12960.5	12007	92.64	14244.07	47.70	37448
2015	6912.5	3830.1	55.41	8845.2	8184.5	92.53	14743.13	25.97	37062
2016	5679.03	3082.41	54.28	8835.6	8178.8	92.57	14493.60	21.27	37450

Source: CBN Statistical Bulletin, 2015; * OPEC Annual Statistical Bulletin, 2016 and Author's Computation

As shows in table 2.1, share of oil export to total export averaged 96% over the entire period. Share of Oil export was above 95% until 1986 when it declined to 94% and further to its lowest ebb in 1988, amounting to about 91%. It rose again the following year and had maintained above 95% share across the years until 2008, when it declined to 94% due to global economic crises of that year. Since 2008, the percentage contribution of oil export to total export has remained around 94% even when global oil prices surged in 2011 and 2012. However, the share dropped again in 2013 and 2014 to 92%, making it the least recorded share of oil export to total export in three decades except in 1988. This is attributed to drastic measures taken by government to diversify the economy and move away from oil economy

In the same vain, the ratio of oil revenue to capital formation was relatively poor in the early 1980s accounting for 59% of total investment. By 1987, the proportion grew to 74%. Similar trend was maintained till 2006. In the year 2007 and 2008, the proportion of oil revenue to capital formation (investment) dropped to 230.4 % and 318.1% respectively from 341.90% in 2006 as a result of decline in oil revenue during the period. However, in 2014, the contribution declined to 47% as indicated in table 2.1. This shows that investment in Nigeria is hugely depends on oil revenue trajectory. Nigeria's proven crude oil reserves have been growing consistently over time standing at 16 billion barrels (brl) in early 1980. It increased consistently to 20 billion brl in 1991. As crude oil price continue to gain ground in the international oil market, Nigeria intensified effort in search of oil in his territorial boundaries, by 2001 (a decade after), additional 14,349 billion brl was discovered culminating to 34,349 billion brl. Currently, Nigeria has more than 37 billion brl proven crude oil reserves, making her the second largest in Africa after Libya and this figure account for 3.1% share of OPEC proven reserves. Table 2.1 shows the dominance of oil in Nigeria economy.

2.8 Oil Price Changes and Performance of Nigeria Economy, 1981-2015

Since 1981, Nigeria Government has been depending heavily on oil revenue in executing her fiscal obligations. Oil accounts for over 90% of export receipt and approximately 78% of total government revenue from 1981-2015. However, the current account balance - an important indicator measuring country's economic health showed unfavorable balance of trade of about $US 6.4, 7.2 and 4.3 billion in 1981, 1982 and 1983 respectively (see table 2.2). The unfavorable balance of trade was on the heels of the 1979 energy crises that slowed down the oil prices in the world due to the Iranian revolution. As revealed in table 2.2, this led to unfavorable balance in the current account from 1981-1985. Crude oil price as measured by Nigeria Farcadoes declined from $36.2 pb in 1981 to $27.7 pb in 1985 thereby making total import to exceed total export by $16 million on the average during this period. The negative balance of trade also reflected on the GDP growth rate which decreased by 13.1%, 1.1%, 5.1% and 2% in 1981, 1982,1983 and 1984 respectively, culminating to about 2.6% decrease over the sub period.

The Ratio of current account to GDP exhibited the same pattern: as the ratio decreased by 5.5% on the average within the period. Net foreign assets were also affected negatively, declining from N2.5 billion in 1981 to N800 million in 1983 but stood at N1.5 billion between 1981 and 1985 on the average. Total reserve fell from approximately $3.9 billion in 1981 to $900 million in 1983 as government strived to fulfill her fiscal obligations and it slightly picked in 1984 and stood at $11.6 billion in 1985. Capital formation (government investment) consistently declined reaching about 52% between 1981 and 1985 as government revenue slacked. The plunge in government revenue resulted increase in government borrowing as external debt rose by 63% between 1981-1985. This constituted general imbalance over the sub-period.

In 1985, Saudi Arabia – a key player in OPEC cartel and other OPEC member states strategized to increase oil production in order to gain back its market share and control international oil market. This culminated to excess crude oil in the international oil market. The slowdown of economic activities by industrial world during 1986 preceded reduced demand for crude oil in international market and thus, resulting in oil glut in mid-1980s. Nigeria Forcados crude oil price declined to the average of 42% from 1985-1990.

Given the resolution among the OPEC members to increase production, Nigeria total export out-weighed total import. Total export appreciated by more than 400% on the average from 1985-1990 relative to 159% growth recorded on import. Thus, the sharp increment in the export also reflected on the ratio of export to GDP that grew averagely by 68% from 1985-1990.

Other external balance variables responded positively to the export growth within the period. Ratio of Current account (CA) to GDP and GDP growth rate were positively increased, hitting 4% and 1.4% respectively, contrary to negative GDP growth rate of 1985. Gross capital formation and current account balance positively increased on the average from $13.3 billion and $-1.1 billion in 1985 to $22.2 and $1.1 billion in 1990. However, Nigeria external debt continue to increase from $15.5 billion in 1985 to $28.8 billion in 1990 which is about 87% increment and total reserves was also depleted from $1.9 billion to $1.7 billion over the period. This could be as a result of fiscal indiscipline from the monetary authority in Nigeria as they used foreign reserves and external borrowing as a stabilizing tool to cushion the effect of economic mismanagement of the period.

In 1990, another oil price shock occurred as a result of inversion of Kuwait by Iraq. The oil price crises lasted for about 9 months – May, 1990 to February, 1991. However, the price spike was not as severe as the 1980s oil shock and was of shorter duration. The average monthly price of oil rose from $17 pb in July to $36 pb in October the same year. Forcados oil price moderately appreciated on the average from $17.97 pb in 1980s to $19.8 pb in 1991-2000. From table 2.2, it is evident that the moderate rise in price benefited Nigeria. As production of oil increased, Nigeria oil export earning appreciated tremendously from an average of N47. 6 billion in 1990 to N1.2 trillion over the period of 1991-2000. Average growth rate of export and import were 8.3% and 11.1% from 1996-2000. The appreciable foreign exchange earning impacted on all the domestic and external balance variables. Current account (CA), net foreign assets (NFA), Capital formation (CF) and total reserves (TR) surged to 36%, 2,954%, 1027%, and 300% respectively. GDP growth rate trended upwards by 3.2% while ratio of CA grew at 3.1% on the average from 1995-2000.

Again, global energy crises broke out in 2003, price of Brent crude rose above $30 pb, while Nigeria Focados and Bonny light were above $28 per barrel. By 2006, the two Nigeria crude prices rose to approximately $67 pb, signifying more than 130% growth rate and eventually peaked at $101 pb in 2008. Economists and energy analysts attributed the spike in oil price to many factors which include, rising demand from emerging economies especially China and India, Middle East tensions, speculation about Iranian nuclear plan in 2006, reduction in the value of US dollar among others. Interestingly, this necessitated sharp expansion of total export dominated by crude oil. Nigeria export earnings stood at N1.7 trillion in 2002 but skyrocketed to N7.2 trillion in 2005. On the average, Nigeria export earnings stood at N1.2 trillion in 1996-2000 but over the next one decade, export earnings was more than N9 trillion. However, import increased as well but less than export in absolute value. Hence, Nigeria achieved favorable balance of trade over the period.

Interestingly, as observed in table 2.2, despite the positive Balance of Trade (BOT) recorded within the sub-period, growth rate of import exceeded that of export: growth rate of import rose from 11.1% in 2000 sub-period to 24% and 21% over the 2005 and 2010 sub-periods respectively. This fiscal behaviour implies that federal government increased consumption of foreign product as foreign exchange earnings appreciated. Ratio of export and import to GDP did not show any significant variation over the period as evident in the table. The positive BOT is clearly reflected on the CA balance. The CA exhibited favorable balance, rising from $1.5 billion in 2000 sub division to $12 billion in 2001-2006 and double the amount by 2006-2010 on the average. The GDP growth responded positively with an average peaked at 11.1% from 2001-2005 but slightly reduced to about 7% by 2006-2010. The reduction in GDP within the period was mostly attributed to the global economic crises of 2008. Though, total reserve surged on the average but still reflected the negative impact of 2008 economic crises. Evidently, total reserve was depleted from $53 billion in 2008 to $44 and $34 billion in 2009 and 2010 respectively to cushion the impact of the crises in the economy.

Table 2.2: Oil price dynamics and performance of selected macroeconomic variables in Nigeria, 1981-2015

Years	*Average GDP Growth (%)	Current Account (% GDP)	*Net Foreign Assets (N' B)	**Current Account ($US/B)	Total Reserve (% of Ext. Total	*Total reserves minus Gold	*Total external debt ($US/ B)	**Capital Formation (N' B) from CBN	***Bonny Light Price ($US/B)	*Export % GDP	*Import % GDP	**Total Import (N' B)	**Total Export (N' B)	*Export Growth Rate (%)	*Import Growth Rate (%)
1981	-13.13	-10.60	2.56	-6.47	36.42	3.90	11.45	18.22	36.18	22.19	26.11	12.84	11.02		
1982	-1.05	-14.17	1.06	-7.28	16.06	1.61	11.99	17.15	33.29	17.83	19.91	10.77	8.21	-10.45	-26.07
1983	-5.05	-12.22	0.81	-4.33	7.12	0.99	17.58	13.34	29.54	14.54	12.50	8.90	7.50	-7.67	-35.27
1984	-2.02	0.43	1.42	0.12	9.41	1.46	17.78	9.15	28.14	15.71	7.90	7.18	9.09	10.27	-30.90
1985	8.32	9.02	1.82	2.60	10.14	1.67	18.66	8.80	27.75	17.39	8.51	7.06	11.72	8.46	7.85
1981-1985	-2.59	-5.51	1.53	-3.07	15.83	1.93	15.49	13.33	30.98	17.53	14.99	9.35	9.51	0.12	-16.88
1986	-8.75	1.02	4.46	0.21	6.08	1.08	22.22	11.35	14.45	13.32	10.40	5.98	8.92	-8.91	-30.07
1987	-10.75	-0.30	6.86	-0.07	5.16	1.17	29.02	15.23	18.39	26.94	14.70	17.86	30.36	5.41	-37.14
1988	7.54	-1.27	7.97	-0.30	3.15	0.65	29.62	17.56	14.99	22.85	12.46	21.45	31.19	3.01	-6.60
1989	6.47	4.50	18.30	1.09	6.78	1.77	30.12	26.83	18.30	43.98	16.41	30.86	57.97	29.83	36.75
1990	12.77	16.22	41.32	4.99	12.34	3.86	33.46	40.12	23.74	35.34	17.69	45.72	109.89	-4.45	19.56
1986-1990	1.45	4.03	15.78	1.18	6.70	1.71	28.89	22.22	17.97	28.49	14.33	24.37	47.67	4.98	-3.50
1991	-0.62	4.39	54.05	1.20	13.95	4.44	33.53	45.19	20.17	41.70	23.18	89.49	121.54	8.06	30.55
1992	0.43	7.74	9.17	2.27	4.12	0.97	29.02	70.81	19.61	37.51	23.52	143.15	205.61	-26.52	-14.97
1993	2.09	-4.94	8.58	-0.78	5.34	1.37	30.70	96.92	17.44	33.83	24.28	165.63	218.77	18.65	20.84
1994	0.91	-11.77	-4.36	-2.13	4.98	1.39	33.09	105.58	16.20	24.31	18.00	162.79	206.06	2.26	-21.60
1995	-0.31	-9.03	61.21	-2.58	5.01	1.44	34.09	141.92	17.26	35.76	24.01	755.13	950.66	-8.58	-11.87
1991-1995	0.50	-2.72	25.73	-0.40	6.68	1.92	32.09	92.08	18.14	34.62	22.60	263.24	340.53	-1.22	0.59
1996	4.99	10.02	193.69	3.51	13.78	4.08	31.41	204.05	21.21	32.24	25.45	562.63	1309.54	-10.88	48.81
1997	2.80	1.54	189.61	0.55	27.33	7.58	28.47	242.90	19.29	41.77	35.09	845.72	1241.66	47.90	34.83
1998	2.72	-13.26	203.23	-4.24	24.08	7.10	30.31	242.26	12.62	29.69	36.48	837.42	751.86	2.09	-6.54
1999	0.47	1.41	646.20	0.51	19.42	5.45	29.10	231.66	17.93	33.87	21.98	862.52	1188.97	-10.75	-33.70
2000	5.32	16.01	1164.93	7.43	31.20	9.91	32.37	331.06	28.40	51.73	19.65	985.02	1945.72	13.25	12.58
1996-2000	3.26	3.14	479.53	1.55	23.16	6.82	30.33	250.38	19.89	37.86	27.73	818.66	1287.55	8.32	11.19
2001	4.41	5.61	1325.34	2.48	33.89	10.46	31.42	372.14	24.24	45.45	36.36	1358.18	1867.95	-23.62	60.89
2002	3.78	1.83	1255.21	1.08	23.81	7.33	31.78	499.68	25.05	35.97	27.42	1512.70	1744.18	11.63	6.35
2003	10.35	5.01	1356.36	3.39	20.20	7.13	36.71	865.88	28.65	39.79	35.43	2080.24	3087.89	31.36	53.44
2004	33.74	19.17	2612.38	16.84	43.25	16.96	39.90	863.07	38.10	30.16	18.29	1987.05	4602.78	-0.95	-33.21
2005	3.44	32.54	3865.39	36.53	111.17	28.28	25.75	804.40	55.60	31.66	19.09	2800.86	7246.53	12.37	33.62
2001-2005	11.15	12.83	2082.94	12.06	46.46	14.03	33.11	681.03	34.33	36.60	27.32	1947.80	3709.87	6.16	24.22
2006	8.21	25.11	6188.68	36.52	444.36	42.30	9.62	1546.53	67.07	43.11	21.50	3108.52	7324.68	60.22	10.82
2007	6.83	16.61	7310.44	27.64	427.41	51.33	12.14	1936.96	74.49	33.73	30.73	3911.95	8309.76	-17.65	85.51
2008	6.27	14.01	8597.23	29.15	408.25	53.00	13.13	2053.01	101.42	39.88	25.09	5593.18	10387.69	28.77	-11.26
2009	6.93	8.18	7287.93	13.87	285.47	44.76	15.94	3050.58	63.35	30.77	31.03	5480.66	8606.32	-30.70	11.68
2010	7.84	3.55	6195.14	13.11	231.75	34.92	15.48	4012.92	82.06	25.26	17.39	8163.97	12011.48	53.52	12.67
2006-2010	7.22	13.49	7115.88	24.06	359.45	45.26	13.26	2520.00	77.68	34.55	25.15	5251.66	9327.99	18.83	21.88
2011	4.89	2.59	6643.74	10.67	205.31	35.21	17.66	3908.28	113.65	31.33	21.46	10995.86	15236.67	25.79	-7.83
2012	4.28	3.77	8715.63	17.37	262.30	46.41	18.13	3357.40	114.21	31.44	12.94	9766.56	15139.33	-3.59	-32.89
2013	5.39	3.70	8262.16	19.05	218.76	45.43	21.14	9666.00	111.95	18.05	13.00	9439.42	15262.01	-21.74	12.22
2014	6.31	0.16	6743.44	0.90	151.47	36.67	24.76		101.35	18.44	12.45	10538.78	12960.49	24.09	5.97
2015	2.65	-3.28	5157.77	-15.76	107.94	30.61	29.03		54.41	10.66	10.79			0.14	-26.82
2011-2015	4.70	1.39	7104.55	6.45	189.16	38.86	22.14	5643.89	99.11	21.98	14.13	10185.16	14649.62	4.94	-9.87

Sources: *World Development Indicator (2017), **CBN Statistical Bulletin (2016), ***NNPC Annual Statistical Bulletin (various issues) and author’s Computation.

External debt has a dramatic trend, increased in 2001-2005 ($33 billion) sub-period but reduced to $13 billion over the sub-division of 2006-2010. The reduction in external debt profile could be credited to financial crunch in the developed countries that made it difficult to borrow from abroad and 2007 debt relief by foreign creditors during the period. Additionally, external reserve depletion and surplus BOT in the period were used to offset part of the debt. Net Foreign Assets (NFA) also increased within the period. The immediate post crises period saw price of crude oil picked up again after Nigeria crude oil price dropped to about $63 per barrel in 2009. The crude oil prices increased in 2011 as Nigeria Forcados and Bonny light averaged $110 per barrel, equivalent to 80% growth rate from 2009, making it the first time global and Nigeria crude price averaged more than $100 per barrel in four-year average. Some of the key factors that influenced the spike in oil price includes: Demand growth in emerging economy notably China and the Middle East, European debt crises, Supply disruption (such as Arab Spring, Libyan civil war, production disruption in Syria, Yemen and Sudan), and Transportation problems in the U.S. The moderate increase in price of oil continued until 2015 when it dropped to $52.9 per barrel which was attributed to slowdown in oil demand from the Developed countries and slump in production as a result of restiveness and vandalism in oil producing zone (Niger-Delta) of Nigeria among other things.

The surge in crude oil prices in the sub-period averaged 99% while export growth and export/GDP averagely reduced drastically from 18% and 34% in 2006-2010 sub-division to 5% and 21% respectively in 2011-2015 sub-period. It is worth noting from this sub-period that the plummeting oil price in 2015 impacted negatively on the average results. The notable decline in world oil price in 2015 combined with the preparations for elections and election's outcome in 2015 in Nigeria changed the narration over the period. Pre-election period saw the ruling party focused more on retaining power than investment. However, when the then opposition party emerged winner from the election, fiscal and monetary policies were tightened. Oil production was halted due to restiveness in the Niger-Delta region. With the plummeting world oil price, macroeconomic fundamental started responding negatively. Inflation, exchange rate and unemployment were all exacerbated and recession loomed. The CA balance and ratio of CA to GDP reduced to $6 billion and 1.3% from 24 billion and 13% from the previous sub-period. The GDP was growing at 2% in 2015, being the lowest over 15 years. External reserves shrunk by 16.5% over the period. External debt reversed and increased by 67% and capital formation was drastically reduced in the same period (see table 2.2).

The decline in domestic and external balance continued as the economy entered recession in 2016. Government sought for more appropriate fiscal and monetary policies to revive the economy. As the world crude oil price was picking up gradually, recovery plans were proposed (see ERGP plan) and government negotiation is ongoing with the aggrieved youths in the Niger-Delta to increase production and boost the economy. The NSE stock prices responded positively to the increase in oil price as market capitalization hit N16.15 trillion in January, 17, 2018 – the highest total value of shares in 57 years of The Exchange

2.9: Oil price changes and Nigeria & OPEC share of crude oil production and exports, 1961-2015

It is pertinent to know how Nigeria and OPEC share of oil production and export have evolved over the years as oil price changes. Nigeria became OPEC member in 1971 and it has been a member till date. According to OPEC statistical Bulletin (2009), OPEC oil production contributes an average of 50% to the world oil production since 2000. An average of 26,168 million barrel per day (b/d) of world crude oil was produced in 1961-1965. Out of this total quantity, OPEC countries supplied 11.7 million b/d, making about 44%. Nigeria's production was 1.1 million b/d of which she exported about 98% and the quantity contributed less than 1% share to both OPEC and world total production. During this period (1960s), crude oil price hovered around \$1.8 pb. In 1970s, as oil price began to gain in global commodity market, it rose from \$1.8 to \$21.8pb. Nigeria production increased to about 1.8 million and 2 million b/d on the average during the periods 1971 - 75 and 1976 – 80; with the ratio of oil export to production hovering around 96%. The share of Nigeria oil production to OPEC and the world rose accordingly to 6.8% and 3.5% on the average, over the two sub-periods i.e. (1971-1975 and 1976-1980).

By 1981-1985, Nigeria oil production declined to 1.3 million b/d and the amount averaged 7.7% and 2.5% of OPEC and World production respectively. The OPEC production equally dropped from 50% in 1976-1980 to 33% in 1981-1985. This period coincided with the second oil shock of 1979 that extended to early 1980s oil glut. Hence, the price of oil decreased by 17.8% in 1986-1990 from 1976-1980 sub-periods. The ratio of oil export to oil production in Nigeria declined from 96% to 81%. This was as a result of increase in local refinery production over the period relative to prior periods that the ratio of oil export to oil production was above 96%.

As evident in table 2.3, oil price was relatively stable from 1986-1990 to 1996-2000 sub-grouping with average value of \$18.5pb. Likewise, production share of Nigeria crude to OPEC was also stable with an average of 7.7% from 1981-1985 and 1996-2000, after which, it rose to 8.3% (2001-2005). This corresponded with the period when world oil price peaked as a result of tensions in the Middle East and soaring demand from China. Oil price surged to \$34.22pb in 2001-2005 from \$19.79pb in 1996-2000. The ratio of crude oil export to oil production in Nigeria followed similar trend, as oil export averaged 2.1 million b/d, and ratio of oil export to production rose to 93% over the period of 2001-2005. However, OPEC production to the world decreased over the sub-period and stood at 37.7% from 40% in 1991-1995 while Nigeria production share to the OPEC increased to 8.3% in 2001-2005 from 7.8% in 1991-1995.

However, the share of OPEC production to the world grew in the last decade (above 47%), but the proportion of Nigeria production to OPEC decreased in 2006-2010 (6.5%) and dropped further in 2011-2015 (6.3%), though, there was a hike in the price of crude oil. Oil price rose to $96.58 pb on the average during 2011-2015 from $75.19 pb in 2006-2010. In 2016, oil price dropped again to about $31 pb. The fall in oil price in 2016 was partly occasioned by increase in militant attacks and vandalization of oil pipelines in Nigeria among other factors in global economy. According to EIA (2017), loss resulting from crude oil vandalism in Nigeria reached about 750,000 b/d in May 2016; this estimate is the highest level since January 2009. Hence, oil production in Nigeria dropped to 1.4 million b/d in May, 2016. Although, oil price and oil production in Nigeria has continued to rise gradually from 2017.

The negative relationship between share of Nigeria oil production to OPEC and OPEC production to the world (i. e. column 6 and 8 respectively) could be attributed to the periods when Middle East countries (major players in the OPEC cartel) were in crises and their production dropped. Nigeria increased production to cover up OPEC quota in order to sustain OPEC visibility/presence in the world oil market. However, when relative peace returned to middle east and OPEC members are meeting up their respective production quotas, Nigeria reduced her production and stick to her OPEC production quota.

However, Nigeria oil production has direct relationship to world oil price changes. The only period where negative relationship was established was the last decade (2006-2010 & 2011-2015). The negative behaviour is explained by incessant domestic oil supply distortion during 2006-2010 & 2011-2015 as earlier discussed.

2.10 Nigeria and OPEC Oil Export

As regards to crude oil export, OPEC members contributed more than 80% of world crude export in the 1960s and 1970s. Although, Nigeria share of export to OPEC was quite low accounting for less than 2% in 1960s and 7% in 1970s. Nigeria reached an average of 1.1 million b/d of oil export from 1981-1985. This account for 10% share of OPEC export over the period. The significant improvement in Nigeria crude oil export resulted in profound performance level in 2001-2005 amounting about 10.2% and 5.4% share to OPEC and the World respectively. This improvement is largely due to lower production by the Middle East countries of the OPEC member states because of political tension in the Middle East and rapid increase in oil price. Brent crude price rose from $19.79 pb to $34.22 pb in that period.

Available statistics showed a negative relationship between share of OPEC crude oil export to the world and share of Nigeria crude oil export to OPEC during the entire period. The inverse relation can be attributed to the incessant political and regional crises associated with Middle East countries. Obviously, OPEC market share usually drops during such crises as Middle East oil export account for about 65% of total OPEC export and 88% without Venezuela's oil production contribution. Hence, during crises, Nigeria share to OPEC tends to increase and OPEC market share to the world drops. When, relative peace is restored, OPEC total production rises while proportion of Nigeria export to OPEC diminishes.

Table 2.3: Nigeria and OPEC average contribution to world crude oil production and exports, 1961 -2015, ('000 b/d)

					PRODUCTION			EXPORT		
Years	***Oil Price Changes (US $)**	**Nig. Oil Prodn. ('000 barrels)**	**Nig. Oil Export ('000 barrels)**	**Oil Export/ Prodn. (%)**	**Nigeria % to OPEC**	**Nigeria % to World**	**OPEC % to World**	**Nigeria % to OPEC**	**Nigeria % to World**	**OPEC to World %**
1961-1965	1.80	116.48	114.64	98.42	0.92	0.42	44.68	1.12	1.01	89.97
1966-1970	1.80	500.70	483.00	96.46	2.50	1.25	49.52	2.80	2.43	87.08
1971-1975	6.22	1889.12	1830.02	96.87	6.66	3.58	53.76	7.30	6.31	86.39
1976-1980	21.84	2085.32	2008.16	96.30	6.98	3.47	49.82	7.79	6.26	80.51
1981-1985	30.96	1370.34	1118.76	81.64	7.73	2.56	33.64	10.30	5.04	51.67
1986-1990	17.95	1514.52	1294.56	85.43	7.67	2.65	34.50	9.43	5.23	55.33
1991-1995	17.83	1883.76	1601.40	85.01	7.89	3.15	40.02	9.06	5.31	58.54
1996-2000	19.79	2064.14	1909.52	92.51	7.76	2.97	38.28	9.70	5.37	55.30
2001-2005	34.22	2327.80	2168.10	93.14	8.33	3.34	37.76	10.21	5.44	53.31
2006-2010	75.19	2302.40	2174.36	94.44	6.54	3.13	47.87	9.18	5.29	57.67
2011-2015	96.58	2344.80	2193.33	93.54	6.35	3.04	47.94	9.15	5.37	58.70

Sources: OPEC Statistical Bulletin (various issue), *BP Statistical World Energy Review (2017) and Author's Computation.

Nigeria percentage share of crude oil export to OPEC has been higher than her percentage share of crude oil production to OPEC. This gave credence to the fact that Nigeria, export higher percentage of her crude abroad (as can be seen in column 5 of table 2.3). The rise in % share of Nigeria crude export signifies that other OPEC member states export less proportionate of their crude oil production relative to Nigeria. Most of these countries refine a significant amount of their crude oil domestically while Nigeria refines negligible amount of hers locally. As such, Nigeria is always susceptible to world oil price fluctuations.

Furthermore, proportion of oil export to oil production in Nigeria has been above 90% in 1960s and 1970s. This signals that Nigeria relies more on importation of refined petroleum products for her domestic consumption even during the period when the first three refineries in Nigeria (Port Harcourt refinery 1, Kaduna refinery and Warri Refinery) were constructed. The trend changed at the construction of second Port Harcourt refinery in 1985. The % share of oil export to total production declined to 81% and the trend hovered around 84% on the average from 1981-1995. Though, the ratio was relatively high but construction of second Port Harcourt refinery impacted positively on the local production than the existing three other refineries (Author's computation using column 4 and 5 of table 2.3).

Table 2.4: 10-Year domestic refinery capacity utilization (%) in Nigeria

Refineries	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
KRPC	8.34		19.6	22	20.46	22.17	29.12	29.33	2.98	2.98
PHRC I & II	50.3	24.9	17.8	15	9.17	4.66	11.95	9.18	4.66	4.66
WRPC	3.85		38.5	41	43.36	27.99	27.88	35.99	7.07	7.07
Avrg. Total	20.82	8.29	25.31	26.00	24.33	18.27	22.98	24.83	4.90	4.90

Source: NNPC Annual Statistical Bulletin, 2016

However, a 10-year domestic capacity utilization of refineries in Nigeria from 2006-2015 showed that the four refineries in Nigeria were underutilized (see table 2.4). The refineries were meant to produce 445,000 b/d (port Harcourt refinery 2 -150,000 b/d, Warri Refinery – 125,000 b/d, Kaduna refinery -110,000 b/d and port Harcourt refinery 1 – 60,000 b/d) but produced 20% of the capacity in 2006. It is alarming that by 2015, the refineries can only produce approximately 5% of its capacity. This justifies while world oil crises affect Nigeria economy greatly since oil contribute more than 80% and 95% of total revenue and export revenue respectively and more than 90% of refined oil products and consumption come from abroad. This adds to the reason while Nigeria stock market and economy generally is prone to world oil crises.

2.11 Overview of the Nigerian Stock Market

The Nigeria Stock Exchange (NSE) was established in 1960, as a private company limited by guarantee and commenced operation in 1961. The Exchange was founded as the Lagos Stock Exchange but later changed name in 1977 to become the NSE. Then in 1979, Federal Government instituted a reform on the structure and operations of NSE which gave rise to the establishment of Security and Exchange Commission (SEC) under The SEC Act of 1979. The SEC is the apex regulatory body in the Nigerian Capital Market, licensed under the Investments and Securities Act (ISA) No. 45, 1999, to regulate and develop the market under the supervision of the Federal Ministry of Finance. The ISA expanded the regulatory and developmental responsibilities of the SEC to include venture capital activities, commodity and futures exchange as well as collective investment schemes. As a Self-Regulatory Organization (SRO), the NSE currently has over 259 listed securities, out of which, 170 are equities and 79 are bonds. (NSE Fact Sheet, Q3, 2017).

According to NSE, equities are categorized into equities-Main Board, Equities-AseM (Alternative Securities Market) and Equities-Premium Board. Equity-main board contains 158 listed securities and accounting for about 62.5% of equity market capitalization while equity –premium Board involves 3 companies with 37.3% share of the equity market capitalization. Equities-AseM has 10 companies with less than 0.5% share of the market capitalization. However, over the period of 2000-2015, approximately 80% of trading activities in NSE were on equities while the remaining was bonds; mainly owned by Federal and State Government, with few corporate and private bonds in existence (NSE Annual Fact Book, 2014). The Nigerian Stock Exchange has a broad index known as All-Share Index (ASI) which measures the general stock market performance while it also has six sectoral indices that are used to gauge the sectoral performance and efficiency of the stock market. They are NSE 30, NSE Banking, NSE Consumer Goods (Formerly Foods & Beverages), NSE Insurance, NSE Oil & Gas and NSE industrial. The categorization of the stocks into the various equity indices depend on the sector the firm is being grouped. At intervals, NSE normally review the set of stocks that made up the Index based on the current market performance and as such replace any stock found under-performing based on set parameter with any new one that fits in.

The Exchange has several branches spread across the country. Additionally, ABUJA Securities and Commodity Exchange (ASCE) was incorporated as a stock Exchange on June 17, 1998 and was converted to a securities and commodity Exchange on August 8, 2001. The Exchange (NSE) belongs to a number of international and regional organizations that promote the development of standards and best practices which include, African Securities Exchanges Association (ASEA), member of the World Federation of Exchanges (WFE), and International Organization of Securities Commissions (IOSCO) (NSE Fact Sheet, Q4, 2013).

Nigeria stock market witnessed significant transformation since the beginning of 2000s, after decades of under development and market segmentation from international stock market. But recently, there has been increased awareness of NSE market activities both locally and internationally, especially after the Banking recapitalization exercise in 2005. With the emergence of stronger financial system anchored on capital market and banking system reforms in the early part of that year, The Exchange rating changed and become one of the emerging market economies of the world (Agu, 2012). Investors now have increased confidence in the exchange as it is reflected by the greater participations by local investors (companies, government and private individuals) and foreign investors.

According to NSE annual report (2005), aggregate market capitalization[40] rose significantly by over 330% from N429.4 billion in 2000 to N1.8 trillion in 2004. By end-December, 2007, market capitalization rose astronomically to N9.3 trillion – a rise above 4000% from its 2004 levels with the banking sector accounting for 41.8% of the capitalization. Market capitalization as a ratio of GDP increased from 9.4% in 2002 to 28.1% in 2006, while turn over value grew by about 691% between the two years. The NSE All share index soared from 8,111.0 in 2000 to 23,844.5 in 2004 and by 2007, it stood at 57,990.2. In fact, the Exchange emerged 2nd best performing market in sub-Africa posting an impressive return of 114% in 2007 (NSE Fact sheet, Q4, 2013).

Over the years, The Exchange has been recognized as the Most Innovative African Stock Exchange by The Business Year Magazine, African Regulator of the Year by the African Business Leadership Awards and Financial Institution of the Year by The Oil and Gas Year and African Investor (Ai) Best Initiative in Support of SMEs and the Millennium Development Goals, amongst others (NSE Fact Sheet Q3, 2017). Quite a number of developments like the recapitalization of banks as well as equity and insurance firms, improved cooperate results and increased investor's confidence in the market and general improvement of the macroeconomic environment collectively lead to improved performance (Agu, 2012).

2.12 Nigeria Stock Exchange and Nigeria Economy

Generally, stock market provides avenue to pool large and long term capital from surplus spending unit (net lenders) to deficit spending unit (net borrowers) through issuing of shares and other securities for industries, government and corporate bodies. Financial and macroeconomic analysts have often argued that stock prices are influenced by some macroeconomic fundamentals such as gross domestic product (GDP), interest rate, exchange rate, public debt, money supply among others. Unarguably, improved fiscal environment is a sine-qua-non for good performance of the macroeconomic variables.

[40] The analysis focuses on equity market; where ever the total and aggregate analysis of the security is mentioned, we are referring to equity otherwise we will explicitly differentiate it.

Hence, fiscal and monetary authorities have devoted a lot of efforts[41] to control and enhance the performance of the Exchange to advance economic growth as well. The performance of stock market is often measured using: Market Capitalization which reflects stock market size; All Share Index (ASI) which measures the performance and condition of the stock market and Turnover Ratio which is the index of comparison for market liquidity rating and the level of transaction costs (Daferighe and Charlie, 2012). Table 2.5 presents the relationship between selected macroeconomic fundamentals and stock performance over the period of 1990-2015 in Nigeria.

The growth rate of GDP, Money supply to GDP, public expenditure to GDP are all expected to positively influence stock market indicators while public debt and all the monetary instruments in the table are expected to negatively affect the stock market indicators. The NSE received massive boost in 2000, and Table 2.5 explicitly shows it. Market capitalization and ASI rose by more than 100% between 2000-2003 from 1997-1999. The same sharp increase was also noticed in GDP growth, capital deepening (M2/GDP) and public debt. This implies that government expenditure and borrowing contributed to stock market improvement. After 2004-2006 period, GDP growth decreased[42] consistently till 2013-2015. There was also a downward trend of the ratio of money supply to GDP after 2007-2009 periods. This trend was reflected in the ASI as it decreased in 2010-2012 but rose in 2013-2015. We can summarize that GDP growth, public expenditure and capital deepening (M2/GDP) determine stock market performance as evidenced in the values of Nigeria ASI. Public debt and exchange rate show no correlation with ASI.

[41] Such as control of public debt, enhancing public spending and mitigating inflation among others.

[42] Although, on the annual basis, Nigeria GDP rose slightly in 2013 and 2014 at 5.4 and 6.3 per cent respectively. See Table 2.2 above

Table 2.5: Nexus between average NSE performance indicators and macroeconomic fundamentals, 1990-2015

years	Nigeria Forcados Price (US$ /b)	GDP Growth Rate (%)	M2 /GDP	Public Exp. /GDP	Total Public Debt (N'B)	Exchange Rate (%)	CPI (%)	Treasury Bill (%)	*MKT CAP (N'B)	*ASI
1990-1993	20.25	3.67	13.23	58.40	387.39	14.32	30.28	20.10	24.63	813.83
1994-1996	18.22	1.87	11.67	622.98	1052.66	21.89	53.03	12.42	171.97	3894.49
1997-1999	16.65	2.00	11.83	67.50	1109.61	45.49	8.43	13.98	275.87	6288.22
2000-2003	26.59	5.97	17.63	70.11	4164.99	116.09	13.13	14.71	781.50	12835.18
2004-2006	53.63	15.13	19.10	85.78	5429.86	131.43	13.03	10.00	2825.97	27039.87
2007-2009	79.75	6.68	31.93	95.63	2552.27	131.09	9.43	5.88	7002.30	36756.07
2010-2012	102.97	5.67	19.63	149.94	5193.26	153.89	12.23	10.62	7639.17	24526.63
2013-2015	78.06	4.79	19.43	125.61	8530.84	169.43	8.47	10.57	10884.20	34410.63

Sources: Author's calculation from CBN statistical Bulletin (various issues). *Authors calculation from NSEFACT BOOK (various issues

As shown in table 2.5, public debt and exchange rate increased consistently in all the periods which supposed to negatively affect the ASI. However, ASI does not respond to it. Inflation (CPI) and Interest rate (Treasury bill) influenced the performance of stock market in Nigeria considering the ASI values. From 2000-2003 period, inflation and interest rates declined to 13.03 and 10 per cent respectively in 2004-2006 and further reduced to 9.43 and 5.8 percent respectively in 2007-2009. ASI rose in both periods to 27039.87 basis point (bp) and 36756.07bp respectively. When inflation and interest rate rose in 2010-2012, ASI declined to 24526.63bp. In 2013-2015, the two variables reduced to 8.47 and 10.57 per cent respectively, ASI negatively responded and close at 34410.63bp. This shows that the two rates determine the performance of stock market in Nigeria.

Market capitalization (MCap) of NSE seems to be independent of the macroeconomic variables. Considering Table, 2.5, MCap rose in all the periods, however, the annual MCap reduced in 2009, 2011, 2014 and 2015[43]. The continuous rise in average MCap symbolized consistent expansion of the NSE since 2000. Although, the rise in MCap was not influenced by macroeconomic variables. All the variables had experienced up-and-down trajectory over the periods but none of the impacts was reflected on MCap. The macroeconomic fundamentals considered involve fiscal instruments (public expenditure to GDP and public debt) and monetary tools comprised of money supply to GDP, inflation, interest rate, Exchange rate and treasury bills.

[43] See table 2.2 in appendices

2.13 Stock Market in Nigeria and Oil Price Change

In this sub section, three stock market performance indicators are used to access the correlation between oil price changes and NSE. The indicators are: (1) NSE All Share Index – which reflects the general behaviors and movement of price of equities listed in NSE. (2) NSE Market Capitalization - measures the aggregate size of The Exchange. (3) Turnover Ratio – measures NSE market liquidity.

After the 1998 oil price crash, crude oil price picked from $9 pb in December, 1998 and rose to annual average of $28.49 Pb in 2000. Coincidentally, a total volume of 5.1 billion shares worth N28.4 billion in 256,532 deals was traded by investors on the floor of The Exchange in 2000. Consequently, Market Capitalization (MCAP), Turnover Ratio (TR) and All Share Index (ASI) were N429.44 billion, 6.63% and 8,111 basis point (bp) respectively. Oil price tilted leftward in 2001 and rose again in 2002. In March, 2003, the crude oil price reached $34.11 pb – its highest price since 1991. The MCAP and ASI of the 264 stocks rose significantly from 2000 to N1, 262.89 billion and 20,128.90 in 2003. The TR also surged by 42.6% in the same year.

The price of oil has been consistently trending upwards since 2003. Monthly analysis showed that in December, 2007, oil was sold above $90 pb. By March 14, 2008, it rose to $107.69 pb and peaked at $141.07 pb in July, 2008. This amounted to about 52% increase from its price in December, 2007. The NSE responded correspondingly to the consistent surge in oil price within the period. In December 2007, when oil rose above $90 pb, MCAP and ASI were N10.18 billion and 57,990.22 bp. By March 2008, as price of oil rose to $107.69 pb, the two increased further to N12.12 billion and 63,016.56 bp which account for 19% and 8.6% increase respectively and declined afterwards. As oil price surged further and peaked at $141.07 pb at end-July 2008, MCAP and ASI had dropped 14% and 23.6% respectively probably due to market speculation all over the world that western stock markets has started signaling market bubble in the period.

Table 2.6: Stock market indicators and oil price change in Nigeria, 2000-2016

YEARS	*BRENT CRUDE (US$ /b)	VOLUME OF SHARE (N' M)	NO. OF DEALS	VALUE TRADED (N' B)	NSE ALL-SHARE INDEX	MARKET CAPITALISATION (N'B)	TURN OVER RATIO (%)	NO OF LISTED SECURITIES
2000	28.49	5111.12	256,523	28.49	8,111.00	429.44	6.63	260
2001	24.5	6013.33	426,163	59.73	10,963.10	644.52	9.27	261
2002	25.15	6550.78	451,850	60.02	12,137.70	721.28	8.32	258
2003	28.77	13219.75	621,717	119.45	20,128.90	1,262.89	9.46	264
2004	38.27	19338.91	973,526	224.81	23,844.50	1,850.51	12.15	276
2005	55.67	26707.35	1,021,967	262.04	24,085.80	2,463.36	10.64	287
2006	66.84	36661.81	1,367,954	470.00	33,189.30	4,164.14	11.29	295
2007	75.14	138163.67	2,615,020	2,086.29	57,990.20	9,381.30	22.24	309
2008	100.6	191593.89	3,535,631	2,379.14	31,450.80	6,668.54	35.68	299
2009	63.25	102671.35	1,739,365	686.13	20,827.20	4,957.19	13.84	266
2010	81.07	93.69	1,925,314	798.00	24,770.50	7,862.89	10.15	264
2011	114.15	90.73	1,235,467	634.92	20,730.60	6,353.94	9.99	250
2012	113.66	104.25	1,147,174	658.23	28,078.80	8,700.85	7.57	256
2013	111.36	267.39	3,224,639	1,044	41,329.20	12,608.90	8.28	254
2014	100.85	108.33	1,211,269	1,338.62	34,657.20	10,675.93	12.54	253
2015	52.95	92.86	946,067	953.47	27,245.48	9,367.88	10.18	257
2016	49.89	6,956.85	3,447	7	26,215.35	9,019.73	0.08	247.0

**Sources: ***Energy Information Administration, 2017; Central Securities Clearing System Limited (CSCS) 2017

Table 2.6 clearly revealed that oil price did not peak in 2007 but stock market indicators did on annual basis except turnover ratio. This coincided with the point where MCAP, ASI and TR recorded N9.3 trillion, 57,900bp and 22.24%. Oil price peaked with an annual average of $100.6 pb in 191.5 million volumes of shares traded, valued at N2.08 trillion in 3,353,361 deals in 2008. Though, the year 2008 recorded the highest tradable security on the floor of the NSE (on annual basis) but the size and performance of the market contracted and the stability of the prices was less guaranteed as evidenced by declining values of MCAP and ASI. The MCAP and ASI dropped from N9.3 trillion and 57,990.20 basis points in 2007 to N6.6 trillion and 31450.80 bp accounting about 30% and 45.7% in 2008. The fall in the two indicators were occasioned by the capital market speculation and waning investor's confidence that preceded the fallen in crude oil price before the stock market bubble of 2008. However, TR (liquidity of the market) was relatively high during 2008.

After July 4, 2008, oil price began to drop and the stock bubble escalated. By December 26, of the same year, oil price dropped to $35.38 pb from $141pb, amounting to 287.7% fall and the volatility continued till 2011 with a mild increase. The NSE was unable to adjust to the gain in oil price immediately; hence, the market indicators were averagely decreasing and reached their lowest ebb in 2011. For instance, the volume of shares and the value of shares traded dropped from 191.6 billion and N2.3 trillion in 2008 to 90.7 million and N634.9 billion. Investors' confidence on NSE reduced drastically, as number of deals within the period was down to 1.2 million from 3.5 million in 2008. The bearish performance of the Exchange recorded its lowest value in eight years as MCAP, ASI and TR decreased from their peak in 2007 to N6.3 trillion, 20,730.6 and 9.9% in 2011.

The price of oil was relatively stable from February, 2011, swinging above $100pb till September, 2014. The NSE indicators surged within the period but number of deals. MCAP, ASI and TR appreciated by 68%, 67.1% and 25.5% from 2011 to 2014 respectively. Volume of trade and value traded rose by 19.3% and 110.8%. However, the number of deals declined by 1.9% over the period.

Crude oil price dropped in September, 2014 again following the weak demand of crude oil as a result of United States shale oil production and slowdown in the economy of emerging economies especially China. Oil price fell from $100.45pb in September 5, 2014 to $46.4pb in January 23, 2015 and declined more to $35.9pb by end-December 2015. The development (fall in oil price), in addition to waning business and consumer confidence arising from uncertainties surrounding 2015 general elections and transition to a new government negatively affected the Nigeria Stock market. Table 2.6 reflects a bearish sentiment on the Exchange in 2015 as the major market indicators trended downwards. The aggregate volume and value of traded securities declined by 14.3% and 40% respectively at the end –December 2015. Aggregate MCAP of the 257 listed securities decreased by 13.9% to close at N9.3 trillion compared with 10.6 trillion recorded in 2014. The ASI and TR also declined by 27% and 23.1% respectively in 2015 from 2014 in 946,067 deals.

2.14 Sectoral Stock Returns Dynamics in the NSE and Oil Price Fluctuations, 2007-2017

Table 2.7 shows the connection between sectoral stock returns in Nigeria and the real oil price. The analysis used 11 sectors but given that financial sector was split into Banking and non-Banking (Insurance) industries make it 12 sectors. The division of financial sector into two stems from the fact that the sector contributes more than 40% of NSE market capitalization and contains 36 firms out of 100 firms in the study. Consequently, due to major role the banking industry is performing in the development of NSE and Nigeria economy at large, it is rational to unmask how oil price risk specifically affects the industry. The annual sectoral stock returns as used in the analysis measures the annual average change in stock's price between two successive years and it is calculated as the logarithmic difference in price between two successive years. A positive value means that the sector's stock return has grown in value while a negative value implies a lost in the value of the pectoral's stock.

After the year, 2000, incidences like soaring demand from China, geopolitical tension in the Middle East and North Korean Missile test of 2003 pushed international oil price up.

Brent oil price rose to an average of \$70.9 per barrel in 2007 from \$65.2 per barrel in 2006. This culminated to about 10.7% increase. In 2008, the surge in oil price rose by 34% from 2007 and all the sectoral stock recorded positive returns indicating that the value of their stocks have grown in value except the financial sector. For instance, Agriculture, Conglomerates, Consumer goods, Health, ICT, Oil & Gas, Industrial gained 2.2%, 32.9%, 0.35%, 18.2%, 34.4%, 19.4, and 5.1% respectively. This implies that oil price surge in 2008 positively impacted on the sectoral stock value except the financial sector. Banking lost 1.3% while insurance lost 3.4% in 2008. The loss in value of financial sector stocks in 2008 could be attributed to sudden withdrawal of investment from bank as financial crises ensued. As oil price dipped in 2009, prices of various sectoral stocks dropped[44] and respective stocks lost value as depicted in Table 2.7. For example, Agriculture, construction, consumer goods, banking, health, oil & Gas, Service sector dropped 0.23kobo(k), 0.42k, 0.15k, 0.42k, 0.18k, 0.26k and 0.37K respectively.

[44] See table 2.4 in appendix

Table 2.7 Relationships between sectoral stock returns dynamics in NSE and oil price fluctuations, 2007-2017

Years	*Oil Price	Agric.	Conglomerates	Construction	Consumer Goods	Banking	Insurance	Health	ICT	Industrial	Natural Res.	Oil & Gas	Services	Avg.Stock Return	%Avg. Return
2007	70.94	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2008	95.82	0.022	0.330	0.029	0.004	-0.013	-0.034	0.183	0.345	0.051	0.515	0.194	0.068	1.693	14.112
2009	61.76	-0.231	-0.142	-0.420	-0.152	-0.423	-0.524	-0.182	-0.124	-0.232	-0.037	-0.264	-0.373	-3.105	-25.871
2010	79.690	-0.146	-0.015	0.149	0.217	0.000	0.054	-0.003	-0.129	0.043	-0.100	0.041	-0.043	0.068	0.563
2011	111.81	0.051	-0.106	0.009	0.072	-0.070	-0.208	-0.074	-0.090	-0.027	-0.077	-0.028	-0.157	-0.704	-5.869
2012	111.77	0.252	-0.044	-0.216	0.047	-0.036	-0.086	-0.047	0.224	-0.020	-0.060	-0.156	-0.170	-0.313	-2.604
2013	108.57	0.288	0.013	0.288	0.208	0.187	0.197	0.176	0.079	0.194	0.012	0.025	0.016	1.801	15.008
2014	97.70	-0.062	-0.012	0.030	0.011	0.002	-0.021	0.029	-0.063	0.086	-0.027	0.076	-0.020	0.030	0.247
2015	52.20	-0.093	-0.196	-0.160	-0.082	-0.114	0.017	-0.164	-0.103	0.003	-0.034	-0.021	-0.079	-1.026	-8.554
2016	43.57	0.084	-0.182	-0.062	-0.066	-0.137	-0.052	-0.258	-0.073	-0.090	-0.047	0.052	-0.102	0.934	-7.802
2017	54.18	0.746	0.069	-0.131	0.080	0.232	-0.028	-0.012	-0.165	0.130	0.016	0.111	-0.053	0.995	8.290

**Sources: ***Energy Information Administration, 2017; Central Securities Clearing System Limited (CSCS) 2017

Where Stock Returns$_i$ (r_i) is calculated as: log (closing stock price$_t$ – closing stock price$_{t-1}$ / closing stock price$_{t-1}$) and r_i is the respective sectoral stock returns.

After 2009, responses of sectoral stock return to oil price fluctuations in Nigeria do not exhibit common response. From 2010 to 2012, oil price exhibit upward movement. Agriculture, construction and consumer goods sector stock gained while Conglomerates, Banking, non-Banking, Health, Natural Resources, and Services lost values in all the three years. Industrial and Oil & Gas sector only gained in 2010 and lost value in the other two successive years. Relative stability in oil price in 2013 from the three preceding years saw all the sectoral stocks gained value. Oil price declined in 2015 and 2016 as a result of decline in global commodity prices and stock's value in all sectors responded positively except that of industrial sector and insurance subsector that recorded positive value in 2015. Industrial sector recorded 0.3% gain while insurance sub-sector gained 1.6% in 2015. There was upward movement of oil price in 2017 majorly alluded to OPEC cartel production cut. Brent crude price rose from $43.5pb to $54.1 per barrel amounting to 19.1%. Stocks from Agriculture, Conglomerates, Consumer Goods, Banking, Industrial, Natural Resources, and Oil & Gas sectors gained 0.74K, 0.6K, 0.7K, 0.23K, 0.12K, 0.20K and 0.11K, while Construction, Insurance, Health and Service sectors lost N0.13, 0.20K, 0.20K and 0.53K worth of value.

Generally, from table 2.7, it is evident that various sectoral stocks respond differently to the oil price swings. However, the analysis deduced that health , Insurance, services, Agriculture, Construction sector stock returns (oil neutral sector) respond negatively to oil price changes while Conglomerates, Consumer Goods, Banking, ICT, Industrial, Natural Resource (Oil User's sector) and Oil & Gas sector (Oil producing sector) have positive relationship with oil price changes in Nigeria. The analysis also considers the overall behaviour of aggregate stock returns as oil price fluctuates. Table 2.7 revealed that when price of oil increased by 34.5% from 2007 to 2008, NSE aggregate stock returns rose by 14.1%, gaining N1.69k in the same period. Brent crude price trended downwards in 2009 by 37%, and NSE stocks lost 25.8%, losing about N3.10k. The year 2010 also recorded positive relationship between the two variables. However, in 2011, the two variables exhibit negative relationship: oil price increased by 40%, the value of aggregate stock return reduced by more than 5% making it to shed 70k. This could be linked to 2011 Arab Spring that propelled fluctuations in world oil price which resulted in uncertainty and loom in the stock market and investors' confidence were negatively affected.

Afterwards, the nexus between oil price changes and stock returns in Nigeria has been positive except in 2013 and 2014. During 2013 and 2014, average oil price dropped from $111.7pb in 2012 to $108.5pb and $97.3pb (approximate 2.7% and 8.6%) in 2013 and 2014 respectively. Although, stock returns gained in the two periods by recording N1.80k and 2k which is valued at 15% and 0.24% rise. The inverse relationships between the two variables in 2013 and 2014 were likened to the relative stability in the price of oil from 2011 to 2014 that boosted investors' confidence in the NSE. However, the annual computation of Table 2.7 hides some fact concerning the dynamics of oil fluctuation due to high frequency nature of the oil price variable. Obviously, during 2013 and 2014, daily data showed that oil price experienced stable upward movement in 2013 and first half of 2014 and investors responded to the relative booming economy of the period. Hence, Nigeria stock market recorded positive returns within the period.

The slowdown in commodity prices in the world commodity market in 2015 and 2016 pushed oil price downwards. Oil price declined by 42% and 16.9% in 2015 and 2016 respectively but increased to the $54.2 per barrel in 2017. NSE market exhibited similar trend. Stock market returns lost N8.5% and 7.8% in 2015 and 2016 respectively but showed positive return of about (N1.0) 8.3% in 2017 as revealed in Table 2.7. Summarily, in Nigeria, aggregate stock market returns is positively related to oil price movement.

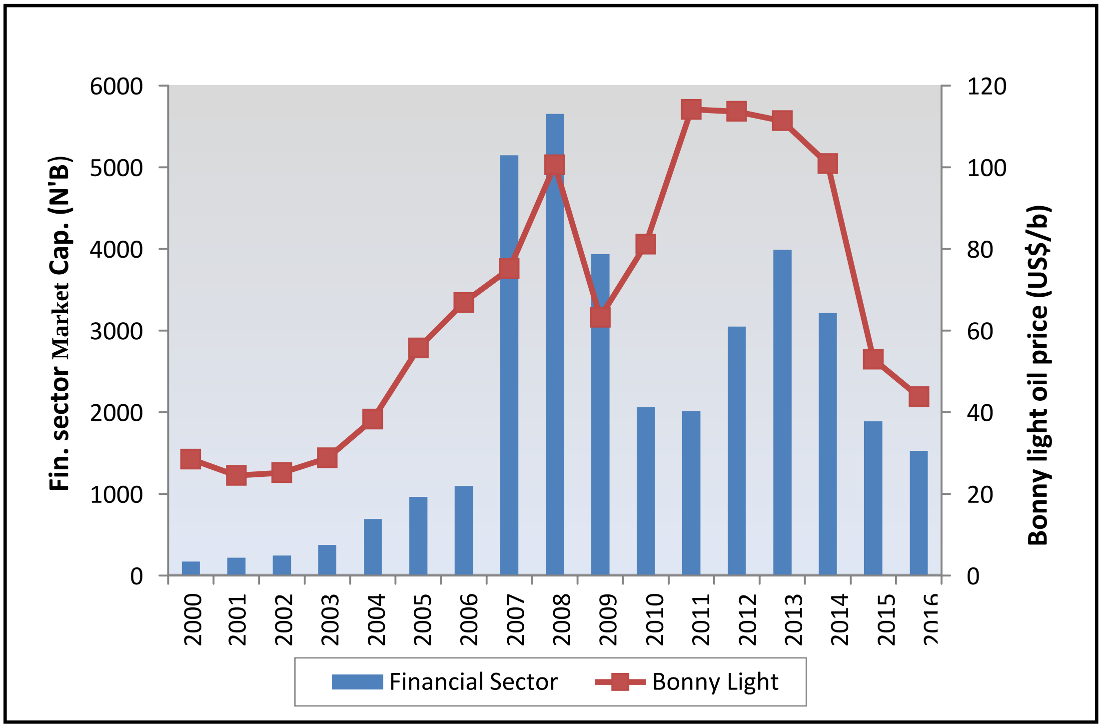
2.15 Oil Price Changes and Sectoral Market Capitalization Dynamics of the NSE

This section presents the relationship between oil price dynamics and respective sectoral performance of firms quoted on the floor of the NSE using Market Capitalization (MCAP) as a gauge for the measurement of sector performance. As earlier defined, MCAP measures the market value and size of company’s outstanding shares. Hence sectoral MCAP intends to measure the size and market value of respective sectors as listed on the NSE. This is to show how sensitive various sectors are to world oil price risk; as this may differ across sectors according to direct and indirect utility of oil for the sectors. There are about 257 securities (Bonds and Equities) listed on the NSE, out of this number, 172 is equity stock (NSE, 2017). The equity market is categorized into 11 sectors; Agriculture, Conglomerates, Construction and Real Estate, Consumer Goods, Financial Services, Health Care, ICT, Industrial, Natural Resources, Oil & Gas, Services. Moreover, financial service sector has the highest number of listed firms among the sectors in the NSE with more than 50 companies, followed by service sector and consumer goods with about 24 and 22 companies respectively. Therefore, the study used 11 sectors in the analysis.

2.15.1 Financial Services Sector

Financial sector of the NSE has the largest number of firms quoted on the Exchange. It contains about 57 equity companies; comprising of 15 deposit banks, 27 insurance companies, 7 Mortgage banks and 8 micro finance banks (NSE, 2017). Financial service Market Capitalization (FSMCAP) contributed about 20.1% and 17% share of aggregate NSE MCAP in 2015 and 2016 respectively (NSE Fact Book, 2017). Share of banking sub-sector was 76.7% in 2015. This shows that Nigeria banking sub-sector plays a big role in NSE activity. Figure 2.2 revealed the relationship on how financial sector respond to oil price changes. The figure showed that the financial sector responds positively to the fluctuations in international oil price over the period of 2000-2016. The two variables follow same trajectory, although, in 2010 and 2011, the price of oil trended upwards, while FSMCAP was relatively stable. Afterwards, both maintained the same pattern.

The positive relationship could be attributed to the customers’ behaviour towards oil price changes. Nigeria is a net exporter of crude oil. During oil price hike, public expenditure increases as a result of rise in income and it resulted in corresponding increase in the household income. Undoubtedly, increase in the income of the households lead to more savings and investments (Financial securities), which inadvertently, increases Financial Service Market Capitalization.

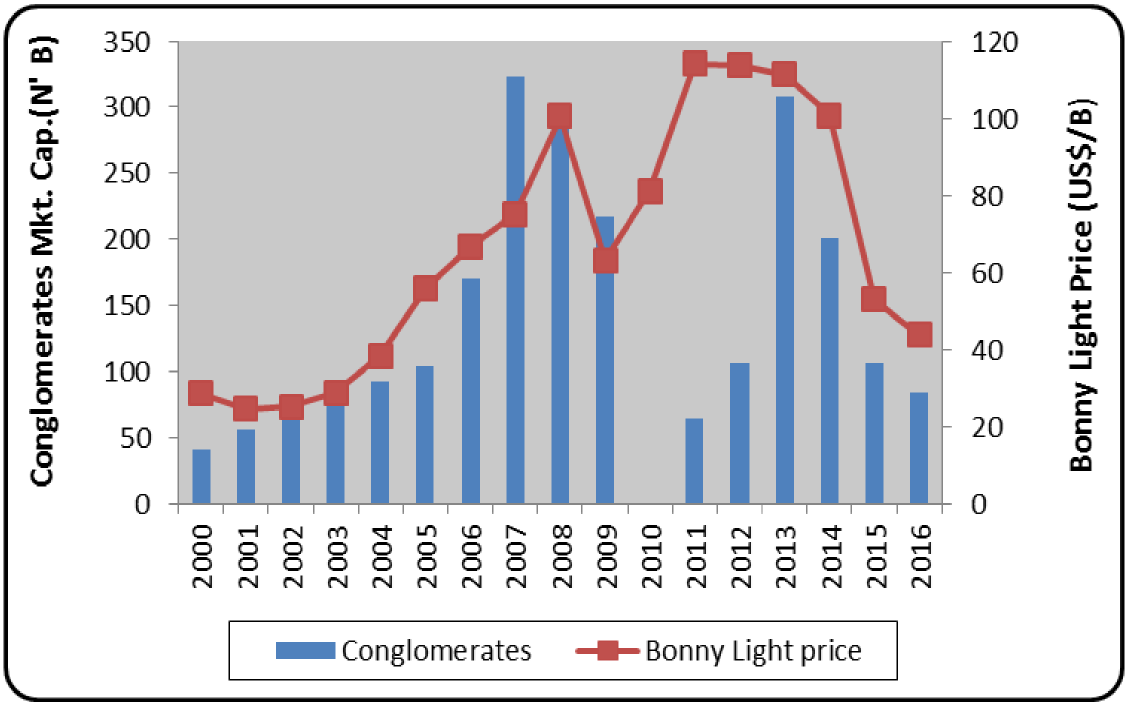


Source: Nigerian Stock Exchange Fact Book (various issues), CBN annual report of the companies and Statement of Accounts (2015), 2015 and 2016 data was retrieved from NSE web site

Figure 2.2: Financial sector market capitalization in Nigeria and oil price changes, 2000-2016

2.15.2 Conglomerates Sector

Conglomerate is made up of 6 firms: CHELLARM,, AGLEVEN, HOHNHOLT PLC, SCOA, UACN and TRANSCORP PLC. The share of this sector to the total MCAP of NSE in 2015 and 2016 was about 1% respectively in both periods, signifying relative small size of the sector. Figure 2.3 showed the interaction of oil price volatility and conglomerates MCAP. The deduced that this relation is positive as the trend of the two variables follow the same pattern. This implies that the price of crude oil drives the market value and size of the conglomerates stocks.

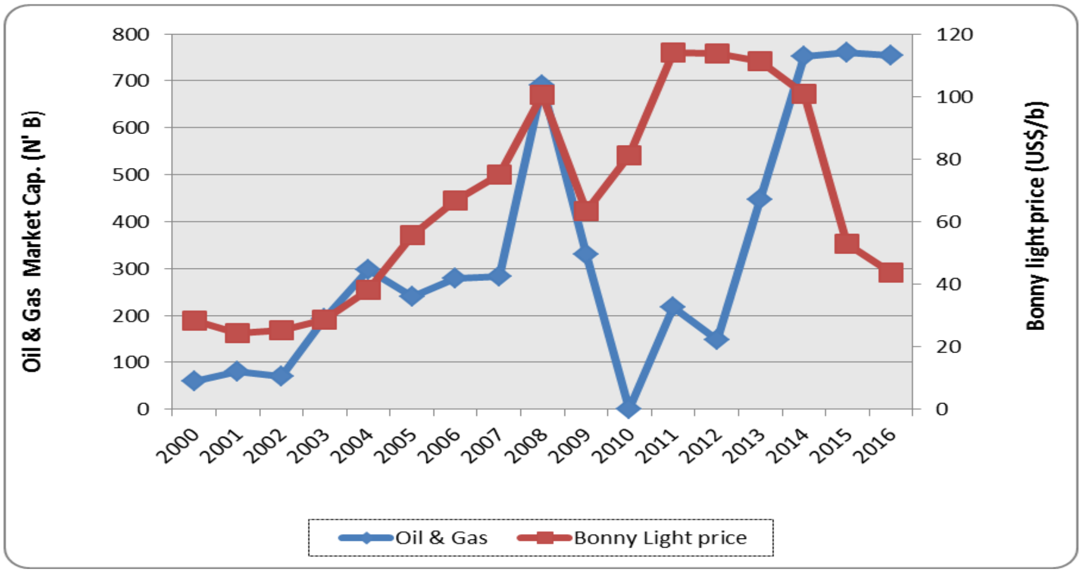


Source: Nigerian Stock Exchange Fact Book (various issues), CBN annual report of the companies and Statement of Accounts (2015), 2015 and 2016 data were retrieved from NSE web site

Figure 2.3: Conglomerates sector market capitalization in Nigeria and oil price changes, 2000-2016

2.15.3 Oil & Gas Sector

The index of oil & gas MCAP revealed insignificant contribution of the sector to the aggregate NSE MCAP from 2000-2015. However, in 2016, the narration changed, and it contributed 8.36% to total MCAP. The sector comprises of 12 firms, but with 4 active companies, while two firms had been delisted from Security and Exchange Commission (SEC) in 2015. Considering figure 2.4, Oil & Gas sector MCAP and oil price fluctuations exhibit varied pattern. Both variables were positively correlated in 2000 to 2004; exhibited negative relation in 2005, 2011 and 2013-2016. When oil price rose in 2011 due to Arab Uprising, Oil & Gas MCAP decreased. After that year, they moved in the same direction till 2013. From 2014 to 2016, the two variables showed negative relationship. This coincided with fall in crude oil price as a result of slowdown in crude oil demand by developed and emerging economies. This implies that the size and market value of Oil & Gas securities increases during falling crude oil prices in Nigeria. Hence, the relationship between the variables is not clear.

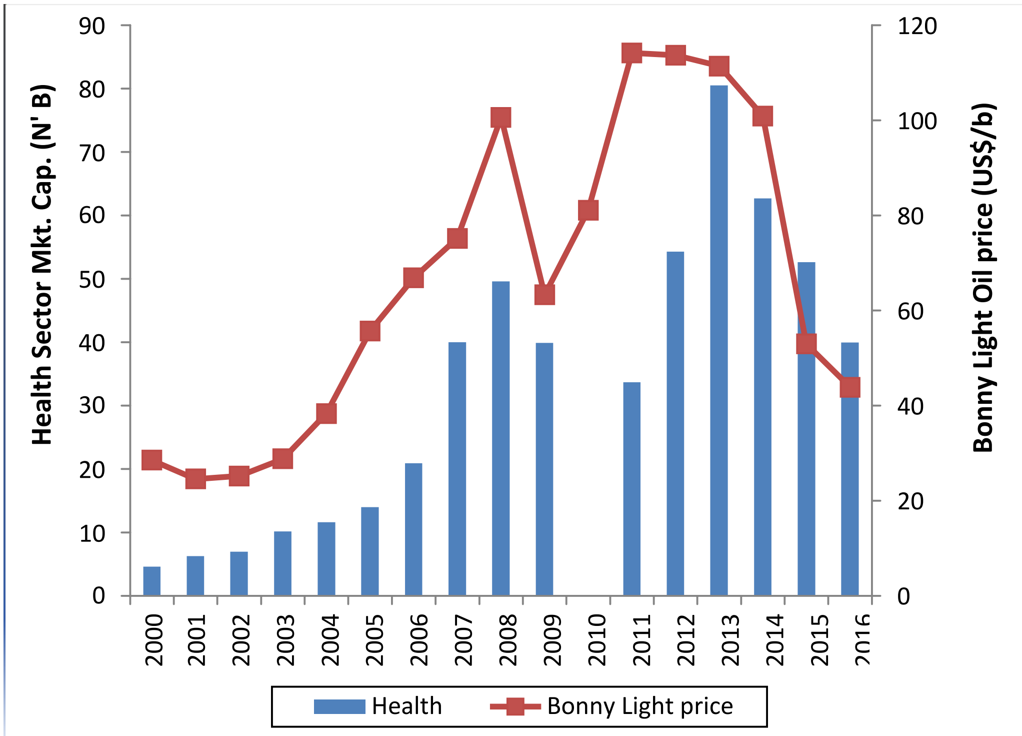


Source: Nigerian Stock Exchange Fact Book (various issues), CBN annual report of the companies and Statement of Accounts (2015), 2015 and 2016 data were retrieved from NSE web site.

Figure 2.4: Oil & gas sector market capitalization in Nigeria and Oil price changes 2000-2016

2.15.4 Health Care Sector

The size of the Health sector MCAP to NSE total MCAP is relatively small as it contributed less than 1% annually from 2000 -2016. However, with the presence of 11 companies from the sector in NSE, the interaction between oil price changes and Health MCAP is positive in all the periods under review. This implies that oil price changes determine the size and behaviour of Health Care security. During the period of hike in price of Oil, Health stocks seem bullish and when oil price falls, Health securities exhibitbearish trend.



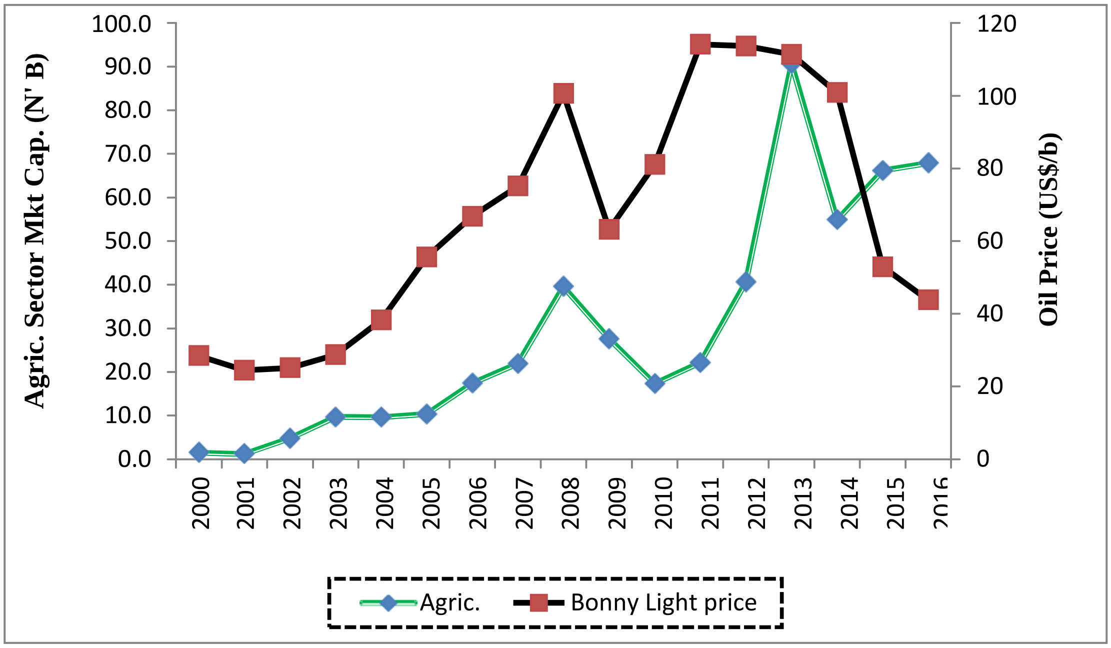
Source: Nigerian Stock Exchange Fact Book (various issues), CBN annual report of the companies and Statement of Accounts (2015), 2015 and 2016 data were retrieved from NSE web site

Figure 2.5: Health care sector market capitalization in Nigeria and oil price changes, 2000-2016

2.15.5 Agricultural Sector

Agricultural sector has 7 firms listed on the NSE but only 3 out of the 7 firms are active till date. Hence, the contribution of Agricultural MCAP to total MCAP on the Exchange has been less than 1%. In 2015 and 2016, it was 0.71% and 0.75% respectively.

Agricultural equipment and machinery use oil product for heating and production. Hence, we expect that increase in oil price would lead to a fall in Agricultural MCAP and vice versa. Figure 2.6, revealed a positive relationship between the two variables over the years up until 2014, when they began to exhibit negative relation. This characteristic could be attributed to the less emphasis on Agriculture and over dependency on oil by the country until 2014 when government began reawakening consciousness in Agriculture through diversification of the economy. Hence, in 2014, as oil price showed a downward movement, the size and performance of Agricultural equity stocks was bullish.

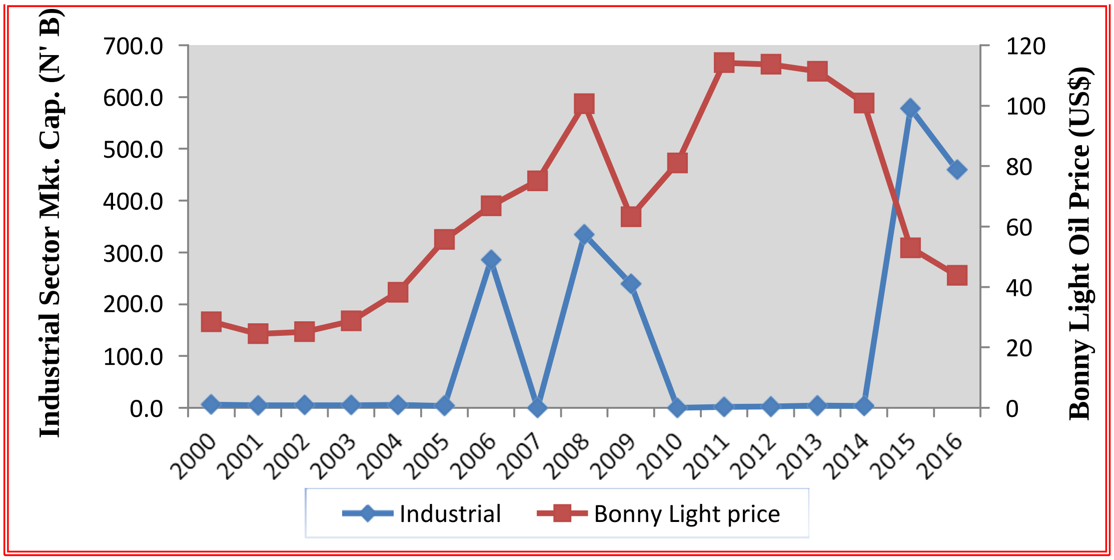


Source: Nigerian Stock Exchange Fact Book (various issues), CBN annual report of the companies and Statement of Accounts (2015), 2015 and 2016 data were retrieved from NSE web site.

Figure 2.6: Agricultural sector market capitalization in Nigeria and oil price changes, 2000-2016

2.15.6 Industrial Goods Sector

Industrial sector MCAP contribution in 2015 and 2016 were 6.2% and 5.1% respectively. Industrial sector has 15 firms listed on the NSE performed relatively higher in 2015 and 2016 in terms of size of these firms. The sector's MCAP was N285 billion in 2006, and rose to N577.9 billion in 2015 which is about 102.7% growth. The sector utilizes oil product in their production. The relationship between industrial sector MCAP and fluctuations in oil prices is not clear from figure 2.7. The erratic relation between the two variables was also aggravated by missing observations in the data point between 2003 and 2007. Generally, we could deduce that the relationship is positive, implying that when oil price is increasing, industrial stocks tend to increase too. This could be associated to oil exporting countries like Nigeria: where increase in oil price generates higher income to household through government purchases; households invest on industrial stocks, thereby increasing industrial sector's market size.



Source: Nigerian Stock Exchange Fact Book (various issues), CBN annual report of the companies and Statement of Accounts (2015), 2015 and 2016 data were retrieved from NSE web site.

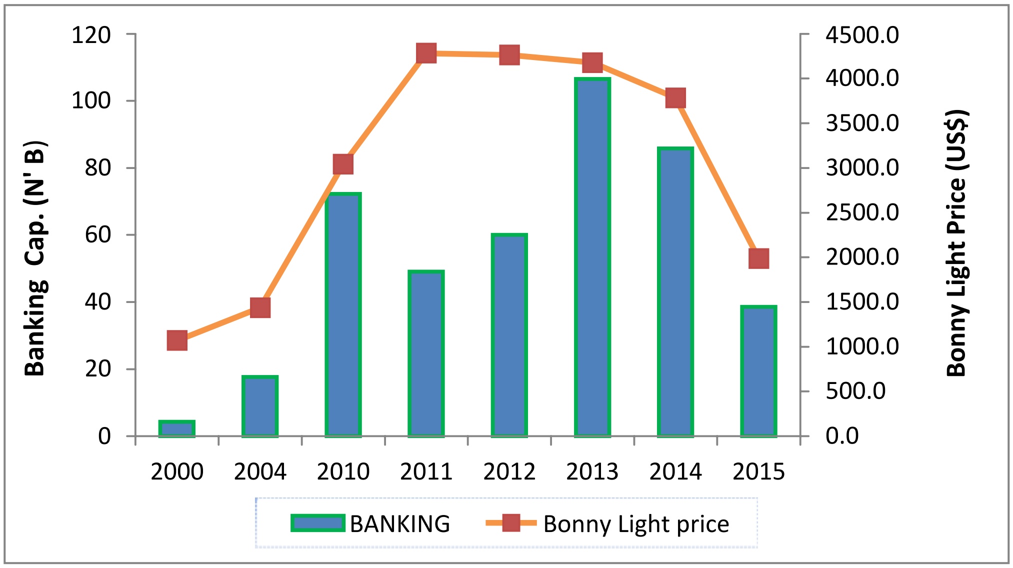
Figure 2.7: Industrial sector market capitalization in Nigeria and oil price change, 2000-2016

2.15.7 Deposit Money Bank (Banking) Sub-Sector

Banking subsector elicits brief analysis in this section given its role as a strong or important player in the NSE. The subsector contributed more than 70% of Financial sector MCAP while Insurance, Mortgage and Microfinance Banks share the remaining 25%.

Figure 2.8 obviously presents the connection between Bonny light price changes and Banking MCAP. The study deduced from figure 2.8 that the two variables are positively related. However, with the available data, it is conspicuously clear that the size and behaviour of the Banking depends on crude oil prices.

Both variables rose over the period under review, and Banking MCAP declined from 2013 as oil price trended downwards in the same period. We could associate the positive relation to spill over of wealth from net oil importing countries to net oil exporting countries during hike in oil price. The channel finally increases Banking MCAP and economic growth.



Source: Nigerian Stock Exchange Fact Book (various issues), CBN annual report of the companies and Statement of Accounts (2015), 2015 and 2016 data were retrieved from NSE web site.

Figure 2.8: Banking sub-sector market capitalization in Nigeria and oil price changes, 2000-2016

2.16 Market Structure of Downstream Sector and Stock Market Performance in Nigeria

In Nigeria, just like any other part of the world, price of oil is regulated and controlled in one way or the other by government given the oligopolistic nature of the industry. One of the reasons for government interference in oil sector has been adduced to the influential role oil plays in the Nigeria economy. Oil proceed generates more than 75% of total revenue in Nigeria over the period 2000 – 2015, hence the economy is driven by petro-dollars[45]. Government control in oil sector has been perceived as a mechanism that helps to ensure that the citizenry enjoyed the benefits associated with oil endowment in Nigeria (NNPC, 2018). Government regulations in Nigeria downstream sector has been inform of subsidy payment, oil product pricing, oil-for-product swap deals and other regulatory frameworks. Extent of these controls determines to a larger degree oil product pricing and market structure of oil industry in Nigeria. Whatever the underlying reasons are for Government regulation of oil products market, it is imperative to see how it affects stock market pricing.

Any activity of the government that affects price of petroleum product, usually affects the income and consumption behaviour of the citizens. Investors react accordingly as it affects their investment options and ultimately assets pricing respond. Investors, especially foreign investors, invest in oil sector in Nigeria in form of options, futures, forwards and other derivatives[46] contracts instead of non-hedge securities. Whatever happens in the market structure of oil affects the stock returns of these derivatives. Therefore, this section is devoted to examine the interaction between market structure of oil industry which focuses on oil pricing, oil subsidy, oil-for-product swamp deals and their interaction with stock market in Nigeria.

[45] See page 1, second paragraph for the roles of oil in Nigeria.

[46] Derivatives such as futures, forwards and options are financial instruments used to hedge foreign currency risk; specifically arising from oil price risk in the case of Nigeria.

2.16.1 Government Regulation of Oil Product Pricing

It is not amazing that various government regimes since 1982 have in one way or the other altered the price of petroleum product in Nigeria. This buttressed how strategic and valuable oil is to the country. Table 2.8 showed the history of oil product pricing determination; while considering civilian regimes and corresponding changes in price of oil at the period. The study focused on changes in Premium Motor Spirit (P.M.S.) domestic pricing since it remains the major energy product choice of the citizenry. PMS is not deregulated like diesel and a change in its price has a larger impact to the citizens than kerosene. Table 2.8 showed changes in the PMS Price beginning from the nascent democratic regime but the analysis commenced from 2007 which corresponded with stock market data in this study.

In the analysis, the study selected at least two companies from each sectors of the NSE. In order to have uniformity in the selection, the study ensures that Companies selected from each sector make up to at least 50% market capitalization of the sector except for the financial sector. The two banks picked from the financial sector (GTB and FBNH) are strong enough to use as inference in Nigeria financial sector. The selected companies are PZ and GUINESS (Consumer goods), PRESCO, LIVESTOCK and OKOMOIL (Agriculture), EVANSMED and MAYBEKER (Health), NRC and TRIPPLEG (ICT), WAPCO and CCNN (Industrial goods), TRANSCORP and NAHCO (Services), GTB and FBNH (Financial), JBERGER and UACPROP (Construction), MOBIL, TOTAL and OANDO (Oil and Gas), UACN and CHELLARM (Conglomerates), ALEX and BOCGAS (Natural resources).

The oil price change can impact on stock prices with lag, this line of argument had been pursued in the literature (inter-alia: Driespong et al. 2008; Narayan and Sharma, 2011). Following under-reaction hypothesis, they argued that investors react to information at different point in time which could be adduced to the conservative nature of investors. Hence, investors do not respond strongly or fast enough to new information. The under-reaction hypothesis is applicable to response of stock prices to oil pump price changes in Nigeria. Therefore, we consider three months lag from the announcement of changes in pump price of PMS in this descriptive analysis.

Table 2.8 Changes in PMS pricing in Nigeria

Regime's President	Date	Price of P.M.S (N)	Change in Price (%)
Abdulsalami Abubakar	6th Jan. 1999	25 -20	-20
Obasanjo	1st June 2000	20 - 30	50
Obasanjo	8 June, 2000	30 - 32	-10
Obasanjo	1st Jan. 2002	22 - 26	18.18
Obasanjo	June - Oct, 2003	26 - 42	23.08
Obasanjo	29th May, 2004	42 - 50	19.05
Obasanjo	25th Aug. 2004	50 - 65	30
Obasanjo	27th May, 2007	65 - 75	15.38
Yar'Adua	June, 2007	75 - 65	-15.38
Jonathan	1st Jan. 2012	65 - 141	116.9
Jonathan	17th Jan. 2012	141 -97	-31.2
Jonathan	5th Feb. 2015	97 - 87	-10.3
Buhari	11th May 2016	87 - 141	62.1

Source: www. Asuktek.com

When Government announced increment in the pump price of petroleum product in May 27, 2007, from N65 to N75 which is about 15.3% increase, Agriculture, consumer goods, health, ICT, Industrial and Services sectoral stock prices depreciated in the first three months from the announcement. While, financial and Construction sector stock prices gained. However, oil and gas sectoral stock price had varying responses to the change in PMS pump price policy. Total and Mobil stock prices depreciated in the first three months from the policy before their stocks' price began to rise again. The OANDO security price increased up till the next six month after the announcement. The NSE monthly series revealed that MCAP ASI was not affected by the policy. This could be adduced to the corresponding reversion of the price less than one month after it was pronounced.

Late President Yar'adua, reverted the price of fuel to N65 after assumption of office in June, 2007. In January 1st, 2012, Jonathan administration increased the price of PMS to N141 from N65 which was anchored on removal of fuel subsidy. This was equivalent to 116.9% rise. The upsurge in pump price of fuel witnessed a lot of demonstration as the majority of ordinary Nigerian favored subsidy. The wide protest and strike experienced at the every major city of the country forced the federal government to cut fuel price to N97. Generally, activities in the stock market were negatively affected by these actions within the period. Most of the daily stock indices plunged. Monthly analysis of company's stock price from consumer goods, health, Oil and Gas, and Industrial sectors plunged in the first six months of the policy changed. However, data available also revealed that financial and ICT sectoral stocks rose within the period. Stock prices of some sectors covered also experienced reduction within the first two months of the new policy and started to rise thereafter. Such stocks are TRANSCORP, OKOMOIL, JBERGER and UACPROP. MCAP and ASI dropped 3.6%, one month after the new PMS pricing.

The 10% reduction in pump price of PMS announced by President Jonathan in February 5th, 2015 saw PMS to be sold at N87 per liter. This reduction caused securities price of consumer goods, financial, industrial, oil and gas, services and health sectors to move up in the first three months. While stock price of Agriculture, ICT, Natural resources dropped, while those of TRIPPLEG (ICT SECTOR), UACPROP (construction sector) seems unaffected. Available statistics showed that MCAP and ASI grew by 13.3% and 11.5% on the average in the first three months after the price. The last government policy in determining oil price in Nigeria was in 11th May, 2017 when president Buhari increased the price of PMS from N87 to N141. This change led to 62.1% increase in PMS pump price. Oil and Gas, Agriculture, construction and financial sector asset prices responded positively in the first three months of the new price. Stock prices of the other sectors dropped in the first three months after the new PMS pricing. Notably, Health sector securities price was unresponsive. Overall, the MCAP and ASIrose by 6.9% but declined by 12% and 10.8% respectively after the next three months.

2.16.2 Oil Swap Deal and Stock Market Pricing in Nigeria

Nigeria had adopted four methods off-shore processing deals in recent times. The major aim of such deal is to provide the NNPC (government) with an alternative means of funding importation of refined petroleum products in order to meet ever increasing domestic fuel consumption needs of Nigerians and also minimizes the cost of oil importation.

In the 1990s, NNPC oil import arrangement was based on using domestic refineries to refine the crude oil and then sale the output to privately owned marketing companies while a fraction is sold through NNPC retail outlets. Due to the ineffectiveness and dilapidated condition of these refineries, that arrangement was ended. The second arrangement was the use of pipeline and product marketing companies (PPMC) – a Subsidiary of NNPC to license oil traders to import petroleum products. The traders delivered the product to NNPC in exchange of cash while PPMC now sold the product to fuel retailers and other intermediary companies. This arrangement is known as Open Account Import and it ended in 2011. Thereafter, the Petroleum Product Pricing and Regulatory Authority (PPPRA) issued permit (license) to private marketers to import crude oil products and sell same to oil product wholesalers and retail buyers. Once the private marketers get the permit, they are liable to import and sale oil products. Here, NNPC was an observer in the market as it was not involved with the oil imports.

In 2010, Government through NNPC entered into import and sell of oil products through swap deal in which crude oil is exchanged for petroleum products with licensed companies. This oil import strategy is called oil-for-product swap. The analysis in this subsection focused on the oil-for-product swap deal[47]; and we examined how it affected oil pricing in Nigeria and its interaction with security's pricing in the NSE. The NNPC started oil swap deal in 2010, majorly to prevent reoccurring domestic fuel scarcity, heightened by domestic refineries inefficiencies. There are three major kinds of oil-for-product swap deal embarked upon by NNPC. These are: Off shore Processing Arrangement (OPA) in 2010, Refined-Product Exchange Agreement (RPEA) in 2011 and Direct Sales Direct Purchase (DSDP) deal in 2017.

[47] Which is the most recent deal

2.16.2.1 Off-shore Processing Agreement (OPA) (2010 to 2017)

OPA is a form of swap agreement where a refiner or trading company is meant to lift a specified amount of crude oil, which it refines abroad and returns the oil product back to NNPC. The refining company pays cash to NNPC for any product that government does not want. In 2010, federal Government signed agreement with the British Petroleum affiliate- Nigermed and Societe Ivoirienne de Reffinage (SIR) under OPA. However, the OPA deal has been faulted on the basis of corruption by the economic watchers.

2.16.2.2 Refined-Product Exchange Agreement (RPEA) in Nigeria (2011)

This is an arrangement where crude oil is assigned to a trader and the trader is responsible for importing specified product worth the same amount of money as crude less certain agreed expenses. In 2011, federal government entered into agreement with four companies in this import strategy namely: Taleveras Petroleum Trading BV, Aiteo Energy Resources Ltd, Ontorio Trading SA and Trafigure Beheer BV. The NSE data revealed that MCAP and turnover ratio dropped by about 22.7% and 1.7% respectively in 2011from 2010 when the oil import policy was used.

2.16.2.3 Direct Sale Direct Purchase (DSDP) (2017)

The DSDP is an oil import policy that involves direct sale of crude oil by NNPC to refineries or consultants who in turn supply NNPC with the equivalent worth of refined products. The adoption of this oil import strategy which replaced RPEA was premised on the fact that it enthrones transparency and of cause eliminate the activities of middlemen that results in inefficiency in product pricing. The strategy kick started in May, 2017 with ten oil companies and the agreement is to expire in June, 2018, but with an option of renewal. One obvious feature of DSDP arrangement is that it relatively minimizes oil product scarcity in the country. However, NNPC has been alleged of still subsidizing oil product given that petroleum product import price is still more than the pump price (NNPC, 2018). Available NSE statistics showed that the DSDP oil import policy did not have much effect on stock market prices since it did not cause significant price differential prior to the policy. MCAP and ASI of NSE exhibited growth of about 8% and 8.3% respectively on the average after the first four month DSDP policy was adopted in June,

2017. We can infer that the policy affected stock market indices positively, all things being equal.

2.17 Exchange Rate Policies in Nigeria

Nigeria has implemented various forms of exchange rate policy starting with regulated exchange rate policy in the pre-Structural Adjustment Programme (SAP) era and to deregulation after SAP. Immediately after independence in 1960, fixed exchange policy was adopted in Nigeria up until 1970s. During the period, the domestic currency was linked to British pounds under the Bretton Woods arrangement. Though, the exchange rate system collapsed in the early 1970s as a result of crash in dollar, which latter led to Bretton Woods‟ break up. In spite of the disintegration, Nigeria maintained her fixed exchange rate policy. When Nigeria changed Nigeria’s pound (Nigeria local currency denomination at that time) to Naira in 1973 due to devaluation of the British pounds sterling, the exchange rate of Naira gained value. However, there were fundamental economic challenges associated with the gain especially in the external sector balances. Some of these problems include massive depletion of the nation’s external reserve and disequilibrium in the external balance. The fixed exchange rate policy was sustained until 1986 but yet, unable to correct the imbalances in the fiscal structure of both external and internal position of Nigeria.

In an effort to correct the fiscal imbalance, government adopted Structural Adjustment Programme (SAP) in 1986 proposed by International Monetary Fund (IMF). Under the IMF flexible exchange rate framework, Nigeria implemented second-tier foreign exchange rate market (SFEM) mechanism in September, 1987. The SFEM was applied as an auction process to ascertain the appropriate exchange rate system. This allowed the market forces to determine the relative value of naira. Although, government still have the discretion to intervene in the exchange rate market in order to maintain stability as need arises. However, First-tier Foreign Exchange Market (FFEM) was used at the beginning of the SFEM for official purposes and its rate was determined administratively. This implies that Dual Exchange rate system (co-existence of FFEM and SFEM) was also implemented at the same period. Obviously, the dual exchange rate system brought about multiplicity of exchange rate in the economy which resulted in fluctuation in the external sector balances.

This prompted the two frameworks to be merged as Foreign Exchange Market (FEM). The FEM is an auction system arrangement that enabled authorized dealers to buy and sale foreign exchange among themselves and also allows dealers to transact FOREX independent of FEM

In January, 1989, Inter-Bank Foreign Exchange Market (IFEM) was instituted. In this arrangement, the exchange rate was determined through marginal rate pricing or using lowest and highest bid system. In the same year, Government also established Bureau De Change (BDC) to increase access to end-user of foreign exchange in a less restrictive framework. The BDC targeted to close the gap between the informal sector and official exchange market. These varied methods of exchange rate resulted in instability in the macroeconomic fundamentals instead of otherwise. This prompted the monetary authority to reintroduce the Dutch Action System (DAS) in 1990 in order to mitigate the depreciation of naira. However, DAS could not stop the naira depreciation at the time. The monetary authority discontinued the DAS in 1992 and introduced total deregulation which is a complete float system of exchange rate.

The Central Bank of Nigeria (CBN) formally introduced fixed exchange rate regime again in 1994 following that the existing float system was aggravating the imbalance in the economy. During the period, naira was pegged at N21.9 per US$1. The objective was to stop the existence of parallel market in the system as it was outlawed during the period. But the policy could not achieve its aim as naira depreciated further and parallel market premium widened. This led the CBN to revert to dual FEM in 1995 aimed at strengthening the naira. The monetary authority deepened their control in the FEM by reintroducing IFEM in 1999. The IFEM was aimed at providing foreign exchange liquidity to private sector. As CBN undertook significant role in the FEM, as at July, 2002, DAS was equally reintroduced with the objective to reduce the gap between official exchange rate and parallel market. This prompted the CBN to determine the amount of foreign exchange it is willing to sell and price the buyers pay at a seemingly market clearing rate called marginal rate. This was a kind of guided exchange system.

Table 2.9 Exchange rate risk in Nigeria

YEAR	Official Ex.	DAS (USD)	IFEM (USD)	BDC (USD)	D (OFEX_IFM)	D (OFEX_BDC)
2004	133.5004	132.416	133.383	143.213	0.118	-9.713
2005	132.147	132.148	132.995	142.559	-0.847	-10.412
2006	128.6516	128.651	128.673	137.104	-0.022	-8.453
2007	125.8331	125.879	125.746	127.393	0.133	-1.514
2008	118.5669	118.567	118.997	120.714	-0.430	-2.148
2009	148.8802	148.880	112.805	161.644	36.075	-12.764
2010	150.298	150.298	151.089	153.065	-0.792	-2.768
2011	153.8616	153.858	155.789	159.319	-1.931	-5.461
2012	157.4994	157.498	158.757	160.858	-1.258	-3.359
2013	157.3112	157.312	159.271	162.464	-1.959	-5.153
2014	158.5526	158.553	164.881	171.448	-6.328	-12.894
2015	192.44		195.516	222.777	-3.076	-207.777
2016	253.4917		253.492	372.864	0.000	-119.373
2017	305.7892		305.789	395.420	0.000	-89.631

Source: CBN and author’s computation

Where Official Ex. = Official Exchange Rate; DAS = Dutch Auction System; IFEM = Inter-Bank Foreign Exchange Market; BDC = Bureau De Change; D(OFEX_IFM) = Difference between Official Exchange Rate and Inter-Bank Foreign Exchange Market; D(OFEX_BDC) = Difference between Official Exchange Rate and Bureau De Change. (USD) = United State Dollars.

Following the reintroduction of DAS policy, IMF encouraged the Federal Government to modify the current exchange rate system by allowing full deregulation of the foreign exchange (FOREX). Given the rise in external reserve and fiscal discipline majorly arising from successful financial sector reform in 2004 and 2005, CBN introduced the Wholesale DAS (WDAS) in February 20, 2006. The WDAS required a private BDC to have an account with an authorized BDC dealer of his choice for the purpose of buying FOREX. The authorized dealers are primary FOREX dealers who buy from CBN through WDAS window. When the authorized dealer (which is usually the commercial banks) purchased from CBN in cash, it sales to private BDCs while the private BDCs in turn sales to the final users of FOREX. The WDAS achieved a great deal of stability in the system. It deepened market determination of exchange rate of naira and also reduced the gap between official and inter-bank market rate.

After the global financial crises in 2008 with its attendant depletion of external reserve and other anomaly in the country, WDAS was reintroduced again in September, 2009. The WDAS was unable to rescue the economy from the demand pressure on foreign exchange rate occasioned by portfolio divestment; hence, it was discontinued in 2013. In September, 2013, CBN implemented Retail Dutch Auction System (RDAS). In RDAS, end-users of FOREX are given the opportunity to bid for Foreign Exchange rate through their commercial banks (authorized dealers). Here, the authorized dealers can only obtain or purchase FOREX equivalent to the same amount the end-users requested from CBN. The RDAS was implemented to reduce widening differential between official rate and parallel market rate resulting from increasing demand for FOREX by Nigerians.

In February, 2015, RDAS was stopped by CBN due to incessant arbitrage and multiple exchange rates between BDC/Inter-bank rate and official exchange rate in table 2.9. Hence, CBN directed to move all FOREX demand to use inter-bank market rate. This is to curtail the widening premium in interbank/BDC and RDAS rates. Due to economic challenges at that period occasioned by falling crude oil price in the international market, the policy could not stop the naira from depreciation. In June, 2016, CBN launched a new exchange rate policy called Foreign Exchange Inter-bank Trading Window (FEITW). The policy involves using between eight to ten primary dealers to manage minimum of US$10 million which will be completely market driven. In this arrangement, CBN introduced FOREX primary dealers that operate with inter-banks market dealers.

According to the monetary authority, this policy aimed at ensuring a single market structure of FOREX. However, the FOREX policy banned 41 items from getting access to FOREX in Nigeria to reduce pressure on the naira. Though, government still operates official exchange rate of N199 per dollar for funding critical transaction that are expected to promote economic growth in the country. While some transaction such as payment of school fees, business tourism, medicals, holidays and other similar bills cannot be able to get FOREX at N199 per US dollar rate. This arrangement was seen as float-managed type of exchange rate. This FOREX policy has continued even till 2018 in Nigeria.

2.17.1 Exchange Rate Risk in Nigeria

Having outlined the development of exchange rate in Nigeria on the immediate preceding pages, this sub-section, therefore, examined the associated exchange rate risk factor. Table 2.9 revealed that movement of exchange rate in Nigeria possesses a risk factor. Exchange rate risk factor (premium) measures the spread or deviation between official exchange rate and the BDC rate or inter-bank rate. The exchange rate premium helps to evaluate the stability in the foreign exchange market of a country. The exchange rate premium is not expected to be above 5% for it to be considered stable (IMF, 2010). From table 2.9, it is obvious that the difference between official exchange rate and BDC has been above 5% since 2004 till date. The difference between official exchange rate and IFEM exceeded 5% except in 2016 and 2017 when CBN moved all demand for FOREX to IFEM. It is possible that this premium is priced in the securities of Nigeria Stock Exchange through portfolio investment. This occurs when exchange rate is overvalued or undervalued due to misalignment between official exchange rate and BDC/IFEM rate. Such disequilibrium influences the behaviour of the investors and stock prices. Also important to mention is thattable 2.9 also showed that the column for DAS does not have any value in the years; 2015, 2016 and 2017. This was due to CBN policy that discontinued operating DAS in February,2015.

2.17.2 Interaction of Stock Market Indices, Exchange Rate and Inflation in Nigeria

Table 2.10 revealed the interaction of exchange rate policies, inflation and stock market indices in Nigeria from 1990 – 2018. The year, 1986, marked the introduction of flexible exchange rate system in Nigeria as proposed by IMF. Since then, various forms of flexible exchange rate had been undertaken.

In 1989 and 1990, CBN implemented IFEM and DAS framework respectively. The two systems were stopped in 1992; and FOREX was deregulated. Exchange rate depreciated to about 9.3% while inflation rose by 37% from 1990 – 1992. However, MCAP and ASI gained value in the same period. When dual exchange rate system was adopted from 1995-1999, exchange rate was N92.2 per US dollar while inflation reduced by 6.6%, MCAP and ASI increased at about 68.1% and 40%.

The DAS policy was implemented in 2002 – 2006, exchange rate depreciated moderately from N120.97 to N128.65 per US dollar within the period. Inflation dropped by about 4% and MCAP rose incredibly from N748.7 billion to N4.164 trillion while ASI moved up from 12137.7 basis point (bp) to 33189.3 bp at the same period. The positive performance of NSE market indices could be attributed to relative moderate exchange rate premium which averaged 9.5% from 2004-2006. However, the implementation of WDAS in 2006 saw exchange rate appreciated and inflation was on the downward trend. The NSE market indices under consideration performed tremendously well, until the global financial crises in 2008. The Implementation of WDAS was unable to remedy depreciation of naira and widening exchange rate risk as the financial meltdown continued. As at 2009, exchange rate premium reached its peak value at 12.7% which was the highest since the implementation of SAP. The WDAS was discarded in 2013, although, naira exchange rate per US dollar lost about 5.7% from its value in 2009. The MCAP and ASI were moderately picking up during the same period. The positive performance of stock market indices could be attributed to stability in the foreign exchange rate risk between 2009 and 2013 which lies between 2 – 5%. Recall, we stated earlier that foreign exchange rate premium that is less than or equal to 5% is said to be stable. Consequently, performance of stock market indices within the period can as well be connected to the gradual increase in the price of oil in international market.

Table 2.10 Stock market indices, inflation and Exchange rate in Nigeria

Years	**Exchange rate (%)**	**CPI %**	**MCAP (N'B)**	**ASI (basis point)**
1990	8.04	7.00	12.16	423.66
1991	9.91	13.00	18.43	671.62
1992	17.30	44.00	26.20	931.02
1993	22.05	57.10	41.83	1229.03
1994	21.89	57.00	61.00	1913.23
1995	21.89	72.80	175.10	3815.12
1996	21.89	29.30	279.83	5955.14
1997	21.89	8.80	276.39	7638.59
1998	21.89	9.90	256.84	5961.88
1999	92.69	6.60	294.51	5264.19
2000	102.11	6.90	466.14	8111.00
2001	111.94	18.80	648.42	10963.10
2002	120.97	12.80	748.78	12137.70
2003	129.36	14.00	1262.89	20128.90
2004	133.50	14.90	1850.51	23844.50
2005	132.15	17.80	2463.36	24085.80
2006	128.65	8.20	4164.14	33189.30
2007	125.83	5.30	9381.30	57990.20
2008	118.57	11.50	6668.54	31450.80
2009	148.88	11.50	4957.19	20827.20
2010	150.30	13.70	7862.89	24770.50
2011	153.86	10.80	6353.94	20730.60
2012	157.50	12.20	8700.85	28078.80
2013	157.31	8.40	12608.90	41329.20
2014	158.55	8.00	10675.93	34657.20
2015	192.44	9.00	9367.88	27245.48
2016	253.49	15.60	10165.33	29812.79
2017	305.79	16.50	11452.17	33117.48

Sources: CBN statistical bulletin and NSE FACTBOOK (various issue)

In February 2015, the CBN designated IFEM as the only platform or window for foreign exchange transaction in Nigeria. The aim of the policy is to reduce the differential (premium) between official exchange and BDC. From table 2.9, the premium between official rate and BDC in 2015, 2016 and 2017 stood at N207.7, N119.3 and N89.6 respectively. This revealed huge presence of exchange rate risk in the country, though it was on a downward trend from its value in 2015 to 2017. Table 2.10 revealed that naira depreciated by about 58.9% from 2015 – 2017 while growth rate of inflation was about 7.5% within the period. Capital market indices under consideration performed positively little above 20% at the same time.

It is evident from the discussion that foreign exchange risk is present in Nigeria and it is expected to explain partly the behaviour of securities pricing in the NSE. It can be deduced that FOREX premium could be priced in the assets of the NSE. Hence, it is important to empirically control for the effect of foreign exchange risk on stock returns while examining the relationship between oil price risk and stock market returns.

2.18 Institutional Policy and Stock Market in Nigeria

The Nature of institutional framework and reforms in Nigeria possesses an interesting revelation in understanding the performance of the stock market. Nigeria has had several economic reform initiatives since 1986 Structural Adjustment Programme (SAP). The implementation of SAP policy covered 1986-1993. The programme aimed at restructuring, diversification of the production base of the economy and deregulation especially the foreign exchange and financial market. However, the fundamental challenges in the economy remained relatively unabated after SAP. The economy still experienced massive unemployment, increased inflation and other macroeconomic imbalances.

With the advent of democratically elected presidents since 1999, different governments have implemented several economic reforms and deregulation. The first institutional reform was launched in 1999-2003 which was christened the National Economic Empowerment and Development Strategy (NEEDS). The goals of the NEEDS policy include deregulation, infrastructural development and economic diversification among others. Table 2.10 revealed that Liberalization of foreign exchange coincided with 1999 NEEDS policy. In spite of the increase in inflation witnessed in that period, MCAP rose tremendously from N294.5 billion to N1.26 trillion, accounting for about 328.7% increase. While ASI also moved up by 282.3%. This period marked a turnaround in the activities and indices of stock exchange market. Turnover ratio, number of deals and volume of trade received significant boost in The Exchange[48].

Arising from the NEEDS policy was the financial system reform in 2004-2005, which was majorly anchored on banking reform (recapitalization). The recapitalization exercise required deposit money banks to increase their capital base to N25 billion from N2 billion with CBN within 18 months from the announcement which aimed at promoting strong and efficient financial system. The exercise saw a lot of mergers and acquisition among Nigeria's banks in a bid to meet the dead line. Hence, after the December, 2005, dead line, the number of banks in Nigeria reduced to 25 from 89 prior to the reform. The CBN (2005) revealed that N406.4 billion was raised by banks in the capital market and N350.2 billion (about $3 billion) was attracted as new investment from outside Nigeria as a result of the

[48] See table 2.6

reform. There was also a pension reform policy in 2004. The reform which compelled both employer and employee to contribute equal percentage of money to pension fund, and it generated a lot of funds. According to CBN (2007), these funds have boosted investment in the NSE through pension fund custodian. The MCAP, ASI, volume of trade, number of deals, value traded, turnover ratio, number of listed companies increased by 406.9%, 143.2%, 417.3%,168.6%, 828%, 83% 11.9% respectively from 2004–2007 before the global financial crises began in 2008.

Corporate Governance and Financial Reporting reforms have been undertaken in the NSE by various government regimes over the decades which aimed at improving stock market efficiency. These rules and regulations were majorly bent towards enhancing corporate governance in order to boost investment. Nigeria Stock Exchange adopted international Financial Reporting Standards and as well passed the Financial Reporting Act into law in 2010. There are other specific reforms carried out by the NSE such as introduction of Automated Trading System (ATS), On-line trading, Electronic Initial Public Offer (E-IPO), Remote Trading, E-bonus etc. These reforms deepened stock market development in Nigeria which is evidenced as NSE was ranked one of the best stock market in Africa in 2015.

CHAPTER THREE
THEORETICAL FRAMEWORK AND METHODOLOGY

3.0 Overview

This chapter presents the theoretical framework for the study. In specific, the theoretical exposition between oil price risk and sectoral stock market returns is examined. Following that is the presentation of the empirical model and the estimation procedures applied. In addition, the nature and sources of data for the analysis are presented.

3.1 Theoretical Framework

The underlying theoretical framework for this study hinges on the Arbitrage Pricing Theory (APT), propounded by Ross in 1976. The APT, like other variants of the MPT was built on the concept of mean-variance efficiency. Mean-variance efficiency is an investment strategy where rational investors would always want to maximize returns (mean) and minimizes risk (variance). The fundamental idea behind the APT is the assumption that there is no diversified or idiosyncratic shock, which connotes that each security's return is a function of its exposure to factor generating risks. The theory ruled out the existence of arbitrage opportunities in the capital market, which implies that at equilibrium, the expected returns on assets are linearly related to the factor loadings (Huberman and Wang, 2005). Of course, according to the APT, these factors are pervasive and perhaps, priced at equilibrium in the stock market. These pervasive factors are common factors that impact on all securities and command risk premium. The APT acknowledged that these risk factors which include macroeconomic and environmental factors are systematic and undiversifiable; hence they could not be priced away in the stock market.

The choice of APT is premised on the fact; it is famous at showing how macroeconomic factors such as oil price risk, exchange rate risk, inflation e.t.c., enter into portfolio theory as pervasive factors that explain stock market returns. The APT allows for the nth-macroeconomic (environmental) factor to be incorporated in the risk-return relation, provided the factors possess risk premium to asset returns like oil price risk. This feature makes it the suitable framework to provide required explanation to asset returns than other factor models. The efficacy of the APT is that it encompasses basically other variants of Capital Market Equilibrium Theories; hence, it can be augmented[49] or restricted[50] to any other model since it allows for the nth-factor to be included. The APT best describes the Nigeria situation where unprecedented fluctuations in crude oil price resulting from the country's huge dependency on oil revenue possess risk factor which affects investment in the financial market. The model brings to the fore how investors make rational choices by investing in sectors (firms) that possess less risk (less sensitive to crude oil fluctuations or risk) to maximize wealth. This is achieved by calculating company's ordinary share as well as its future returns and compares it with the corresponding risk. This study follows Salisu and Isa (2017), Nusair (2016), Pablo et al. (2014) who employed the Arbitrage Pricing Theory to analyze how stock market returns respond to changes in world oil price in oil exporting and importing countries, GCC countries and Spanish economy respectively. This study differs from theirs by focusing on the asymmetric effect of oil price risk on sectoral stock returns in the Nigeria stock market.

Assume an investor who invested all his funds in the financial market, the rate of return on the security is broken into its expected and unexpected components:

$$R_i(p) = E(R_i) + e_i \qquad (3.1)$$

Where $R_i(p)$ is the actual stochastic rate of returns on security i. $E(R_i)$ represents the expected rate of return on security i, e_i denotes unexpected rate of return; with $E(e_i) = 0$ and $\text{var}(e_i) = \delta_i^2$ (finite). Here the variance measures the deviation of expected return from its actual.

Equation (3.1) shows a simple case where the overall rate of returns of assets is determined by the joint normally distributed returns, resulting in a single-factor security market. For simplicity, equation (3.1) follows CAPM foundation where returns on securities depend

[49] Like in Fama and French three or five factor model
[50] Like in CAPM

solely on one factor generating risk.[51]

Hence, the sources of uncertainty (e_i) from equation (3.1) can be decomposed into: Uncertainty (risk) that affects all firms, which is captured by w and uncertainty that is firm's specific, which is captured by e_i. Let β be the factor sensitivity of each macro factor generating uncertainty (risk) for each security i.

$$R_i(p) = E(R_i) + \beta_i w + e_i \qquad (3.2)$$

Where w captures all the common risk factors that affect asset's return in the whole economy (firms), with zero mean and standard deviation of δ_w. e_i now measures risk factors that are specific to firms. It is important to note that w and e_i are uncorrelated since the former is a common factor that affects all securities irrespective of the firm or sector while the latter is firm's specific risk. We also take cognizance that w does not have subscript because it is a common factor that impact on all securities.

The portfolio variance of the uncorrelated components of the two risks i.e. common (systematic) risk and firm's specific risk factors is expressed as:

$$\delta_i^2 = \beta_i^2 \delta^2 w + \delta^2(e_i) \qquad (3.3)$$

Note that, as the variability in any expected earnings (returns) increases, so the investors desired risk premium. The portfolio is said to be efficient if it commands lowest risk (minimum variability) by providing the highest expected return. The objective function of a given portfolio investor is given by:

MAX: $R(P)$, given $VAR(P)$

MIN: $VAR(P)$, given $R(P)$

Obviously, with the presence of common factor, w, there is likelihood it generates

[51] Although, the expected scenario should be a case where returns on securities depend on infinite number of factor generating risks including macroeconomic and environmental factors.

correlation across all assets since all securities respond to the same factor. However, firm's specific uncertainties represented by ℓ_i are uncorrelated across industries. Consequently, since w is uncorrelated with the firm-specific uncertainties, the covariance between any two securities i and j is given by:

$$Cov(r_i r_j) = Cov(\beta_i w + e_i \beta_j w + e_j) = \beta_i \beta_j \delta^2 w \qquad (3.4)$$

The above analysis is a single factor model which shows a linear relationship between expected returns of securities and a common factor. It may not be difficult to assert that the analysis so far follows CAMP framework. The use of market risk factor as the only systematic factor in predicting the variation on securities return (which is the foundation of CAPM) has been criticized. Therefore, CAPM framework was extended by Ross (1976) under the APT. The APT argued that any systematic factor that impacts on security's return including macroeconomic factors can be incorporated into the APT framework as a risk factor. The theory suggested that returns on securities can be explained by n-factor which he called factor loadings. The APT is a general asset pricing model given that it can be restricted or augmented to take the form of the CAPM or any other factor model. One fundamental tenet of the APT theory is the intuition that there is a linear relationship[52] between securities expected returns and nth-factor generating process.

To represent APT and showing n-factor of systematic risk, we express it thus:

$$R_{it}(p) = E(R_{it}) + \sum_{n=1}^{k} \beta_{in} Q_{nt} + \varepsilon_{it} \qquad (3.5)$$

Where $R_{it}(p)$ = actual rate of return on security i in any given time t. $E(R_{it})$ = expected rate of return on security i at time t. β_{in} measures the sensitivity or magnitude of security i response to nth-common risk factors. Q_{nt} is the mean zero nth- factor common to the returns of all asset under consideration between t-1 and t. ε_{it} denotes the residual risk

[52] The linearity assumption is not as restrictive as it might first appear. Any of the factors can be nonlinear function of a variable. It could be a variable squared, the log of a variable or any other nonlinear transformation that seems appropriate.

(asset specific risk) specific to security i between time t-1 and t which has a zero means, finite variance and identically and independently distributed across securities. The presence of the idiosyncratic risk (ε_{it}) makes the model more general and realistic. $\sum_{n=1}^{k}$ is the summation symbol for all nth factors.

There are three basic tenets of the APT that underpins return generating process of the framework. They are:

(i) There is linear relationship between expected returns of assets and factor loadings and specific risks

(ii) The number of assets (n) is assumed to be much larger than the number of factors i.e. $n \geq \infty$. This implies that the number of securities is larger than the number of return generating factors.

(iii) There is no arbitrage opportunity on asset pricing

The first statement allows for disaggregation of the risk of both individual securities and portfolios into the sum of systematic and unsystematic (idiosyncratic) risk components. The second argument implies that well-diversified portfolios should reduce the amount of idiosyncratic risk of investors. No arbitrage opportunity implies that the expected return of each asset must equal the weighted average of expected return of the k-fundamental securities (Connor and Korajczyk, 1985).

Expanding equation 3.5, taking the weighted value and subtracting the expected value from eqn. 3.5 yields:

$$R_{it}(p) - E(R_{it}) = [\varphi_1 - \varphi_x]\beta_{i1} + [\varphi_2 - \varphi_x]\beta_{i2} + \ldots + [\varphi_k - \varphi_x]\beta_{in} + \varepsilon_{it} \qquad (3.6)$$

Where φ_x measures the expected value of nth common risk factors for sector i

$E(R_{it})$ is the expected rate of return on security i at time t for sector i

Equation (3.6) is reduced to equation (3.7) after subtracting the expected values (φ_X) which is expressed as

$$R_{it}(p) = \beta_{i1}\varphi_1 + \beta_{i2}\varphi_2 + \ldots + \beta_{in}\varphi_k + \varepsilon_{it} \qquad (3.7)$$

Where i = 1, 2, 3, . . . , n

The assumption of no arbitrage opportunity in the capital market; implies that at equilibrium, all portfolios selected from the set of assets under consideration must satisfy the following conditions: (a) using no wealth and (b) having no risk must earn no return on average. This assertion gives credence to the fact that the mean-return on portfolio is simply the weighted average of return on securities, where the weights (Y_i) are the amount invested in those securities (Copeland, et al, 2005). The statement can be stated mathematically as: $\beta_{pn} = \sum Y_i \beta_i$

Which implies that the mean return on a portfolio is the return on sum of the amount invested in those securities

For the APT theory to hold, these conditions must be satisfied in the market so that portfolio with the following characteristics can be formed: the zero change in wealth, which is represented as:

$$\sum_{i=1}^{n} Y_i = 0 \qquad (3.8)$$

$$\sum_{i=1}^{n} Y_i \beta_{in} = 0 \qquad (3.9)$$

$$\sum_{i=1}^{n} Y_i \varepsilon_{it} = 0 \qquad (3.10)$$

Equation (3.8) implies that the vector of security proportions is orthogonal to a vector of ones. This means that the portfolio with zero investment is zero. Equation (3.9) says that the vector of security proportions is orthogonal to the vector of β_{in}; this means that the portfolio that has no risk has no return. While lastly, equation (3.10) states that the idiosyncratic risk approximates to zero since they are specific risk to the firm's securities.

So, when portfolio involves no investment and no risk intuition, it must yield zero expected return by extension (Elton et al. 2003; Copeland et al. 2005; Bodie et al. 2009). Consequently, all the equation (eqn. 3.8 - 3.10) can be summarized as:

$$\sum_{i=1}^{n} Y_i \, E(R_{it}) = 0 \qquad (3.11)$$

Equation (3.11) indicated that if the vector of portfolio proportions is orthogonal to a vector of one or a vector of β_{in}, this implies that the vector of security proportions is orthogonal to the vector of expected returns. But there is a famous theorem in linear algebra that states that; if the fact that a vector is orthogonal to N-1 vectors, it implies that it is orthogonal to the Nth vector, then the Nth vector can be expressed as a linear weighted combination of the N-1 vector (Elton et al., 2003). Following this, the vector of expected returns can be expressed as a linear combination of a vector of ones and a vector of β_{in}.

Hence, the expected value of any security can be expressed as a constant of one, plus a second constant times β_{in}.

$$E(R_{it}) = \beta_{1i}\varphi_1 + \beta_{2i}\varphi_2 + \ldots + \beta_{in}\varphi_n \qquad (3.12)$$

Equation (3.12) is applicable to all securities and all portfolios. The no arbitrage condition of the APT makes it possible not to achieve an infinite rate of return with no capital requirement and no risk. This is the strongest condition or tenet of the APT framework if capital market must be in equilibrium (Elton et al. 2003). It might not be possible to identify all risky asset and factor generating risk to test the APT but it is rational to test it over certain stock index or all stock in particular stock exchange (Elton et al. 2003)

Equation (3.12) is a linear regression equation line with joint and normally distributed vectors of returns and the transformed factors that generate orthogonal vectors. It also has coefficients, β_{in}, that are defined exactly the same way like beta factor in the CAPM.

Therefore, the APT framework is chosen as a preferred theory in this study because of its relative intuition in explaining risk-return relationship such as:

(i) The APT makes no assumptions about the empirical distribution of asset returns
(ii) The APT makes no strong assumptions about the individuals' utility functions
(iii) The APT allows the equilibrium returns of assets to be dependent on many factors, not just one (e.g. beta in CAMP)
(iv) The APT yields a statement about the relative pricing of any subset of assets; hence one need not measure the entire universe of assets in order to test the theory
(v) The APT is easily extended to a multi-period framework
(vi) There is no special role for the portfolio in the APT, unlike the CAPM that requires the market portfolio to be efficient.

Following these points, the choice of anchoring this study on the APT framework is justified, as APT allows us to incorporate in oil price risk and other state variable or control variables into the model unlike CAPM that relies on single factor. The APT model aided the study to show the sensitivity of sectoral stock returns of NSE to asymmetric oil price risk and other stock returns generating risk factors in Nigeria.

In vector notation, the APT framework from equation (3.7) can be expressed as:

$$R_{it}(p) = \beta_i \varphi_{it} + \varepsilon_{it} \qquad (3.13)$$

Where φ_{it} represents vector of common factor loadings that affect assets' return; β_i is a vector that shows the sensitivity of the factor loadings while other variable remain as defined earlier. $E(\varphi_i) = 0;\ E(\varepsilon_i) = 0;\ E(\varphi_i \varepsilon_i) = 0,\ for\ all\ i\ and\ j$

3.2 Model Specification

This study aimed to fully capture the effect of oil price fluctuation risk on the returns of Nigeria stock market in sectoral level. Stock market investor in oil dependent country takes into account the fluctuations in oil prices when making portfolio investment choices. The expected return on equity investment is decreasing in the variance of oil price (systematic risk). To capture the variability of oil price on stock return, we decompose the common risk factor in eqn. (3.13) into oil price risk and other systematic risk in a linear form and show the n-number of sectors in Nigeria, we obtain eqn. (3.14)

$$r_{it} = B_{1i}Q_{it} + \beta_{2i}P_{it} + e_{it} \qquad (3.14)$$

where $r_{it} = R_{it}(p)$ which represents return on asset in sector i at time t, P_{it} refers to oil price fluctuation risk that impact on stock returns in all sectors while $\beta_{i's}$ represents coefficient that measures risk factors including oil price fluctuation on asset returns in different sectors. Q_i is a vector that captures all states variables like exchange rate risk, stock market liquidity, global market risk and lag of stock returns under consideration in this study.

Instructively, it was earlier stated that oil price reacts either positively or negatively to events in the economy that causes oil price to change. Consequently, stock market behaves to positive news differently from negative news. Therefore, if oil price affects stock prices, it is expected that stock prices will react differently to positive oil price change (positive news) from negative oil price changes (negative news). This is where asymmetric comes in. Hence, the study partitioned oil price into positive and negative oil price change to account for such behaviour as shown in eqn. (3.15)

$$P_t = Po + P_t^{+} + P_t^{-} \qquad (3.15)$$

Where p_o is the initial value, p_t^{+} *and* p_t^{-} represent the partial sum processes of positive and negative oil price changes. Therefore, infusing eqn. (3.15) into eqn. (3.14), oil price systematic risk yield Eqn. (3.16) which involves oil price asymmetries.

$$r_{it} = \beta_{1i}Q_{it} + \beta_{2i}{}^{+}P_t^{+} + \beta_{2i}{}^{+}P_t^{-} + e_{it} \qquad (3.16)$$

Where $\beta_{2i}{}^{+}P_t^{+}$ and $\beta_{2i}{}^{-}P_t^{-}$ represent positive and negative oil price change respectively with their beta coefficients that measure respective oil price risks. Other variables remain as defined earlier. Eqn. (3.16) shows an asymmetric representation of oil price-stock returns nexus and it allows for short-run and long-run nonlinearity being introduced via positive and negative partial sums of oil price. Another advantage of using asymmetric in such analysis include that both the dependent and independent variables can be introduced in the model with lags. Given the presence of asymmetries established in eqn. (3.16), the study used the NARDL methodology of Shin et al. (2014) which is the appropriate econometric method that captures asymmetries.

However, to deal with the existence of asymmetries in oil price-stock returns relation using the NARDL, it is essential to commence the specification with the ARDL framework. The rationale for starting with the ARDL stems from the fact that Nonlinear ARDL is an asymmetric expansion of the linear the ARDL model of Pesaran et al. (2011). Equation (3.14) is transformed into symmetric panel ARDL of pesaran et al. (2011) as shown in Eqn. (3.17).

$$\Delta r_{it} = \alpha_{0i} + \sum_{j=1}^{q} w_{ij}\,\Delta Q_{it-j} + \sum_{j=0}^{k} \psi_{ij}\,\Delta p_{t-j} + \varepsilon_{it} \qquad (3.17)$$

where industry’s stock returns depend on the lag of nth common factors that affect sectoral (market) stock returns and prior changes in oil price distortions respectively. **Δ** is the logarithmic notation.

Δr_{it} denotes log of sectoral (industry) stock returns index over a period of time. p_t represents log of Brent oil price at period t. $\sum_{j=1}^{q} \Delta Q_{it-j}$ refers to sum of vector of the common risk factor in log form other than oil price risk across sectors at time t, which includes lag of stock returns in the NSE. $\sum_{j=0}^{k} \Delta p_{t-j}$ implies lag sum of oil price risk in logarithmic form. ε_{it} is the error term of the sample unit over a period of time. w_{ij} *and* ψ_{ij} are short run coefficients (same as betas in eqn. 3.14) of other systematic factors and oil price for individual sectors.

Instructively, Q_{it} is a vector that comprises lag of stock returns and other control variables used in the study. Since we are dealing with autoregressive model (a model where the lag of dependent variable is introduced into the model as one of the regressors), we factored out prior returns on stocks from the vector-variable in eqn. 3.17 which yields eqn. 3.18

$$\Delta r_{it} = \alpha_{0i} + \sum_{j=1}^{q} w_{ij}\, \Delta Q_{it-j} + \sum_{j=1}^{z} \delta_{ij}\, \Delta r_{it-j} + \sum_{j=0}^{k} \psi_{ij}\, \Delta p_{t-j} + \varepsilon_{it} \qquad (3.18)$$

Where $\sum_{j=1}^{z} \Delta r_{it-j}$ = summation of lag of stock returns in various sectors over time. δ_{ij} measures the sensitivity of the risk associated with lag of stock returns in each sector to actual sectoral stock return. Definition of other variables remain the same as in eqn. 3.17

Therefore, the symmetric response of stock returns to oil price changes in ARDL framework by expanding eqn. (3.18) and factoring out lag of stock returns is presented as:

$$\Delta r_{it} = \alpha_{0i} + \alpha_{1i} Q_{it-1} + \beta_{1i} r_{it-1} + \alpha_{2i}\, p_{t-1} + \sum_{j=1}^{k1} w_{ij}\, \Delta Q_{it-j} + \sum_{j=1}^{k3} \delta_{ij}\, \Delta r_{it-j} + \sum_{j=0}^{k2} \psi_{ij}\, \Delta p_{t-j} + \mu_i + \varepsilon_{it} \qquad (3.19)$$

Where i = 1, 2, …, k; t = 1, 2, …, T

But for convenience, lag of stock returns $\left(r_{it-j}\right)$ will be henceforth infused into the vector-variable $\left(Q_{it-j}\right)$. Therefore, eqn. 3.19 is rewritten as eqn. 3.20

$$\Delta r_{it} = \alpha_{0i} + \alpha_{1i} Q_{it-1} + \alpha_{2i}\, p_{t-1} + \sum_{j=1}^{k1} w_{ij}\, \Delta Q_{it-j} + \sum_{j=0}^{k2} \psi_{ij}\, \Delta p_{t-j} + \mu_i + \varepsilon_{it} \qquad (3.20)$$

Where the definition of the variables remain same. The slope coefficients for each cross section in the long run is computed as α_{2i}/α_{1i}. k_1 *and* k_2 are the optimal lag length for the dependent variables for individual sectors which will be selected with Akaike Information Criterion (AIC) and Schwarz Information Criterion (SIC).

Pesaran et al. (2011) showed that the conditional error correction term (ECM) which is a short run model can be expressed using equation (3.20). Therefore equation (3.21) becomes the re-specified model of eqn. (3.20) and aims at capturing the short run model involving the ECM.

$$\Delta r_{it} = \phi_i u_{it-1} + \sum_{j=1}^{k1} w_{ij} \Delta Q_{it-j} + \sum_{j=0}^{k2} \psi_{ij} \Delta p_{t-j} + \mu_i + \varepsilon_{it} \qquad (3.21)$$

Where $u_{it-1} = r_{it-1} - Z_{0i} - Z_{1i} Q_{t-1} - Z_{2i}\, p_{t-1}$ and implies error correction term in the respective sector. whereas ϕ_i denotes speed of adjustment that enable the unit to revert to their respective equilibrium in the presence of fluctuation. Z_{0i} *and* Z_{1i} are the results of $-\frac{\alpha_{0i}}{\alpha_{1i}}$ *and* $-\frac{\alpha_{2i}}{\alpha_{1i}}$ respectively.

It is obvious that the analysis in equation (3.20) and (3.21) deal with symmetric model because there is no decomposition of oil price in the equations. Hence, the analysis so far is a linear ARDL. However, to pursue nonlinear form of the analysis, the study followed the NARDL of Shin et al. (2014), which comprises asymmetric long run regression. The Shin et al. (2014) model has the desirable attributes that it is linear in parameters. It can as well accommodate combinations of persistent and stationary variables in a coherent manner. Asymmetric in this context implies that stock market prices in Nigeria respond differently following an increase in the price of world crude oil price from equivalent decrease in the oil price. Moreover, asymmetry is expected to be more pronounced on firm’s level stock returns due to expected effect of the oil price fluctuation risk on the future cash flow of the respective company or sector. This may partly explain why some studies found that oil price changes have positive impact on stock returns of sectors that are oil consumers and negative effect for oil related sectors. (see: Gugliemo et al., 2014; Bouri et al., 2016; Jimenez-Rodriguez and Sanchez, 2005 and Bjørnland, 2009).

Therefore considering eqn. (3.16) and following equation (3.20), the nonlinear version of the model is expressed as:

$$\Delta r_{it} = \alpha_{1i} Q_{it-1} + \alpha_{2i}^{+} p_{t-1}^{+} + \alpha^{-}_{2i} p^{-}_{t-1} + \sum_{j=1}^{m} w_{ij} \Delta Q_{it-j} + \sum_{j=0}^{n} \left(\psi^{+}_{ij} \Delta p^{+}_{t-j} + \psi^{-}_{ij} \Delta p^{-}_{t-j} \right) + \mu_i + \varepsilon_{it}$$

(3.22)

However, from equation (3.22), the asymmetric long run regression is expressed as:

$$\Delta r_{it} = \alpha_{2i}^{+} p_{t-1}^{+} + \alpha^{-}_{2i} p^{-}_{t-1} + \varepsilon_{it} \qquad (3.23)$$

Where r_{it} is a scalar I(1) variable. α^{+}_{2i} *and* α^{-}_{2i} are the associated long run coefficients. The long run coefficients of p_t^{+} *and* p_t^{-} are computed as $-\frac{\alpha^{+}_{2i}}{\alpha_{1i}}$ *and* $-\frac{\alpha^{-}_{2i}}{\alpha_{1i}}$ respectively. ε_{it} denotes error term with zero mean and finite variance. p_t is a k X 1 vector of regressors such that $p_t = p_0 + p_t^{+} + p_t^{-}$ where p_0, p_t^{+} and p_t^{-} are same as defined above.

Following Shin et al. (2014), the $p_t^{+} + p_t^{-}$ (oil price fluctuations risk) are computed as positive and negative partial sum decompositions respectively in p_t which is defined as:

$$p_t^{+} = \sum_{j=1}^{t} \Delta p_{ij}^{+} = \sum_{j=1}^{t} MAX\left(\Delta p_{ij},\ 0 \right) \qquad (3.24)$$

$$p_t^{-} = \sum_{j=1}^{t} \Delta p_{ij}^{-} = \sum_{j=1}^{t} MIN\left(\Delta p_{ij},\ 0 \right) \qquad (3.25)$$

Shin et al. assumes a simple case in which p_t is decomposed into p_t^{+} and p_t^{-} around a single threshold value of zero, which allows distinguishing between positive and negative changes in p_t and aid interpretation. However, this assumption of zero threshold value is meaningful only if the growth rates in p_t is not predominantly positive or negative. Obviously, the assumption is supported in our sample of sectors as the study found that the growth rate in p_t are not predominantly positive or negative.[53]

[53] In fact, the study finds that decomposing the Brent spot price in this way results in an approximate 60:40 split of observations in favor of the positive regime

The NARDL (m, n)-in-levels, embedding eqn. (3.23) is expressed as:

$$\Delta r_{it} = \sum_{j=1}^{m} w_{ij}\,\Delta Q_{it-j} + \sum_{j=0}^{n}\left(\psi^{+}_{ij}\,\Delta p^{+}_{t-j} + \psi^{-}_{ij}\,\Delta p^{-}_{t-j}\right) + \nu_i + \varepsilon_{it} \tag{3.26}$$

To account for the Error correction term in a nonlinear form, equation (3.26) is rewritten as

$$\Delta r_{it} = \alpha_{it}\pi_{it-1} + \sum_{j=1}^{m} w_{ij}\,\Delta Q_{it-j} + \sum_{j=0}^{n}\left(\psi^{+}_{ij}\,\Delta p^{+}_{t-j} + \psi^{-}_{ij}\,\Delta p^{-}_{t-j}\right) + \nu_i + \varepsilon_{it} \tag{3.27}$$

Where $\pi_{it-1} = \beta_{1i} Q_{it-1} + \beta_{2i}^{+} p_{t-1}^{+} + \beta_{2i}^{-} p^{-}_{t-1}$ denotes nonlinear error correction term and

$\beta_{2i}^{+} = -\dfrac{\alpha_{2i}^{+}}{\pi_{it}}$ *and* $\beta_{2i}^{-} = -\dfrac{\alpha^{-}_{2i}}{\pi_{it}}$ are associated long run parameters.

$$\pi = \sum_{j=1}^{k} \alpha_{2i\,j-1};\, w_{ij} = \sum_{i=j+1}^{m} \alpha_{2i} \quad for\ j=1,\ldots,k-1; \alpha_{2i}^{+} = \sum_{j=0}^{n1} \alpha^{+}_{2i\,j};\ \alpha_{2i}^{-} = \sum_{j=0}^{n2} \alpha^{-}_{2i\,j};$$

ψ_{ij}^{+} *and* ψ_{ij}^{-} capture short run adjustment to positive and negative oil price changes respectively.

The NARDL model for estimation is presented as:

$$\Delta r_{it} = \alpha_{0i} + \alpha_{1i} Q_{it-1} + \alpha_{2i}^{+} p_{t-1}^{+} + \alpha^{-}_{2i} p^{-}_{t-1} + \sum_{j=1}^{m} w_{ij}\,\Delta Q_{it-j} + \sum_{j=0}^{n1} \psi_{ij}^{+} \Delta p_{t-1}^{+} + \sum_{j=0}^{n2} \psi_{ij}^{-} \Delta p_{t-1}^{-} + \mu_i + \varepsilon_{it} \tag{3.28}$$

Where α_{0i} is the intercept of the individual sample unit.

To capture the aggregate structure of the reaction of stock returns to oil price risk and other systematic risk considered in this study, we specify equation (3.29)

$$\Delta r_t = \alpha_0 + \alpha_1 Q_{t-1} + \alpha_2^{+} p_{t-1}^{+} + \alpha^{-}_{2} p^{-}_{t-1} + \sum_{j=1}^{m} w_j\,\Delta Q_{t-j} + \sum_{j=0}^{n} (\psi_j^{+} \Delta p_{t-1}^{+} + \sum \psi_{ij}^{-} \Delta p_{t-1}^{-}) + \varepsilon_t \tag{3.29}$$

Equation 3.29 says that Nigeria stock market returns depends on the lag of the risks generated from the composite variable which include exchange rate, market liquidity, world stock market risk, NSE stock returns plus risks from positive and negative oil price fluctuation plus all other unobserved risks.

3.2.1 To test for asymmetric impact of oil price changes on stock returns on sectoral level in Nigeria (Objective 1). We specify eqn. (3.30)

$$\Delta r_{it} = \alpha_{0i} + \alpha_{1i} Q_{it-1} + \alpha_{2i}{}^{+} p_{t-1}{}^{+} + \alpha^{-}{}_{2i} p^{-}{}_{t-1} + \sum_{j=1}^{m} w_{ij} \Delta Q_{it-j} + \sum_{j=0}^{n1} \psi_{ij}{}^{+} \Delta p_{t-1}{}^{+} + \sum_{j=0}^{n2} \psi_{ij}{}^{-} \Delta p_{t-1}{}^{-} + \mu_i + \varepsilon_{it}$$

(3.30)

Equation 3.30 states that returns on sectoral stocks in Nigeria is determined by the summation of lag of composite index which involves: lag of sectoral stock returns, lag of exchange rate risk, lag of market liquidity risk, lag of world stock market risk plus lag of positive and negative oil price risk in each sector. Plus the error term that captures unobserved variables.

This expression $\alpha_{1i} Q_{it-1} + \alpha_{2i}{}^{+} p_{t-1}{}^{+} + \alpha^{-}{}_{2i} p^{-}{}_{t-1}$ captures long run model while

$\sum_{j=1}^{m} w_{ij} \Delta Q_{it-j} + \sum_{j=0}^{n1} \psi_{ij}{}^{+} \Delta p_{t-1}{}^{+} + \sum_{j=0}^{n2} \psi_{ij}{}^{-} \Delta p_{t-1}{}^{-}$ captures short run model

This expression $\alpha_{2i}{}^{+} p_{t-1}{}^{+} + \alpha^{-}{}_{2i} p^{-}{}_{t-1}$ is the long run asymmetry of the model while

$\sum_{j=0}^{n1} \psi_{ij}{}^{+} \Delta p_{t-1}{}^{+} + \sum_{j=0}^{n2} \psi_{ij}{}^{-} \Delta p_{t-1}{}^{-}$ captures short run asymmetry

The model provides useful framework into how different sectors in NSE react to fluctuation in oil price. Following the literature, firms respond differently to external risks like fluctuations in crude oil prices. These responses differ and depend on firm's policies, management, size and corporate structures. The expectation is that if sectors/firms react differently to oil price risk, the result of the study would enable investors to know which sector to diversify/invest in order to hedge their portfolio from oil price risk or distortions.

To test the size effects of oil price risk on firm's stock returns (Objective 2). We present the model below:

$$\Delta r_{it} = \alpha_{0i} + \alpha_{1i} Q_{it-1} + \alpha_{2i}{}^{+} p_{t-1}{}^{+} + \alpha^{-}{}_{2i} p^{-}{}_{t-1} + \sum_{j=1}^{4} \delta_{ij} \Delta Q_{it-j} + \sum_{j=1}^{4} (\gamma_{ij}{}^{+} \Delta p_{t-1}{}^{+} + \gamma_{ij}{}^{-} \Delta p_{t-1}{}^{-}) + \xi_i + \nu_{it}$$

(3.31)

Where r_{it} represents security's return on different quintiles across the firms considered in this study. While other variables remain the same as explained earlier.

Model 3.31 states that stock returns on various quintiles in Nigeria are determined by the lag of exchange rate, lag of stock market liquidity, lag of logarithm of world market risk, lag of logarithm of various quintiles stock returns plus lag of logarithm of positive and negative oil price risk plus error term.

The disaggregation of firms into sizes follows prior studies that argued that the behaviour (response) of small firms is different from large firms. Some of these studies showed that small firms earn higher risk-adjusted returns compared to large firms (Narayan and Sharma, 2011; Broadstock, et al., 2012; Phan, et al., 2014). The distinction is more relevant in Nigeria given a lot of differences in some factors among industries such as economies of scale, resource availability, productivity and market capitalization. These factors are likely to determine their responses to risk factors. This study recognized that industries in NSE are composed of high and low capitalized firms[54]. Some firms have high market capitalization of over N50b such as TOTAL PLC, First Bank of Nigeria Holdings (FBNH) while others have less than N5b, for example Link Assurance PLC. It is imperative to examine if the variance in the market capitalization of these firms matter in pricing risks associated with oil price in their stocks. Hence, asymmetric model of NARDL was constructed which covers the distinction as express in eqn. (3.31).

3.3 Estimation Technique

The choice model for this study is the dynamic heterogeneous panel data model. The suitability of dynamic heterogeneous panel data analysis is made more important given that the series has large individual number of units (N) and number of time period (T). The estimation technique for this study commenced by examining the characteristics of the variables to determine their stationarity. The study employed the panel unit root test in order to determine the order of integration of the variables. The study considered six different types of unit root tests for panel data analysis that were categorized into three groups for robustness. The first three unit root tests in the first group assume unit root with common process. These are Levin, Lin and Chu (2002) test, Breitung (2000) t-test and

[54] GTBANK market capitalization was about N744,130,567,439.50 (N744 .1billion) on the average in the second quarter of 2018 while TRIPPLEG market capitalization stood about N433, 686,528.00 (433.6 million) within the same period

Harris-Tzvalis (2000) panel root test. The second group which made up the fourth and fifth unit root test in this study was the widely used test developed by Im, Pesaran and Shin (2003) and Augmented Dickey Fuller-Fisher test respectively. They assume unit root with individual unit root process. These tests assume heterogeneity between units in a dynamic panel framework, which makes it less restrictive and more robust. The sixth type of the panel root employed in the study is the Hadri-z panel unit root test that assumes no unit root with common unit root process. The different unit root test applied was quite important for this study as it was used to test for robustness and also to test if the various cross-sections in each group are homogeneous or heterogeneous. Once the order of integration of the variables was determined, the existence of cointegration between the variables was examined, using Pedroni's (1999) residual-based panel cointegration test. However, cointegration test may not be important in NARDL framework because NARDL estimates can still be efficient in the presence of cointegration.

Consequently, the study was aware of the possible autocorrelation and endogeneity associated with the introduction of lagged endogenous regresssors in large T, large N long panel and in time series observations. There are two approaches found in the literature in solving this: differencing and instrumental variable (General Method of Moments) and Coefficient averaging (Mean Group and Pool Mean Group) approach. Differencing and instrumental variable approach (GMM) cannot be applied in this study because GMM is best suited in series with large N and small T. In this study, our N and T are large. Another reason while Differencing and instrumental variable (IV) estimator was not applicable in the study is the issue of proliferation of instrument in the analysis as T tends to infinity, which is readily associated with IV. Such sudden increment on the instrument affects the efficiency and consistency of the estimates (see: Blundell and Bond, 1998, 2000). Hence, the study employed coefficient averaging estimator approach (MG and PMG); which is a difference estimator. The efficacy of coefficient averaging lies in its ability to take care of cointegration and endogeneity bias of the lagged regressors intrinsically. This approach allows the intercepts, slope coefficients and error variances to differ across groups which yield consistent estimates. This allows for heterogeneity in the intercepts and trend coefficients across sectors or cross-sections.

Once the existence of cointegration in the series was confirmed, the study examined the long run relationship by constructing the nonlinear ARDL model of Shin et al. (2014) in panel form. The nonlinear ARDL panel will be suitable for such dynamic heterogeneous panel data with large T. The Pooled Mean Group (PMG) estimator and the Mean Group (MG) estimator are two prominent techniques used in the estimation of a dynamic heterogeneous panel model and they were applied in the analysis. The MG estimator is best suited for estimating N time-series regressions and averaging the coefficients, while the PMG estimator would pool and finally average the coefficients (Blackburne and Frank, 2007). Consequently, the analysis applied Hausman test which detect the consistent or efficient estimator between the two estimators. By design, the MG and PMG would generate results for various sectors and the results enabled us to gauge individual sectoral stock market returns response to oil price risk in both symmetric and asymmetric scenarios. Finally, both the long-run and short-run responses of the two categories (MG and PMG) to oil price risk were evaluated.

The dynamic heterogeneous panel data (PMG and MG) estimator was preferred in this study to panel ordinary least squares (POLS) model and panel dynamic ordinary least squares (PDOLS) model adopted by Nusir, (2016) and Phan et al. (2015). It has been argued that POLS and PDOLS estimates may not be 'highly' consistent and its distribution is not usually standard, because they assume away slope heterogeneity among group of firms. The results in disturbances are to be serially correlated as well as contemporaneously correlated with the regressors, thus causing the estimated coefficients to be inconsistent (Pesaran et al., 1996).

To achieve the second objective i.e. testing the size effect of asymmetric oil price risk on firms' returns, the sampled firms were divided into four sizes (groups) based on market capitalization of these firms. The objective was to test the difference among various categories of firms as regards to the asymmetric effects of crude oil prices risk on stock returns of these firms taking cognizance of their sizes.

3.4 Data Description and Sources

The study utilized daily dataset of world oil Brent prices and stock prices of 100 firms across eleven (11) sectors listed on the Nigeria Stock Exchange. The data scope ranged from January, 6th, 2007 to December, 31st, 2017 and the selected sectors are Agriculture, Conglomerates, Construction, Consumer goods, Financial Services, Health, ICT, Industrial Goods, Natural Resources, Oil & Gas and Services. Moreover, to form firm's size, the study used firms' MCAP. It categorized the MCAP of the firms in the study sample into four quartiles which were grouped into low MCAP, middle MCAP, strong MCAP and highly strong MCAP.

Stock returns: Stock return is measured as the average change in stock's price between two successive periods. In the study, daily stock return is used and calculated as the ratio of logarithmic difference in price between two successive closing period. A positive value means that the sector's stock return has grown in value while negative return implies lost in the value of the sector's stock. The data is extracted from Central Securities Clearing System Limited (CSCS) data base of the Nigeria Stock Exchange.

Oil price changes: It measures the average changes in international oil price between successive trading days. It is calculated as the logarithmic difference between two successive days. Oil price data are extracted from US Energy Information Administration (EIA) website. The Brent spot oil prices are used as proxy for international crude oil price in the study. Brent oil price is used because it is usually served as the reference price for other crude oil prices and derivative products in international oil market. It also has a consistent data series relative to Nigeria Bonny light.

Stock market liquidity: This refers to the extent at which stock market allows assets to be bought and sold at stable price. Turnover ratio is a measure of market liquidity. It is computed by dividing the value of stock traded by the market capitalization at the end of a period multiplied by 100. The data are sourced from Cash Craft Asset Management Ltd via http://cashcraft.com/analysis.

Exchange rate: It is measured using a trade weighted exchange rate index which is a weighted average of foreign exchange value of the United States Dollar against Nigeria

Naira, i.e bilateral US-Nigeria exchange rate. The series come from Central Bank of Nigeria data base. http://cbn.org.

Global market risk: The study used STOXX Europe 50 as a measure of world market risk. This is a weighted index that measures the equity market performance of European stock market. values of STOXX Europe 50 were multiplies by each daily corresponding exchange rate in Nigeria. The data is generated from The Wall Street Journal: via www.wsj.com/.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.0 Overview

This chapter is divided into six main sections. Section 4.1 provided the descriptive statistics of the variables. Section 4.2 examined the panel time series properties of the variables. Following this is the presentation and interpretation of the estimated results of the empirical analysis addressing objective one in section 4.3. Section 4.4 presented and discussed empirical robustness of the analysis. The fifth sub-section addressed objective 2 which tested if the size of firms contributes in determining how their stock returns respond to risk factors in NSE. The last section synthesized our empirical results.

4.1 Descriptive and Statistical properties of the variables

Recall that the study focuses on how oil price risk, global stock market risk, domestic market liquidity and exchange rate risk impact sectorals' stock returns in the Nigeria Stock Market. Hence, table 4.1 presents how respective sectoral stock returns responded given the behaviour of independent variables. It reported the characteristics of these variables by considering their respective mean, standard deviation and how the risks associated with exogenous variables correlate with stock returns. It is interesting to note that the mean and standard deviation of the independent variables for all the sectors are the same. This is because the series of the independent variables are the same across panels. Therefore, the focal points in table 4.1 are on mean, standard deviation of stock returns and the correlation of the independent variables with stock returns across sectors.

The summary statistics in Table 4.1 showed that oil and gas sector has the highest mean value (3.43), this was followed by construction sector (3.10). This implies that oil and gas sector recorded the highest returns in NSE; followed by construction sector over the period under consideration. Service sector had the lowest average return over the period at 0.81 after financial sector (0.87). In terms of volatility of the sectorals' stocks, oil and gas industry exhibited the highest volatility with a score of 2.0. Following oil and gas industry in that order are: consumer goods (1.85), financial (1.57) and agricultural sectors. These sectors had the most volatile and unstable stock price during the period under review. On the contrary, the least volatile sector as indicated in table 4.1 are natural resources (0.77), followed by construction (0.80) and ICT (0.81).

Concerning the correlation of the various risks (premiums) to stock returns across sectors, oil price risk showed positive association with stock returns in all the sectors except conglomerates. Amazingly, the correlation is very weak across all sectors. The highest correlation coefficient is 27% recorded by Natural resources. The positive correlation between oil price changes and sectoral stock returns across all the sectors in NSE could suggest the impact of income effect of rising oil price in net oil-exporting countries like Nigeria as espoused in the literature (inter alia: Ramos and Veiga, 2013; Salisu and Isa, 2017). When oil price rises, it is expected to impact positively on national revenue in net oil exporting economies. The rise in national revenue base stimulates government spending. This positively affects consumption, investment and GDP. The increase in investments and economic activities will lead to increase in stock returns as income and investors' confidence rise. Hence, portfolio investors in Nigeria seem to expect bullish economy during hike in international oil price. This affects economic growth and portfolio earnings positively and vice versa. Interestingly, oil price risk recorded the highest correlation of about 27% relative to other independent variable under consideration in the study. This is observed in the natural resource sector. After natural resources, next in line are construction and service sectors which recorded 26% and 22% respectively. While conglomerate showed the lowest correlation among the sectors in absolute term of about 2.4%.

Table 4.1: Descriptive statistics

		Agriculture	Conglomerates	Construction	Consumer Goods	Fin.	Health	ICT	Industrial	Natural Resources	Oil and Gas	Services	Aggregate
lSTKR	Mean	2.23	2.23	3.10	2.59	0.87	1.41	1.62	1.85	1.34	3.43	0.81	1.64
lOP		4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33
lEXR		5.12	5.12	5.12	5.12	5.12	5.12	5.12	5.12	5.12	5.12	5.12	5.12
lGMR		7.90	7.90	7.90	7.90	7.90	7.90	7.90	7.90	7.90	7.90	7.90	7.90
lMKTL		3.45	3.45	3.45	3.45	3.45	3.45	3.45	3.45	3.45	3.45	3.45	3.45
lSTKR	Standard Deviation	1.55	1.47	0.80	1.85	1.57	1.21	0.81	1.40	0.77	2.00	1.11	1.75
Lop		0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36
lEXR		0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28
lGMR		0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
lMKTL		1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16
Lop	Correlation Coefficient With Lstkr	0.19	-0.024	0.26	0.050	0.077	0.19	0.17	0.027	0.27	0.061	0.22	0.079
lEXR		-0.26	0.08	-0.20	-0.035	-0.24	-0.39	-0.31	-0.13	-0.45	-0.16	-0.51	-0.177
Lgmr		-0.08	0.16	0.007	0.052	0.017	-0.10	-0.08	0.014	-0.143	-0.02	-0.11	0.005
Lmktl		0.10	0.005	0.05	0.018	0.068	0.009	0.13	0.069	0.142	0.046	0.12	0.053

Source: Author's computation using stata

Note: lSTKR = log of stock market returns
lOP = log of oil price
lEXR = Exchange rate
Lgmr = log of global/world stock market risk
lMKTL = Domestic stock market liquidity

The relationship between exchange rate risk and sectoral stock returns is negative. This inverse relationship could be attributed to exchange rate policy in Nigeria. Monetary authority in Nigeria keeps changing and adopting different exchange rate policies intermittently which erode investors' confidence. To this extent, there are different exchange rates for different transactions in Nigeria. Such policy somersault affects portfolio investment and ultimately affects stock returns negatively. From table 4.1, exchange rate risk affects the sectors in NSE in the following order: services (51%), natural resources (45%), health (39%), ICT (31%), agriculture (26%), financial (24%), construction (20%), oil and gas (16%), industrial (13%), conglomerates (8%) and consumer goods (3.5%). It can be deduced that the first four sectors in the order of listing are moderately correlated while the rest exhibit weak correlation.

Changes in world market risk showed a weak correlation with all sectoral stock returns. Although, some of the sectors namely: conglomerates, construction, consumer goods and industrial exhibited positive correlation while agriculture, health, ICT, natural resources, services, oil and gas sectors indicated negative correlation. Conglomerates sector showed the highest correlation of about 16% with changes in the world market risk. This relationship between world market risk and conglomerates could be attributed to the growing link between conglomerates firms/industries and international market in Nigeria. This anchors on the fact that most of the industries in conglomerates sector have their headquarters in foreign countries, for example, JOHNHOLT PLC, UACN. There is likelihood that the activities (costs and benefits) of the sister-foreign firms are transmitted to the subsidiaries in another country.

As regards to domestic market liquidity, all the sectors indicated positive correlation. This is expected because if it is easy and less time consuming to convert stocks to money, there will be an improvement in turnover ratio and stock returns. However, the association is weak in all the sectors, but they have the correct sign. Natural resource sector has the highest correlation (14%) in this category, ICT sector comes next with correlation coefficient of 13% while services recorded 12%. Conversely, conglomerates, health, and oil and gas have the lowest correlation in that order with their correlation coefficients standing at 0.5%, 0.9% and 4.6% respectively.

4.2 Panel Unit Root Tests Results

This section commences by considering the dynamic panel unit root properties of the variables under investigation. In long panels, like in this study, stationarity and homogeneity of slope coefficients are assumed away (Pesaran and Smith, 1995). Therefore, it is necessary to consider both the non-stationarity and heterogeneity of variables as it is a concern in long panels. This gives credence for using panel unit root test in examining the non-stationarity and heterogeneous characteristics of the series in long panels as earlier proposed in this study. The study adopted standard approach in analyzing macro panels with large time series (T) observation by subjecting the appropriate variables to panel unit root test. These variables are: log of sectoral stock returns in Nigeria ($lSTR_{it}$), log of Brent crude oil spot as a proxy for changes in oil price (op_{it}), domestic stock exchange market liquidity (MKL), real effective exchange rate (lEXR) and log of global market risk (lGMR) proxy for Dow Jones (DJ) stoxx Europe 50 index.

The study considered three standard panel unit root tests as shown in Table 4.2.1, 4.2.2 and 4.2.3. The first is based on the null hypothesis of Unit root with common process. This unit root test was examined using Levine, Lin and Chu (2002) unit root test; Harris and Tzavalis (1999) unit root test and Breitung (2000) unit root test approach which was reported in Table 4.2.1. The second test rest on the null hypothesis of Unit root with individual unit root process. The study examined this test using Im, Persaean and Shin, (2003) approach and ADF Fisher chi square framework presented in Table 4.2.2. The third tested the null hypothesis of no unit root with common unit root process using Hadri, (2000) framework as shown in Table 4.2.3. The null hypothesis for the test assumes homogeneous non-stationary as against the alternative hypothesis of heterogeneity.

Considering the individual hypothesis and test regressions of these categories: the Null Hypothesis (Ho) for the first test states that there is unit root with common process acrossall sectors under review (i.e. Null hypothesis of no stationarity). Although, since we do not accept Ho at 5% levels of significance, it implies that the series are heterogeneously stationary at various levels of significance as shown in Table 4.2.1. This signifies that there is no unit root with common process among the series across sectors.

Panel Unit Root Test Results

Table 4.2.1: Null Hypothesis: Unit root with common process

Var.	**Panel A: Levin, Lin and Chu.**											
	AGR	CONGL	CONST	CONSM	FIN	HLTH	ICT	IND	NAT	OIL	SER	ALL SECT.
lSTR	-99.55*b	-0.0011*b	-1.344**a	-0.0021*b	-1.97**a	0.0013*b	-82.26*b	-6.183*a	-73.18*b	-0.0012*b	-0.0013*b	-3.31*a
lOP	-68.40*b	-90.25*b	-69.91*b	-0.0017*b	-0.0015*b	0.0012*b	-57.08*b	-0.0011*b	-57.08*b	-90.25*b	-0.0012*b	-0.0035*b
MKL	-49.40*a	-88.47**a	-68.53*a	-0.0017*a	-0.0015*a	0.0010*a	-55.95*a	-0.0011*a	-55.95*a	-88.47*a	-0.0012*a	-0.0034*a
lEXR	-98.96*b	-0.0014*b	-0.0011*b	-0.0027*b	-0.0024*b	0.0017*b	-90.97*b	-0.0018*b	-90.97*b	-0.0014*b	-0.0019*b	-1.89**a
lGMR	-12.04*a	-16.32*a	-12.64*a	-30.97*a	-27.32*a	-19.31*a	-10.32*a	-20.65*a	-10.32*a	-16.32*a	-21.905*a	-63.53*a
Panel B: Breitung t-stat												
lSTR	-3.282*a	-69.16*b	-3.16*a	-2.24**a	-3.867*a	0.996*a	-2.202**a	0.001*b	-1.421***a	-4.255*a	-1.860**a	-5.52*a
lOP	-2.062**a	-2.453*a	-1.90**a	-4.65*a	-4.105*a	0.998*a	-1.551***a	-3.103*a	-1.551**a	-2.453*a	-3.291*a	-9.59*a
MKL	-41.02*a	-79.44*a	-61.53*a	-0.0015*a	-0.0013*a	0.0020*a	-1.628*a	0.001*a	-50.24*a	-79.44*a	-0.0011*a	-0.003*a
lEXR	-2.060**a	-2.574*a	-1.94**a	-4.88*a	-4.308*a	0.995*a	-5.323**a	-3.256*a	-1.628***a	-2.57*a	-3.454*a	-10.04*a
lGMR	-7.805*a	-8.416*a	-6.51*a	-15.96*a	-14.08*a	0.855*a	-50.242*a	-10.64*a	-5.323*a	-8.41*a	-11.292*a	-33.01*a
Panel C: Haris-Tzvalis rho												
lSTR	0.988*a	0.997*a	0.991*a	0.995*a	0.9995*a	-2.052*a	0.984*a	0.995*a	0.987*a	0.995*a	0.997*a	0.995*a
lOP	0.034*b	0.998***a	0.033*b	0.998*a	0.998**a	-2.903***a	0.033*b	0.998**a	0.033*b	0.998***a	0.998**a	0.033*b
MKL	0.004*a	0.002*a	0.002*a	0.002*a	0.002*a	-93.99*a	0.0020*b	0.002*a	0.995*a	0.002*a	0.002*a	0.0021*a
lEXR	0.994*a	0.995*a	0.995*a	0.995*a	0.995*a	-3.046*a	0.995*a	0.995*a	0.855*a	0.995*a	0995*a	0.995*a
lGMR	0.885*a	0.855*a	0.885*a	0.885*a	0.855*a	-9.958*a	0.855*a	0.885*a	0.0020*a	0.855*a	0.855*a	0.855*a

Note: *, ** and *** represent significance at the 1%, 5% and 10% levels respectively while a and b imply stationarity at level and first difference respectively,

Table 4.2.2: Null Hypothesis: Unit root with individual unit root process

Var.	Panel A: Im, Persaean and Shin											
	AGR	CONGL	CONST	CONSM	FIN	HLTH	ICT	IND	NAT	OIL	SER	ALL SECT.
lSTR	-5.93*a	-2.506*a	-3.76*a	-5.25*a	-4.317*a	-1.510***a	-5.487*a	-5.166*a	-1.604***a	-4.35*a	-0.0012*b	-11.80*a
Lop	-69.60*b	-0.265*b	-69.46*b	-0.0017*b	-0.0015*b	-0.0011*b	-56.718*b	-0.0011*b	-56.718*b	-89.67*b	-0.0012*b	-0.0035*b
MKL	-63.06*a	-91.16*a	-70.61*a	-0.0017*a	0.0015*a	-0.0011*a	-57.657*a	-0.0012*a	-57.657*a	-91.16*a	-0.0012*a	-0.0035*a
lEXR	-1.96**a	-1.860**a	-1.44***a	-3.529*a	-3.112*a	-2.200**a	-69.314*b	-2.352*a	-69.31*b	-1.86**a	-2.49*a	-7.35*a
lGMR	-25.07*a	-32.40*a	-25.10*a	-61.48*a	-54.22*a	-38.34*a	-20.494*a	-40.98*a	-20.494*a	-32.40*a	-43.47*a	-0.0013*a
Panel B: ADF Fisher Chi-square												
lSTR	-14.07*b	-18.17*b	-14.07*b	-34.47*b	-30.40*b	-21.49*b	-11.491*b	-2.641*a	-11.49*b	-18.17*b	-24.37*b	-70.83*b
lOP	-14.07*b	-18.17*b	-14.07*b	-34.47*b	-30.40*b	-21.49*b	-11.491*b	-22.98*b	-11.49*b	-18.17*b	-24.37*b	-2.019*a
MKL	-13.65*a	-18.17*a	-14.07*a	-34.47*a	-30.40*a	-21.49*a	-11.491*a	-22.98*a	-11.49*a	-18.17*a	-24.37*a	-70.10*a
lEXR	-14.07*b	-18.17*b	-14.07*b	-34.47*b	-30.40*b	-21.49*b	-11.491*b	-22.98*b	-11.49*b	-18.17*b	-24.37*b	-70.83*b
lGMR	-7.054*a	-9.152*a	-7.089*a	-17.36*a	-15.31*a	-1082*a	-5.788*a	-11.57*a	-5.788*a	-9.152*a	-12.27*a	-35.67*a

Note: *, ** and *** represent significance at the 1%, 5% and 10% levels respectively while a and b imply stationarity at level and first difference respectively.

Table 4.2.3: Null Hypothesis: No unit root with common unit root process

Var.	Hadri Z-stat											
	AGR	CONGL	CONST	CONSM	FIN	HLTH	ICT	IND	NAT	OIL	SER	ALL
Lstr	0.00012*a	0.00027*a	0.00014*a	0.00040*a	0.00037*a	0.00029*a	0.00017*a	0.00022*a	0.00013*a	0.00029*a	0.00038*a	.00092*a
Lop	826.56*a	0.00011*a	826.88*a	0.00020*a	0.00018*a	0.00013*a	675.14*a	0.00014*a	675.14*a	0.00011*a	0.00014*a	.00042*a
MKL	1.67**a	-0.106**	-0.082**	-0.201**	-0.177**	-0.125**a	-0.067**a	-0.134**a	-0.067**a	-0.106**a	-0.142**a	-0.177**a
lEXR	0.00022*a	0.00029*a	0.00022*a	0.00055*a	0.00034*a	0.00034*a	0.00018*a	0.00037*a	0.00018*a	0.00022*a	0.00039*a	.00011*a
lGMR	549.60*a	710.39*a	550.26*a	0.00013*a	0.00012*a	840.54*a	449.29*a	898.58*a	449.29*a	710.39*a	953.09*a	.00028*a

Note: *, ** and *** represent significance at the 1%, 5% and 10% levels respectively while a and b imply stationarity at level and first difference respectively

The second test assumes in the Ho that there is unit root with individual process. Given the level of significance at various level exhibited by the series in Table 4.2.2, we do not accept Ho of homogeneous non-stationarity. Therefore, the study concluded that there is no unit root with individual process across the panel under consideration. This implies that the series are heterogeneously stationary. Further, the third of the unit root tests as used in the study assumes in the Ho that there is no unit root with common unit process (There is stationarity). Since we do not accept Ho, it implies that the series exhibit unit root with common unit process across sectors over the period at 5% level of significance.

Table 4.2.1, 4.2.2 and 4.2.3 further showed the behaviour of the series across the eleven sectors in NSE when subjected to unit root test. The tables indicated that all the sectors exhibit mixed order of integration that is not more than one [I(1)] using LLC, Im et al. and Fisher panel unit root test. Consequently, when Breitang panel unit root test was applied across the sectors, all the variables are integrated at level except Conglomerates and Industrial sector. Both have mixed order of integration. Similar outcome is also observed using Haris-Tzvalis panel unit root test. Although, Agriculture, Construction, ICT and Natural Resources showed mixed order of integration while the other sectors exhibited stationarity at level.

Generally, from the observed characteristics of the variables across all sectors when subjected to different unit root tests, it can be inferred that the stationarity status of the series show mixed order of integration that is not more than I(1) which is I(0) and I(1). Hence, this characteristic underscores the choice of NARDL model as the suitable technique for this study. One of the crucial advantages NARDL over other estimation techniques such as VAR, GARCH e.t.c. is its ability to function efficiently in series with mixed other of integration. Moreover, since oil price is decomposed partially into positive and negative oil price movement, it validates the adoption of NARDL as the appropriate estimation framework for the study.

4.3 Empirical Results Presentation

The empirical method adopted as earlier explained is the NARDL model of Shin et al. (2014). In the results discussions, the aggregate and sectoral's estimates obtained are presented for the four variants of the model: models (1A), (1B), (2A) and (2B). Models 1A and 1B are the symmetric (linear) equations while the asymmetric (nonlinear) equations are models 2A and 2B. The study also employed two different estimators in each sector namely: Mean Group (MG) and Pool Mean Group (PMG) estimator. The study applied each of the estimators (MG and PMG) in symmetric and asymmetric equations. Model 1A reported the estimates of the symmetric regression model (Linear model or model without asymmetries) using the MG estimation technique. Model 1B presented the estimates of the symmetric regression (linear model) using the PMG estimation technique. Model 2A showed the results of the asymmetric regression model (nonlinear model or model with asymmetries) using the MG estimation technique. Model 2B reported the estimates of asymmetric regression model using the PMG estimation technique. The rationale for the application of the two estimators in symmetric and asymmetric model is to detect the efficient model between the two estimators.

Instructively, to choose the best estimator between the MG and the PMG, the study applied the Hausman specific test decision rule in each of the sectors. The Hausman test seeks to detect the preferred estimator between MG and PMG technique in the study. We carried out the Hausman test twice in each sector: one for symmetric model (where we choose the efficient model between the MG and the PMG) and secondly, in asymmetric model (where we also choose between the MG and the PMG). The decision rule for the Hausman test is: a non-rejection of the null hypothesis (Ho) is stated against MG; which implies the acceptance of the PMG estimator while the rejection of Ho means that the MG estimator is the efficient estimator. In clear term, if the Hausman test chi-square is significant, you reject Ho, otherwise accept Ho. Once the efficient model is established, the estimator becomes the best estimator and thus, forms major focus of the results interpretations and discussions.

Further, each model (models: 1A, 1B, 2A and 2B) reported the short run and long run results in all the sectors. The upper part of the results presented the short run estimates of the models. While the lower part of the results reported the long run estimates. Note that Ec is the error correction elasticity. The result of Ec showed that oil price changes and stock returns in all the sectors return to the equilibrium in the long run. The conclusion was drawn given the fact that error correction estimates are negatively signed and significant in all the models.

4.3.1 Aggregate market result of oil price-stock returns in Nigeria

The first step is to consider the Hausman test result in both symmetric and asymmetric model in Table 4.3. According to the Hausman test for symmetric model (model 1A and 1B), Ho is rejected, because Hausman test Chi square estimate is significant. Hence, MG (IA) is the efficient estimator in the symmetric regression. Therefore, the study focused attention on interpreting the estimates of model 1A. In model 1A, oil price changes do not show any significant influence on Nigeria Stock returns in the short run. In the long run, oil price variation is inversely related to stock market returns with estimated coefficient of about -0.73%. Using model 1A, the estimates of the other variables of interest are all significant in the long run with the expected sign but exchange rate. The estimate of exchange rate signifies that 1% change in exchange rate leads to about 0.91% drop in stock market returns. According to the link established in the statement of the problem, a priori expectation between exchange rate risk and stock market returns is positive. When exchange rate depreciates, domestic currency loses value; causing too much money in circulation which could ultimately leads to inflation. During inflation period, households and investors are expected to invest in durables and stocks in order to store the value of their wealth. If that is true, it implies that exchange rate depreciation (fall in the value of domestic currency) ought to lead to more investment in the capital market. The increase in investment enhances productivity, profit and ultimately improves stock returns.

World market risk (Igbr) was not significant on the returns of stocks in the NSE in the long run. Market liquidity showed positive relationship as expected with aggregate market return both in the short run and long run. Though, the estimated coefficient of market liquidity is small in magnitude. This can be associated to the relative small value of the observations. Obviously, model (1A) did not give us all the information needed for inferences and policy options regarding the relationship that exist between asymmetric of oil price and stock returns in Nigeria. This is because oil price risk is not divided into positive and negative oil price risk; and model 1A was unable to determine if it was positive or negative oil price change that actually affects stock returns. Asymmetric regressions (2A and 2B) become relevant in explaining that.

As regards to the asymmetric regressions, Hausman Test in Table 4.3 revealed that PMG (model 2B) is the efficient estimator because Hausman test Chi square is not significant; hence, we do not reject Ho. Therefore, the interpretations centered on model 2B. Model 2B showed that all the variables under consideration are significant in both the short run and long run except market liquidity. The asymmetric responses of aggregate stock returns to oil price variation in both short run and long run are remarkable. In the short run, positive oil price change is inversely related to stock return which is contrary to apriori expectation and empirical findings by Masil et al. (2011). This is plausible given the fact that during initial upward price movement, investors may not be in a hurry to invest in stocks as a result of increase in household income. They would want to monitor the movement of oil as to determine if the changes are transitory or permanent. Then, in the long run, when they have adjusted and determine the policy and dynamics of the upward movement, they are likely to invest more on stock as income keeps rising.

Table 4.3: Aggregate stock returns-oil price relation

VARIABLES	SYMMETRIC MODELS Model(1A) mg_symmetric	Model(1B) pmg_symmetric	ASYMMETRIC MODELS Model(2A) mg_asymmetric	Model(2B) pmg_asymmetric
Short run estimates				
Ec	-0.0286*	-0.00904**	-0.0125***	-0.00835***
	(0.0157)	(0.00201)	(0.00231)	(0.00136)
D.lop	-0.00217	0.0142		
	(0.0163)	(0.0171)		
D.lexr	-0.0189**	-0.0222**	-0.0157**	-0.0194***
	(0.00412)	(0.00409)	(0.00401)	(0.00396)
D.lgbr	0.0116*	0.0118*	0.0112*	0.0115**
	(0.00666)	(0.00657)	(0.00654)	(0.00643)
D.mktl	3.49e-07**	-2.45e-07***	-3.16e-07***	-7.81e-08
	(9.07e-08)	(9.20e-08)	(9.06e-08)	(7.58e-08)
D.r_{it-1}	0.1335	0.6662	0.9582*	0.0381
	(0.2568)	(-0.1229)	(0.1906)	(1.0243)
D.lop_p			-0.0999**	-0.114***
			(0.0169)	(0.0134)
D.lop_n			-0.0707**	-0.104**
			(0.0159)	(0.0212)
Long run estimates				
Lop	-0.733**	0.0213		
	(0.0383)	(0.0638)		
Lexr	-0.911**	-1.004***	-2.540	-0.828***
	(0.0309)	(0.0898)	(1.593)	(0.0671)
Lgbr	-0.105	0.799**	2.044	-0.457***
	(0.357)	(0.0106)	(2.070)	(0.102)
Mktl	0.000134**	5.46e-05	-0.000233	4.15e-05
	(4.74e-05)	(3.99e-05)	(0.000339)	(3.78e-05)
r_{it-1}	0.430	1.092	0.8201	2.0223
	(0.242)	(0.0910)	(0.1122)	(0.1287)
lop_p			4.769	5.131**
			(5.610)	(0.043)
lop_n			4.186	-25.46**
			(31.99)	(0.031)
Constant	0.0414**	-0.00142	0.0352**	0.0197***
	(0.0163)	(0.00359)	(0.0193)	(0.00295)
Hausman test	**symmetric**		**Asymmetric**	
$\ddot{X}_n^2$	11.44		13.48	
p-value	0.0096		0.191	
Observations	117,467	117,467	117,370	117,370

p-values are in parentheses; *** p<0.01, ** p<0.05, * p<0.10
Where MG = Mean group estimator and PMG = Pool mean group estimator

But, in the long run, hike in oil price indicated positive relation with stock returns which showed that one percent increase in oil price gives rise to about 5.13% increase in stock market return. But for negative oil price change, there is a positive relationship between the two variables in the short run as indicated in model 2B. A percentage decrease in oil price leads to about 0.10% drop in stock prices in short run. This is supported by literature that stock price responds to negative news quickly than positive news (Narayan and Gupta, 2014). This is evidenced considering the coefficients of short run model in equation 2B. As negative oil price change intensified, the negative effect on stock prices deepened. This is buttressed by the magnitude of the coefficient of long run negative oil price fluctuation which stands at -25.46%. Here, a percentage drop in oil price depressed stock market returns by about 25.46%. Generally, the results indicated that stock returns in Nigeria exhibited oil price asymmetry in both short run and long run. The stock market responded more to negative oil price variation (25.46%) than positive oil price change in the long run (5.13%).

Exchange rate showed inverse relationship with stock prices in both short and long run as revealed by model 2B in Table 4.3. The magnitude of the impact of exchange rate to stock market returns deepened as exchange rate variation intensified in the long run (-0.82). If global market risk changes by 1%, stock prices on the average will change by about 0.011% in the short run but wrongly signed. The wrong negative sign could be as a result of lag in the adjustment in the associated risk from overseas market to developing country's market. For example, during global financial crises in 2008, which allegedly originated from developed markets, experience showed that it did not instantaneously trickle down to developing country's market. As global risk deepened, domestic stock market began to feel the impact. This is evidenced in the study as long run global market risk showed inverse relation with higher magnitude (-0.45%). Meaning that 1% change in the world stock market risk causes stock market returns in Nigeria to drop by 0.45% on the average daily.

4.3.2 Agricultural sector stock return-oil price change relation

The Hausman test for the symmetrical regression on Agricultural sector indicated that PMG is the efficient model as contained in Table 4.4. Hence, the focus was on interpreting the coefficients of PMG, which is model (1B). However, in the symmetric models (model 1A and 1B), MG and PMG estimators for the sector showed that oil price elasticity was insignificant and negatively related to stock returns in the short run. Turning to model (1B, the efficient model), oil price fluctuation and Agricultural stock returns in NSE showed negative relationship but insignificant in the short run. The opposite is true in the long run but still insignificant. This could be attributed to weak connection between oil price and Agricultural sector. Consequently, among the other variables of interest, it is only exchange rate that is significant (0.66%) but wrongly signed in the long run.

Table 4.4: Agricultural sector stock return-oil price change relation

VARIABLES	SYMMETRIC MODELS model(1A) mg_symmetric	model(1B) pmg_symmetric	ASYMMETRIC MODELS model(2A) mg_asymmetric	model(2B) pmg_asymmetric
Short run estimates				
Ec	-0.0303***	-0.0272***	-0.0303***	-0.0272***
	(0.0213)	(0.0225)	(0.0212)	(0.0225)
D.lop	-0.00504	-0.00183		
	(0.0300)	(0.0297)		
D.lexr	-0.0140	-0.0141	-0.0102	-0.0125
	(0.0146)	(0.0104)	(0.0178)	(0.0116)
D.lgbr	-0.00694***	-0.00341	-0.00696***	-0.00360
	(0.00198)	(0.00273)	(0.00129)	(0.00315)
D.mktl	-1.04e-07	1.29e-05	1.05e-06	1.32e-05
	(3.63e-07)	(1.34e-05)	(7.83e-07)	(1.35e-05)
D.r_{it-1}	-0.058	0.0057	-3.219	-1.0044
	(0.113)*	(0.00081)	(0.0005)	(0.0041)
D.lop_p			0.0505	0.0258
			(0.0442)	(0.0604)
D.lop_n			-0.0142	0.00476
			(0.0695)	(0.0893)
Long run estimates				
Lop	0.390**	0.154		
	(0.0156)	(0.131)		
Lexr	0.552	0.669***	0.265	0.550***
	(1.041)	(0.0194)	(0.987)	(0.0151)
Lgbr	1.219**	0.215	0.0399**	0.0231
	(0.569)	(0.221)	(0.0547)	(0.221)
Mktl	0.000280	4.50e-06	0.000245	-3.58e-05
	(0.000416)	(0.000653)	(0.000380)	(0.000646)
r_{it-1}	0.0073	0.9311	2.0833	0.5088
	(0.184)	(0.28620)	(0.06202)	(0.00990)
lop_p			-8.254**	-1.849
			(0.0199)	(2.307)
lop_n			6.257**	1.614
			(0.06837)	(2.323)
Constant	-0.125***	-0.0711*	-0.0745***	-0.0384**
	(0.0123)	(0.0505)	(0.0221)	(0.0236)
Hausman Test	**Symmetric**		**Asymmetric**	
$\ddot{X}_n^2$	1.02		1.26	
p-value	(0.9063)		(0.9391)	
Observations	7,704	7,704	7,701	7,701

P-values are in parentheses, *** p<0.01, ** p<0.05, * p<0.

As regards to the asymmetric models (model 2A and 2B), Hausman test revealed that PMG estimator (model 2B) is the preferred model. Since Hausman test X^2 is not significant considering its p-value, then, Null Hypothesis (Ho) was not rejected. This implies that the coefficients of the models are heterogeneous. Although, as clearly shown in model (2A), MG coefficients are significant both in positive and negative oil price change (-8.25 for P^{+} [55]and 6.25 for n^{-} [56] respectively) in the long run: Although, model (2A) is not an efficient one. Estimates from model (2B) reported no relationship between oil price fluctuation and Agricultural stock returns in both the short run and long run. In terms of sign, it is wrongly signed for the both short run and long run in negative oil price risk. For the positive oil price risk, the short run coefficient (0.03) is positive but not significant. Although, it is expected that increase in oil price would cause stock returns of oil exporting countries like Nigeria to rise and vice versa, (see: Salisu and Isa, 2017). However, this conclusion is not obtainable in Agricultural stock returns in Nigeria both in the symmetric and asymmetric models. This may not be unconnected to lack of linkage between Agriculture and stock market in Nigeria. Moreover, returns from Agricultural sectoral stocks did not exhibit asymmetries to oil price changes given the results obtained.

[55] Positive oil price change
[56] Negative oil price change

4.3.3 Conglomerate sector stock return-oil price relation

Critical inspection of the symmetric models in Table 4.5 showed that PMG (model 1B) is the true model with recourse to Hausman test. From model 1B, oil price risk did not exert any influence on conglomerates stock returns in the short and long run. This outcome gives credence to the fact that one of the objectives of forming conglomerates is to help firms offset temporary losses or risks in some of its subsidiaries, with the gain accrue from other or bigger companies in other geographical areas. Hence, it is presumed that during oil price changes; conglomerates companies quoted in the NSE tend to internalize risks associated with oil price fluctuation. This internalization of risks could be achieved through coordination, production, financing and management activities of the companies. For example, cases abound where conglomerates use its firm's profit located in one geographical region to offset bills in other regions.

Global stock market risks (D.Igbr) and domestic stock market liquidity (D.mktl) are significant in the short run. If the world stock market risk worsened by 1%, conglomerates stock returns drop about 0.04% in the short run. Market liquidity is wrongly signed in the short run, though significant. An improvement in the stock market liquidity by one unit causes the sector's stocks to drop by 0.0000020% daily in the short run. In the long run, other variables of interest are not significant except exchange rate. A percentage change in exchange rate leads to about 1.29% drop in conglomerate stock returns. The inverse relationship between the two variables (exchange rate and conglomerates stock return) is because most of these companies are internationally affiliated. When exchange rate appreciates, foreign products become cheaper, sales, productivity increases in domestic market, more profit and returns are experienced in the stocks.

Table 4.5: Conglomerate sector stock return-oil price change relation

VARIABLES	SYMMETRIC MODELS		ASYMMETRIC MODELS	
	Model(1A) MG_symmetric	Model(1B) PMG_symmetric	Model(2A) MG_asymmetric	Model(2B) PMG_asymmetric
Short run model				
Ec	-0.0101***	-0.00731***	-0.0103***	-0.00358***
	(0.00305)	(0.00258)	(0.00183)	(0.00127)
D.lop	0.221	0.218		
	(0.196)	(0.196)		
D.lexr	0.00379	-0.00193	0.0105	0.00145
	(0.0197)	(0.0175)	(0.0193)	(0.0186)
D.lgbr	-0.0442**	-0.0438**	-0.0261	-0.0258
	(0.0216)	(0.0212)	(0.0327)	(0.0331)
D.mktl	-4.51e-07***	-2.04e-07**	-1.46e-07	3.64e-07***
	(1.66e-07)	(1.20e-07)	(2.86e-07)	(1.06e-07)
D.r_{it-1}	-0.8226	1.9220	0.0062	2.051
	(0.1251)	(0.1661)	(0.1752)	(0.1439)
D.lop_p			-0.105**	0.0969**
			(0.0469)	(0.0455)
D.lop_n			-0.0394	-0.0781
			(0.0650)	(0.0696)
Longrun model				
Lop	-0.242	0.199		
	(0.284)	(0.212)		
Lexr	-1.179	-1.295**	-1.864*	-0.787**
	(1.475)	(0.0307)	(0.0631)	(0.0346)
Lgbr	-0.383	0.0831	-0.305	-0.0182
	(0.396)	(0.355)	(0.402)	(0.540)
Mktl	6.98e-05	6.65e-05	2.96e-05	-8.82e-05
	(6.24e-05)	(0.000136)	(8.33e-05)	(0.000204)
r_{it-1}	0.7380	-3.0822	0.4911	-6.2008
	(-0.0066)	(0.0982)	(0.1081)	().0271
lop_p			36.53	5.97**
			(23.82)	(0.052)
lop_n			46.17	9.39**
			(35.77)	(0.027)
Constant	0.147**	0.0527**	0.140***	0.0275**
	(0.0576)	(0.0215)	(0.0446)	(0.0125)
Hausman Test	**Symmetric**		**Asymmetric**	
$\ddot{X}_n^2$	6.08		4.01	
p-value	0.1936		0.4050	
Observations	12,845	12,845	12,840	12,840

P-values are in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Turning to asymmetric models (model 2A and 2B), the Ho is not rejected which implies that the PMG is the efficient estimator given the Hausman test results. Oil price is asymmetrically significant in the long run and also in the short run for positive oil price change. One % rise in price results in about 0.10% rise in returns of conglomerates sector daily in the short run. While a percentage decrease in the price of oil reduces the sectoral's stock returns by about 0.08% though not significant. In the long run, oil price increase exert more influence positively on the conglomerates stock returns by about 5.97% while negative oil price change affect the sectoral's stock returns by about 9.39% but wrongly signed. From the results, the study deduced that positive oil price fluctuation exert more influence on conglomerates stock return than negative oil price change. This could be because of our earlier position about the ability of the sector to internalize risks. Generally, the sector responds asymmetrically to oil price changes. Furthermore, other variables of interest like market liquidity are significant and positively related to conglomerates stock returns but with a mild impact in the short run but the effect disappeared in the long run. Exchange rate has a wrong sign just as in model 1B. Table 5.5 revealed that global market risk does not impact on the sectoral's stock in both the short run and long run.

4.3.4 Construction sector stock return-oil price relation

The results in Table 4.6 indicated that the symmetric models (model 1A and 1B) showed statistically significant estimates both in the long run and short run but wrongly signed in the short run. The Hausman test statistics showed that the PMG estimator (model 1B) is the more efficient model. In the short run, oil price changes is positively related to stock returns in the sector but not significant. However, in the long run, oil price changes and the sector's stock returns are significant and positively related. Specifically, a percentage rise in oil price resulted to 0.20% increment in the returns of construction sector's securities. Other variables of interest (exr, gbr, r_{it-1} and mktl) are not statistically significant in the long run except exchange rate but with negative sign (-2.267).

Table 4.6: Construction sector stock return-oil price change relation

VARIABLES	SYMMETRIC	MODELS	ASYMMETRIC	MODELS
	Model(1A) MG_symmetric	Model(1B) PMG_symmetric	Model(2A) MG_asymmetric	Model(2B) PMG_asymmetric
Short run model				
Ec	-0.0376***	-0.0311***	-0.0369**	-0.0305**
	(0.0237)	(0.0268)	(0.0231)	(0.0261)
D.lop	-0.0577**	-0.0554		
	(0.0350)	(0.0371)		
D.lexr	0.0211	0.0201	0.0214	0.0203
	(0.0340)	(0.0538)	(0.0337)	(0.0334)
D.lgbr	-0.00135	0.00311***	-0.00137	0.00278
	(0.00402)	(0.00188)	(0.00398)	(0.00185)
D.mktl	-7.66e-07	-7.28e-07	-8.68e-07	-8.14e-07
	(7.16e-07)	(7.43e-07)	(7.66e-07)	(8.07e-07)
D.r_{it-1}	0.3521	0.685	1.0911	4.2282
	(012054)	(0.1941)	(0.2054)	(0.1900)
D.lop_p			0.0360**	0.0108
			(0.0173)	(0.1417)
D.lop_n			-0.0557	-0.0226
			(0.0409)	(0.0556)
Long run model				
Lop	0.155**	0.205*		
	(0.013)	(0.0775)		
Lexr	-1.266***	-2.264***	-1.375***	0.0203
	(0.014)	(0.000)	(0.010)	(0.0000)
Lgbr	0.662*	-0.0149	0.593**	0.00278
	(0.059)	(0.127)	(0.068)	(0.9363)
Mktl	4.01e-05***	6.11e-05	4.58e-05***	-8.14e-07
	(0.000)	(7.46e-05)	(1.13e-05)	(8.07e-07)
r_{it-1}	5.0546	2.9229	0.7620	0.46226
	(0.258)	(0.20332)	(0.1373)	(0.129)
lop_p			-5.956	-2.939**
			(1.07)	(0.036)
lop_n			7.550**	2.464**
			(0.034)	(0.051)
Constant	0.371	0.415	0.428	0.460
	(0.392)	(0.355)	(0.419)	(0.389)
Hausman test	**symmetric**		**Asymmetric**	
$\ddot{X}_N^2$	3.79		3.78	
p-value	0.4351		0.4360	
Observations	7,704	7,704	7,704	7,701

P-values are in parentheses; *** p<0.01, ** p<0.05, * p<0

For models with asymmetries (model 2A and 2B), Hausman test revealed that the PMG model (model 2B) is relatively the efficient estimator. Considering the estimates of model 2B, in the short run, all the variables under consideration are not significant. But, in the long run, Oil price had significant impact in determining the sector's stock prices. One interesting thing in the result is that both increase and decrease in oil price fluctuation influenced stocks of this sector. However, their expected signs are contradictory to the apriori. Stock returns decreased by about 2.94% if oil price rises by 1% while stock returns increased by about 2.46% when oil price reduced by 1% in the sector. This could be explained from the fact that listed constriction companies in NSE are not being patronized during oil price increase (economic growth) in Nigeria. Government tends to hire foreign construction companies other than those listed in NSE, therefore affecting their productivity, profit and stock returns.

4.3.5 Consumer Goods sector stock returns-oil price relation

According to the Hausman test results in this sector, Ho is not rejected. This implies that the PMG are the true estimator in both the symmetric and asymmetric models (i.e. model 1B and 2B). With model 1B, Table 4.7, it is only exchange rate that was significant but with wrong sign. Depreciation of the exchange rate denotes that the value of the currency has fallen, which worsen inflation rate. During inflationary period, cost of production increases, households prefer investment in stocks and other durables to prevent eroding the value of their wealth. When households invest in stocks, it leads to increase in productivity, dividends, profit and ultimately stock returns. This therefore explained the observed inverse relationship between exchange rate and stock returns in this sector. This implies that households do not invest in consumer sector stocks during exchange rate risk. However, in the long run, exchange has no impact on the sector's stock returns.

Table 4.7: Consumer goods sector stock return-oil price change relation

VARIABLES	SYMMETRIC MODELS Model (1A) Mg_symmetric	 Model (1B) Pmg_symmetric	ASYMMETRIC MODELS Model (2A) Mg_asymmetric	 Model (2B) Pmg_asymmetric
Short run model				
Ec	-0.00999***	-0.00650***	-0.00869***	-0.00556***
	(0.00183)	(0.00137)	(0.00163)	(0.000961)
D.lop	0.00992	0.0115		
	(0.0169)	(0.0165)		
D.lexr	-0.0176***	-0.0181***	-0.0134	-0.0152
	(0.00949)	(0.00949)	(0.00944)	(0.00944)
D.lgbr	-0.00625	-0.00477	-0.0105	-0.00894
	(0.0140)	(0.0142)	(0.0137)	(0.0132)
D.mktl	1.01e-08	1.05e-07	3.19e-08	-5.23e-08
	(1.43e-07)	(1.31e-07)	(1.35e-07)	(1.23e-07)
D.r_{it-1}	2.7002	0.08755	0.0950	1.0082
	(0.08722)	(0.1265)	(1.0069)	(0.13091)
D.lop_p			-0.0370	-0.0383**
			(0.0226)	(0.0177)
D.lop_n			-0.0863***	-0.0837**
			(0.0223)	(0.0220)
Long run model				
Lop	-3.861	0.926***		
	(4.195)	(0.0156)		
Lexr	0.582	0.206	-8.756	-0.0998
	(1.033)	(0.212)	(8.563)	(0.213)
Lgbr	-1.196	-0.101	11.36	-0.0399
	(1.170)	(0.253)	(11.01)	(0.321)
Mktl	0.000293	5.68e-05	-0.00180	6.80e-05**
	(0.000246)	(9.45e-05)	(0.00182)	(0.000117)
r_{it-1}	0.7902	-0.6520	-0.42980	-3.33002
	(1.00549)	(0.12197)	(0.2021)	(0.16007)
lop_p			28.56	1.309***
			(2.001)	(0.0119)
lop_n			-142.3	-39.59**
			(169.1)	(0.0338)
Constant	-0.0203*	-0.00967***	0.0324*	0.0231***
	(0.0306)	(0.00357)	(0.0243)	(0.00418)
Hausman test	**Symmetric**		**Asymmetric**	
$\ddot{X}_N^2$	2.81		4.01	
p-value	0.3268		0.1936	
Observations	46,206	46,206	46,200	46,200

P-values are in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Oil price risk showed no relationship with the sector's stock returns in the short run in model 1B. When oil price risk persists, a percentage change in the oil risk affected consumer good stock returns by about 0.93% in the long run. Closer inspection of column 3 of Table 4.7 indicated that other control variables like global market risk (gbr) and domestic market liquidity (mktl), though rightly signed, do not exert significant impact on stock returns of this sector. This could be attributed to the nature of the firm's product in this sector. The sector's output are majorly consumables and necessities whose consumptions do not depend on these variables. Rather, the consumption of the consumer goods sectors is mainly determined by population and household income.

From model 2B, it is seen that the sector was asymmetrically impacted by oil price changes both in the short run and long run. This gives credence to the significance of oil price to the sector in model 1B in the long run. Negative oil price change affected the stock of the sector in magnitude than positive oil price change. In the short run, despite that positive oil price change has a wrong sign; a % change in negative oil price reduced consumer goods stocks by 0.08%. Then, in the long run, the magnitude of negative oil price variation lowered the sectoral's return with about 39.59%. While positive oil price shock increased consumer goods sector stock returns by about 1.31%. It is conspicuous that the other control variables were not significant in model 2B.

4.3.6 Health sector stock return-oil price relation

The Hausman test results showed that the MG estimates are the most efficient for both the symmetrical and asymmetrical models for the sector. In the symmetric model (1A), oil price fluctuation showed no relationship with the sector's stocks in both the short run and long run as revealed in Table 4.8. It is only exchange rate that seemed to impact on the sector's stocks in the long run.

Table 4.8: Health sector stock return-oil price change relation

VARIABLES	SYMMETRIC MODELS Model(1A) Mg_symmetric	Model(1B) Pmg_symmetric	ASYMMETRIC MODELS Model(2A) Mg_asymmetric	Model(2B) Pmg_asymmetric
Short run model				
Ec	-0.00832***	-0.00609***	-0.00801***	-0.00598***
	(0.00243)	(0.00132)	(0.00228)	(0.00013)
D.lop	-0.0282	-0.0267		
	(0.2216)	(0.182)		
D.lexr	0.00300	0.00319	0.00198	0.00166
	(0.8331)	(0.138)	(0.146)	(0.140)
D.lgbr	-0.8573	0.551	-0.000340	0.00156
	(0.00261)	(0.00258)	(0.269)	(0.548)
D.mktl	2.20e-07	2.26e-08	1.95e-07	2.50e-08
	(3.82e-07)	(1.72e-07)	(3.76e-07)	(1.70e-07)
D.r_{it-1}	-0.274526	-0.10352	-0.37981	0.27465
	(0.2644)	(0.256)	(0.8822)	(0.1754)
D.lop_p			0.00190	-0.00278
			(0.151)	(0.262)
D.lop_n			-0.0581**	-0.0609**
			(0.017)	(0.0289)
Long run model				
Lop	-0.571	-0.372**		
	(0.1817)	(0.0210)		
Lexr	-2.928**	-2.309***	-2.308***	-1.995***
	(0.0193)	(0.000)	(0.002)	(0.000)
Lgbr	0.853	-0.0534	0.538	-0.131
	(0.229)	(0.344)	(0.336)	(0.366)
Mktl	4.21e-05	6.46e-05	2.42e-05	6.37e-05
	(0.13982)	(0.19009)	(0.8316)	(0.21561)
r_{it-1}	0.772826	-0.173	-2.22008	0.037890
	(0.311)	(0.111)	(0.171)	(0.116)
lop_p			2.812	-2.812
			(0.439)	(0.111)
lop_n			-0.294**	0.294***
			(0.0170)	(0.014)
Constant	0.0551**	0.0916***	0.0550***	0.0751***
	(0.0251)	(0.0018)	(0.0014)	(0.0161)
Hausman test	**Symmetric**		**Asymmetric**	
$\ddot{X}_N^2$	55.22		64.55	
p-value	0.0267		0.000	
Observations	17,976	17,976	17,969	17,969

P-values are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Turning to the asymmetric model, the results suggested that negative oil price change is significantly related to health sector returns in both short and long run. Both estimates are in support of prominent findings in the literature that negative oil price variation depresses stock prices of oil exporting economies (Ramos and Veiga, 2013). One percent downward change in oil price brought about 0.29% decrease in the sector's stock returns. This co-movement could be explained that during negative oil price shocks, health sector funding is declined due to the reduction in government purchases, and households welfare are negatively affected. This affects patronage and profit of conventional medicine which in turn affects stock returns of this sector negatively.

Summarily, stock returns of health sector responded to oil price change asymmetrically. In the linear model (1A), health sector stocks did not respond to oil price changes. However, in a nonlinear model (2A), negative oil price change has a long run relationship with health sector stocks returns while positive oil price fluctuation mattered less in this sector. Exchange rate influenced stock returns of this sector in the long run.

4.3.7 ICT sector stock return-oil price relation

A critical examination of Table 4.9 showed that the PMG estimates are preferred to those of the MG in both the symmetric and asymmetric models going by the Hausman test results. In other words, models 1B and 2B are the models of focus for discussion. The results from model 1B showed positive and significant long run effect on the ICT sector's stock returns. Even in the short run, the results also revealed co-movement between the two variables. A percentage upward movement of oil price increased ICT stock returns by 0.029% and 0.33% in the short run and long run, respectively. However, it is only exchange rate with coefficient of about 0.115% that influenced ICT stocks in the long run when considered other variables of interest in this linear model. Results for model 2B indicated that in the long run, oil price change did not influence ICT stock price asymmetrically. However, negative oil price fluctuation had significant impact in the short run but positively signed. From model 2B, none of the variables seem to have significant effect on ICT stocks in the long run.

Table 4.9: ICT sector stock return-oil price change relation

VARIABLES	SYMMETRIC MODELS		ASYMMETRIC MODELS	
	Model(1A) Mg_symmetric	Model(1B) Pmg_symmetric	Model(2A) Mg_asymmetric	Model(2B) Pmg_asymmetric
Short run model				
Ec	-0.0309***	-0.0263***	-0.0287***	-0.0253***
	(0.0198)	(0.0242)	(0.0196)	(0.0227)
D.lop	0.0350**	0.0297***		
	(0.0137)	(0.00033)		
D.lexr	0.0141***	0.00807	0.0160***	0.0120
	(0.00015)	(0.368)	(0.00806)	(0.28252)
D.lgbr	0.00670***	0.00554***	0.00680***	0.00550***
	(0.00131)	(0.000539)	(0.0028)	(0.000337)
D.mktl	4.29e-07	7.12e-07	3.99e-07	6.23e-07
	(9.99e-07)	(6.41e-07)	(8.79e-07)	(5.23e-07)
D.r_{it-1}	-0.9433	0.03501	0.09114	-0.5311
	(0.21725)	(0.1269)	(0.8627)	(1.00519)
D.lop_p			0.0140	0.0146
			(0.264)	(0.4992)
D.lop_n			0.167**	0.164**
			(0.018)	(0.0195)
Long run model				
Lop	-0.179	0.327**		
	(0.537)	(0.042)		
Lexr	-1.175	0.115***	-1.046	-0.153
	(0.345)	(0.00220)	(0.266)	(0.189)
Lgbr	-0.203	0.120	-0.309	0.156
	(0.351)	(0.264)	(0.5518)	(0.278)
Mktl	3.16e-05	-3.98e-05	3.74e-05	-3.62e-05
	(7.41e-05)	(0.154)	(7.86e-05)	(0.823)
r_{it-1}	-.15588	0.32135	3.95865	1.5220
	(0.291)	(0.1135)	(0.8233)	(0.09922)
lop_p			-3.059***	-3.303
			(0.000)	(2.662)
lop_n			-0.911***	-0.830
			(0.000)	(2.993)
Constant	0.0846***	-0.0205**	0.108**	0.0445**
	(0.054)	(0.0163)	(0.0424)	(0.0429)
Hausman test	**Symmetric**		**Asymmetric**	
$\ddot{X}_N^2$	0.92		0.88	
p-value	0.9211		0.9270	
Observations	5,136	5,136	5,134	5,134

p-values are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Generally, the result implied that the ICT stock was insensitive to asymmetric oil price movement. This can be explained given that higher government revenue translates more money in the hands of households. When household welfare rises as a result of high disposable income, people tend to invest and purchase ICT products as ICT products is termed luxury especially in Africa. The increased demand and patronage in ICT contribute to a rise in product price and stocks of the ICT firms. As earlier said, ICT stocks price did not exhibit asymmetries; therefore, this suggested that oil price increase or decrease have symmetrical effects on ICT sector stock returns.

4.3.8 Industrial sector stock return-oil price relation

With recourse to the Hausman test hypothesis as usual, the PMG estimates in both the symmetric and asymmetric models are the best estimator relative to MG. Model 1B which is PMG symmetrical regression revealed insignificant and inverse relationship between oil price risk and industrial stocks returns in the long run and short run as shown in Table 4.10. The coefficients of oil price changes in the short run and long run are -0.0129 and -0.123, respectively. The behaviour of the other variables in the model was as expected. Exchange rate was inversely related to industrial sectoral stocks which imply that when exchange rate depreciates, local consumption of the industrial sector output tends to be high. Industrial production, turnover and returns increased. A percentage appreciation in exchange rate risk causes industrial stock returns to fall by 0.94% in the long run. Increase in global market risk by 1% caused industrial sector stock returns to gain about 0.70% on the average. The NSE market liquidity is insignificant but positive to industrial stock returns.

Coming to the asymmetric model, (model 2B), the results suggested that oil price increase and decrease could not explain stock returns of industrial sector in the long run. Though, negative oil price change tends to have effect on stocks in the short run but not in the long run as the relationship disappeared. The result implied that industrial sector stock returns did not exhibit asymmetric. Therefore, oil price did not seem to have influence on industrial stock returns both in the symmetrical and asymmetrical models especially in the long run.

Table 4.10: Industrial sector stock return-oil price change relation

VARIABLES	SYMMETRIC MODELS		ASYMMETRIC MODELS	
	Model(1A) mg_symmetric	Model(1B) pmg_symmetric	Model(2A) mg_asymmetric	Model(2B) pmg_asymmetric
Short run model				
Ec	-0.00816***	-0.00646***	-0.00738***	-0.00639***
	(0.000969)	(0.000738)	(0.000883)	(0.000796)
D.lop	-0.0114	-0.0129		
	(0.306)	(0.0298)		
D.lexr	0.0195**	0.0175	0.0184**	0.0172
	(0.0112)	(0.0108)	(0.0110)	(0.1108)
D.lgbr	-0.01992	-0.1620	-0.000428	-0.000484
	(0.189611)	(0.1985)	(0.2101)	(0.193005)
D.mktl	-2.92e-07**	-2.29e-07***	-2.86e-07**	-2.05e-07***
	(1.59e-07)	(5.26e-08)	(1.35e-07)	(5.58e-08)
D.r_{it-1}	-2.67045	-0.6770	-0.94539	0.7491
	(0.27875)	(0.642)	(0.178)	(0.1944)
D.lop_p			-0.0282	-0.0258
			(0.0425)	(0.426)
D.lop_n			-0.0424**	-0.0458**
			(0.0231)	(0.0175)
Long run model				
Lop	-0.397**	-0.123		
	(0.040)	(0.180)		
Lexr	-1.392***	-0.942***	-1.108***	-0.804***
	(0.000)	(0.000)	(0.000)	(0.000)
Lgbr	0.711***	0.704**	0.608**	0.672**
	(0.006)	(0.013)	(0.042)	(0.016)
Mktl	0.000107**	7.92e-05	0.000117**	7.91e-05
	(4.54e-05)	(0.000166)	(4.74e-05)	(0.000163)
r_{it-1}	-0.814581	0.03326	-0.3698	0.49944
	(0.1168614)	(0.2477)	(0.221)	(0.625)
lop_p			1.267	0.658
			(0.464)	(0.826)
lop_n			0.235	0.279
			(0.243)	(3.078)
Constant	0.0399*	0.0107***	0.0185*	0.0265**
	(0.0237)	(0.00321)	(0.0105)	
Hausman test	**Symmetric**		**Asymmetric**	
$\ddot{X}_N^2$	0.92		2.68	
p-value	0.9216		0.7498	
Obervations	20,544	20,544	20,536	20,536

P-values are in parentheses; *** p<0.01, ** p<0.05, * p<0.1

This implied that oil price fluctuations do not determine consumption of industrial products in Nigeria. This can be buttressed from the point of view that most industrial firms listed on the floor of NSE are Nigeria's firms whose production do not depend on oil price fluctuation for example, cutix wire, first aluminum company and premium paints. In the models, what explained the variation of the industrial stock returns was global market risk. It could be that local consumers tend to patronize local product more. As documented in model 2B of this sector, when global market risk rose by 1%, industrial stock returns gained about 0.67%. Exchange rate was also important in explaining the response of industrial sector. Of course, if exchange rate appreciates, domestic consumers tend to patronize foreign industrial products in Nigeria. This affects local production and consumption of industrial products negatively and also their stock returns.

4.3.9 Natural resources sector stock return-oil price relation

Table 4.11 contains the results of natural resources sector. The Hausman test results for this sector suggested non rejection of the null hypothesis which indicates that PMG estimator (models 1B and 2B) is the efficient estimator in both the symmetrical and asymmetrical models. For the symmetric models, the efficient model (model 1B) revealed no relationship between oil price and the sector's stock returns in both short and long run. When oil price fluctuations was partitioned into negative and positive oil price changes (model 2B), changes in oil price still did not show significant relationship with stock returns of this sector in both the short and long run. The intuition behind this is that oil price fluctuation does not have power in explaining the variations in stock prices of the natural resources companies. This behaviour between the two variables can be likened to the kind of products produced by the sector. Natural resources goods have a different market and regulation from oil market so it is possible that oil price fluctuations may not affect it. Since most of the products generated in this sector are extractive products, and they are exported in raw state, hence, oil price has slim chance in affecting them. Even if oil price should affect them, the relationship could be inverse.

Table 4.11: Natural Resources sector stock return-oil price change relation

VARIABLES	SYMMETRIC MODELS Model(1A) mg_symmetric	Model(1B) pmg_symmetric	ASYMMETRIC MODELS Model(2A) mg_asymmetric	Model(2B) pmg_asymmetric
Short run model				
Ec	-0.0248***	-0.0249***	-0.0255***	-0.0255***
	(0.0212)	(0.0207)	(0.0220)	(0.0215)
D.lop	0.00627	0.00600		
	(0.00760)	(0.00685)		
D.lexr	0.0564***	0.0566***	0.0561***	0.0563***
	(0.00725)	(0.00788)	(0.00646)	(0.00780)
D.lgbr	0.00636	0.00657	0.00601	0.00615
	(0.1599)	(0.17702)	(0.51258)	(0.16663)
D.mktl	-6.80e-07	-6.36e-07	-6.56e-07	-6.29e-07
	(7.01e-07)	(5.18e-07)	(6.70e-07)	(5.31e-07)
D.r_{it-1}	0.2118	0.8822	0.6611	2.9010
	(0.00339)	(0.00679)	(0.0051)	(0.00645)
D.lop_p			3.73e-05	0.00270
			(0.00317)	(0.0122)
D.lop_n			0.0581	0.0531
			(0.0936)	(0.0603)
Long run model				
Lop	0.132	-0.0411		
	(0.224)	(0.145)		
Lexr	-1.680**	-1.524**	-1.793**	-1.492**
	(0.0184)	(0.0199)	(0.0363)	(0.0159)
Lgbr	-0.385	-0.170	-0.410	-0.141
	(0.271)	(0.237)	(0.328)	(0.233)
Mktl	1.78e-05	4.72e-05	1.97e-05	4.44e-05
	(3.88e-05)	(0.000139)	(3.11e-05)	(0.000136)
r_{it-1}	-0.8397	0.00499	0.28788	0.6222
	(0.14944)	(0.1373)	(0.2438)	(0.17119)
lop_p			-0.691	1.772
			(3.060)	(2.503)
lop_n			4.717	-2.254
			(8.557)	(2.520)
Constant	0.276***	0.278***	0.265***	0.269***
	(0.226)	(0.236)	(0.202)	(0.232)
Hausman test	**Symmetric**		**Asymmetric**	
$\ddot{X}_N^2$	0.71		0.71	
p-value	0.9507		0.950	
Observations	5,136	5,136	5,134	5,134

P-values are in parentheses; *** p<0.01, ** p<0.05, * p<0.1

However, exchange rate as a critical variable of interest showed significant but inverse relationship with the sector's stock returns. When domestic exchange rate appreciates, less of the natural resources products are demanded, productivity and profit are negatively affected and thus, stock returns depreciates. According to model 1B, 1% rise in exchange rate resulted in about 1.52% fall in the sector's stock price in the long run.

While in model 2B, a percentage rise in exchange rate brings about 1.49% decreases in stock returns. Market liquidity (mktl) and global market risk (gbr) did not influence natural resources stock returns in any way. Summarily, the results of this sector suggested that oil price movement did not have any power in explaining natural resources stock returns in Nigeria both in the symmetrical and asymmetrical models. Hence, nonlinearity is not a factor to be considered in this sector.

4.3.10 Oil and Gas sector stock return-oil price relation

The Hausman test results for the estimates of this sector, indicated the PMG estimators as the efficient one in both the symmetric and asymmetric regressions. Starting with the symmetric model, from model 1B, oil price fluctuation was significant (0.0681) and positively related to oil and gas stock price in the short run. The co-movement persisted in the long run but not significant (0.063). This could be alluded to investors behaviour, whereby during initial fluctuation in oil price, they tend to react positively; but when the fluctuation persists, they invest more on oil sector due to the believe that oil price will certainly pick up. Secondly, some investors seize the opportunity to invest in derivatives such as option contracts, future and forward markets. The partly development of derivatives has helped to reduce drastically problems associated with oil price fluctuation. Hence, this could be the reason why oil and gas stocks returns respond positively but insignificant effect to oil price changes in the symmetrical relationship. Obviously, other variables of interest show insignificant relation with the sector in the short run. Moving to the model with asymmetry (model 2B), in the short run, negative oil price change was significant with an inverse relationship while positive oil price change showed no connection with oil sector stocks.

Table 4.12: Oil and Gas sector stock return-oil price change relation

VARIABLES	SYMMETRIC	MODELS	ASYMMETRIC	MDELS
	Model(1A) mg_symmetric	Model(1B) pmg_symmetric	Model(2A) mg_asymmetric	Model(2B) pmg_asymmetric
Short run model				
Ec	-0.0124***	-0.00965**	-0.0123***	-0.00978**
	(0.00319)	(0.00392)	(0.00333)	(0.00398)
D.lop	0.0703**	0.0681**		
	(0.0333)	(0.0342)		
D.lexr	-0.0133	-0.0190***	-0.0117	-0.0171**
	(0.00929)	(0.00984)	(0.00974)	(0.0102)
D.lgbr	-0.00577*	-0.00445	-0.00552	-0.00452
	(0.00321)	(0.00331)	(0.00341)	(0.00330)
D.mktl	-1.15e-06***	-6.18e-07	-1.06e-06***	5.77e-07*
	(3.35e-07)	(4.13e-07)	(3.18e-07)	(4.15e-07)
D.r_{it-1}	2.4808	4.06371	0.88661	12. 2704
	(0.1922)	(0.15636)	(0.11443)	(0.17039)
D.lop_p			0.0178	0.0188
			(0.0351)	(0.0408)
D.lop_n			0.0466	0.0612**
			(0.0285)	(0.0227)
Long run model				
Lop	-0.197	0.0625		
	(0.248)	(0.119)		
Lexr	-1.394***	0.232	-1.237*	0.177**
	(0.001)	(0.162)	(0.04707)	(0.0132)
Lgbr	0.538**	0.257	0.437**	0.293
	(0.0177)	(0.195)	(0.0410)	(0.0195)
Mktl	0.000152**	3.51e-05	0.000158**	3.34e-05
	(6.19e-05)	(0.000113)	(7.03e-05)	(0.000113)
r_{it-1}	0.0226	2.49003	0.9449	7.9531
	(0.00222)	(0.1758)	(0.00469)	(0.00698)
lop_p			-0.187	2.377**
			(3.960)	(0.0285)
lop_n			4.823**	-1.726***
			(0.055)	(0.0137)
Constant	0.0622**	0.0109**)	0.0582**	0.0135***
	(0.0282)	(0.00837)	(0.0302)	(0.00945)
Hausman test	**Symmetric**		**Asymmetric**	
$\ddot{X}_N^2$	3.99		4.45	
p-value	0.4070		0.3481	
Observations	12,840	12,840	12,835	12,835

P-values are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Oil and gas sector clearly responded to positive and negative oil price change following a priori expectation in the long run. A percentage change in positive oil price resulted in about 2.40% appreciation in oil and gas stocks. While 1% change in negative oil price movement yielded about 1.72% decline in oil and gas stocks in the long run. Evidently, oil and gas sector's stocks responded to oil price fluctuations asymmetrically. In particular, the magnitude of the positive oil price changes is greater (2.38) than the magnitude of negative oil price change (-1.73) in absolute terms. What this portends is that investors invest more on oil and gas stocks during positive oil price change than the rate at which they withdraw their investment during negative oil price movement. This behaviour could be as a result of the opinion (believe) formed that oil price must keep rising in future in the international oil market. Another rational for higher magnitude of positive oil price changes than negative oil price changes is the higher welfare associated with oil boom in oil exporting countries like Nigeria that encourages investment; which is contrary to the rate of investment experience during oil glut period. In summary, oil and gas sector stock prices respond to oil price change asymmetrically. Surprisingly, exchange rate affects stock price in this sector as expected while gbr and mktl do not matter in explaining oil and gas stock returns.

4.3.11 Services sector stock return-oil price relation

The results of Hausman test in the service sector confirmed the MG estimator as the more efficient both in the linear and nonlinear models (Table 4.13). Hence, the efficient models are 1A and 2A. Beginning with model 1A, oil price movement was not significant in both the short run and long run.

When oil price fluctuation was partitioned asymmetrically, the results as contained in model 2A showed the same pattern as model 1A (see: Table 4.13). Oil price, be it in linear or nonlinear form did not explain the behaviour of stock prices in the services sector in both the short run and long run. These results may be surprising. This behaviour may not be unconnected to the sample of firms from the sector. Three (3) out of the nine (9)[57] companies considered in this sectors are publishing firms; the other four (4) firms are

[57] Publishing firms – (UPL, LEARNAFRICA, ACADEMY); Automotive leasing and Courier services – (CILEASING, RTBRISCOA and ABCTRANS, TRANSEXPRESS); Hospitality - (TRANCSCORP); Aviation – (NAHCO).

automotive leasing and delivery services. The last two (2) are into hospitality and aviation services each. The firms‟ stock behaviour may be independent of oil price behaviour given their link to oil price and nature of their services except NAHCO. However, it is obvious they use oil in their services but that was not connected to the sector's stock price as observed in the study. It is possible that oil price variation affects aviation stocks but due to the fact the study sample contained only one aviation firm i.e. NAHCO; it is possible that the effect of the oil price changes to other firms in the sector masked that of NAHCO.

Table 4.13: Services sector stock return-oil price change relation

VARIABLES	SYMMETRIC MODELS		ASYMMETRIC MODELS	
	Model(1A) Mg_symmetric	Model(1B) Pmg_symmetric	Model(2A) Mg asymmetric	Model(2B) Pmg_asymmetric
Short run model				
Ec	-0.00771***	-0.00569***	-0.00739***	-0.00577***
	(0.00232)	(0.00189)	(0.00029)	(0.0001)
D.lop	-0.0221	-0.135		
	(0.154)	(0.0151)		
D.lexr	-0.00772	-0.00886	-0.00875	-0.00937
	(0.480)	(0.1113)	(0.117)	(0.117)
D.lgbr	-0.00240**	-0.00157	-0.00215	-0.00137
	(0.0566)	(0.00116)	(0.1136)	(0.200)
D.mktl	-2.50e-07	-1.53e-07	-2.44e-07	-1.62e-07
	(2.14e-07)	(2.04e-07)	(2.12e-07)	(0.246)
$D.r_{it-1}$	-0.6393	-0.03541	-0.00573	-0.181133
	(0.20981)	(0.221)	(0.24533)	(0.4829)
D.lop_p			0.00403	-0.00357
			(0.1622)	(0.555)
D.lop_n			-0.0322	-0.0290
			(0.294)	(0.290)
Short run model				
Lop	-0.359	-0.180		
	(0.301)	(0.209)		
Lexr	-2.521***	-2.531***	-2.157***	-2.472***
	(0.000)	(0.000)	(0.000)	(0.000)
Lgbr	0.897	0.189	0.657	0.0464
	(0.1529)	(0.343)	(0.255)	(0.197)
Mktl	0.000163***	0.000138	0.000161***	0.000137
	(0.000)	(0.198)	(0.000)	(0.485)
r_{it-1}	-5.9408	-0.00472	-0.00408	-0.79495
	(0.186)	(0.716)	(0.6485)	(0.142606)
lop_p			-2.239	0.583
			(0.156)	(0.178)
lop_n			0.1683	3.725
			(7.366)	(0.302)
Constant	0.0761**	0.0750***	0.0727**	0.0763***
	(0.0463)	(0.0052)	(0.0471)	(0.0079)
Hausman test	**Symmetric**		**asymmetric**	
$\ddot{X}_N^2$	9.58		6.82	
p-value	0.0481		0.1060	
Observations	23,112	23,112	23,103	23,103

P-values are in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Exchange rate and NSE market liquidity were the only variables that influenced stock returns of the services sector. If exchange rate appreciates by 1%, stock returns of service sector will respond by dropping about 2.52% and 2.15% of its value in model 1A and model 2A respectively in the long run. If NSE market liquidity deepens, it will enhance stock returns of the sector by about 0.00016% in model 1A and 2A respectively. The result suggested that NSE market liquidity and exchange rate variables can only influence stock returns of this sector.

4.3.12 Financial sector stock return-oil price relation

For this sector, the PMG estimates are the efficient estimators in both linear (symmetric) and non-linear (asymmetric) model. Table 4.14 showed that financial sector stock returns did not react to oil price fluctuations in the short run in model 1B. However, when oil price risk persisted (long run), the sectoral's stock returns responded to the oil price risk negatively. One percent change in oil price resulted in about 0.20% drop in stock returns. Other variables of interest are significant in both the short run and long run except market liquidity in the long run. Global market risk affected financial stock returns with the expected sign in both the short run and long run. In the short run, a percentage change in global stock market risk results in about 0.02% reduction in financial sector stock returns and if the global market risk intensifies, stock returns drop close to 1.12%. These results seemed plausible given the partly integration of Nigeria financial sector to the world financial market. Exchange rate was inversely related to financial stock returns. This could be attributed to flare/taste for foreign products by Nigerians. When exchange rate appreciates, Nigerians invest less on financial sector assets; given the fact that most investors are skeptical and believe that monetary authority does not have full control of exchange rate. Investors are afraid that their investments could be trapped during such changes. Hence, they prefer to invest in other durables or consume foreign products that are relatively cheaper. It was also observed that market liquidity mattered in financial asset prices in the short run: such that a unit change in NSE market liquidity brought about marginal rise on returns of financial sector stocks. And as market liquidity deepened, returns in this sector increased slightly.

Table 4.14: Financial sector stock return-oil price change relation

VARIABLES	SYMMETRIC MODELS		ASYMMETRIC MODELS	
	(1A) mg_symmetric	(1B) pmg_symmetric	(2A) mg_asymmetric	(2B) pmg_asymmetric
Short run model				
Ec	-0.0575**	-0.0118**	-0.0143***	-0.0117***
	(0.0434)	(0.00522)	(0.00547)	(0.00393)
D.lop	-0.0352	0.00966		
	(0.0297)	(0.0333)		
D.lexr	-0.0295***	-0.0329***	-0.0256***	-0.0282***
	(0.00702)	(0.00706)	(0.00667)	(0.00650)
D.lgbr	0.0190*	-0.0202***	0.0199**	0.0211**
	(0.0111)	(0.0110)	(0.0110)	(0.0109)
D.mktl	-5.97e-07***	5.91e-07***	-5.83e-07***	-3.98e-07**
	(1.62e-07)	(2.09e-07)	(1.70e-07)	(1.67e-07)
D.r_{it-1}	0.6733	2.0277	6.6072	3.7722
	(0.0036)	(0.0085)	(0.00291)	(0.00062)
D.lop_p			-0.176**	0.186**
			(0.0332)	(0.0233)
D.lop_n			-0.111**	-0.140**
			(0.0325)	(0.0468)
Long run model				
Lop	0.0658	-0.200**		
	(0.183)	(0.0102)		
Lexr	-0.707**	-1.173***	-0.503	-0.901***
	(0.0408)	(0.0014)	(0.394)	(0.00102)
Lgbr	-0.104	-1.125***	-0.505	-0.944***
	(0.666)	(0.00173)	(0.758)	(0.00158)
Mktl	9.29e-05***	6.34e-05**	0.000139***	5.45e-05
	(1.79e-05)	(6.55e-05)	(2.57e-05)	(5.75e-05)
r_{it-1}	4.046	4.8440	4.1188	13.9902
	(0.0051)	(0.00928)	(0.0072)	(0.00031)
lop_p			-5.017	3.837***
			(6.851)	(0.0025)
lop_n			56.13**	-18.81**
			(0.057)	(0.0451)
Constant	-0.00140***	-0.0227***	-0.0371***	-0.01754**
	(0.0184)	(0.0133)	(0.0381)	(0.0127)
Hausman test	**Symmetric**		**Asymmetric**	
$\ddot{X}_n^2$	4.64		17.28	
p-value	0.3268		0.1700	
Observations	89,880	89,880	89,868	89,868

P-values are in parentheses; *** p<0.01, ** p<0.05, * p<0.1

As earlier stated, financial stock returns reacts negatively to oil price changes. However, the symmetric models were silent if it is actually increase or decrease in oil price that negatively impacted on stock returns. To answer this puzzle, asymmetric models become handy to solve the problem (specifically model 2B). It is obvious that financial stocks responded to oil price change asymmetrically. In the short run, one percent increase in oil price resulted in about 0.18% rise in financial stock returns daily. While a % drop in the price of oil led to about 0.14% reduction in the stock returns. Consequently, when oil price moves up by 1%, stock returns of the sector gained about 3.83% in the long run while a % drop in the oil price necessitated about 18.80% drop in financial sector stocks.

From the foregoing, it can be inferred that financial sector stock responded more to negative oil price change than positive oil price variation. Other variables of interest were significant. Exchange rate is equally negatively related to stock returns in both the short run and long run. A percentage change in exchange rate led to about 0.02 and 0.97% drop in stock returns in the short and long run respectively. Global market risk is significant but wrongly signed in the short run. Whereas in the long run, one percent change in the global stock market risk causes about 0.94% drop in financial stock return during the period under review. Market liquidity is significant in the short run but with a wrong sign. As market liquidity deepened, investors pay less attention, it became less determinant of investment in the sector (see Table 4.14).

4.3.12.0 Robustness

Financial sector is made up of two components namely: Banking sub-sector and insurance (non-banking) sub-sector. The study followed this classification and evaluated how each sub-sector's stock returns responded to oil price fluctuation.

4.3.12.1 Banking sub-sector sector stock return-oil price relation

The study examined the banking sub-sector distinctly given the crucial role the banking industry plays in the Nigeria economy. Isolating the sub-sector to consider how oil price risk affected the sub-sector's stock returns was necessitated by the fact that the banking industry contributed about 40% of the total market capitalization in the NSE. When the study ranked the financial sector sample[58] based on their market capitalization, it is interesting to know that 10 banking firms occupied the first-thirteen most capitalized company out of thirteen banks considered in the study.

[58] There are 35 firms that constitute financial sector in the study's sample

Table 4.15: Banking Sub-sector stock return-oil price change relation

	SYMMETRIC MODELS		ASYMMETRIC MODELS	
	(1A)	(1B)	(2A)	(2B)
VARIABLES	mg_symmetric	pmg_symmetric	mg_asymmetric	pmg_asymmetric
Short run estimates				
Ec	-0.00782***	-0.00338***	-0.00799***	-0.00346***
	(0.00103)	(0.00116)	(0.00103)	(0.000412)
D.lop	0.0352**	0.0365**		
	(0.0140)	(0.0138)		
D.lexr	-0.0400**	-0.0395***	-0.0321**	-0.0380**
	(0.0129)	(0.00131)	(0.0129)	(0.0132)
D.lgbr	0.0339**	0.0338**	0.0357**	0.0378**
	(0.0152)	(0.0150)	(0.0160)	(0.0157)
D.mktl	-5.75e-07**	-4.17e-07	-5.23e-07**	-4.18e-07
	(2.48e-07)	(3.16e-07)	(2.61e-07)	(3.35e-07)
D.r_{it-1}	2.0066	2.4309	2.0835	2.9871
	(0.0013)	(0.0671)	(0.3500)	(0.00448)
D.lop_p			-0.156***	0.172**
			(0.0267)	(0.0197)
D.lop_n			-0.136***	-0.136***
			(0.0313)	(0.0029)
Long run estimates				
Lop	0.484***	0.476		
	(0.00186)	(0.308)		
Lexr	-0.558	-2.670**	-0.945*	0.0911
	(0.631)	(0.0399)	(0.571)	(0.522)
Lgbr	0.686**	1.223**	0.749**	-0.275
	(0.0407)	(0.0494)	(0.0444)	(0.0709)
Mktl	4.13e-05	-4.39e-05	7.05e-05*	5.13e-05
	(3.57e-05)	(0.000185)	(3.92e-05)	(0.000244)
r_{it-1}	3.0644	2.2418	1.1460	7.0266
	(0.0889)	(0.06511)	(0.08672)	(0.00331)
lop_p			0.499	3.956**
			(0.1791)	(0.0456)
lop_n			41.91**	-73.77***
			(0.0217)	(0.040)
Constant	-0.00134***	0.0102***	0.0315**	0.0158***
	(0.0231)	(0.00371)	(0.0268)	(0.00242)
Hausman Test	**Symmetric**		**Asymmetric**	
$\ddot{X}_N^2$	17.98		0.93	
p-value	0.0012		0.9201	
Observations	35,952	35,952	35,938	35,938

P-values are in parentheses; *** p<0.01, ** p<0.05, * p<0.1

For this sub-sector, MG (1A) is the consistent estimator for the symmetric model. The variables indicated similar characteristics like financial sector; oil price was significant in both the short run and long run. In the asymmetric model, PMG (model 2B) is the efficient model. This sub-sector's stock returns responded asymmetrically to oil price changes. Although, the response was higher in magnitude with positive oil price change (0.172) than negative oil price change (0.136) in the short run. In the long run, negative oil price variation has higher estimated coefficient (73.77), hence, the study concluded that negative oil price distortion influences banking sub-sector stock return more than positive oil price change as reported in Table 4.15. Banking sector stocks responded to oil price dynamics asymmetrically.

4.3.1.2.2 Insurance (non-banking) sub-sector stock return-oil price relation

The study also considered insurance sub-sector differently to observe its behaviour to oil price movement. The study showed that banking sub-sector market capitalization and All Share Index were relatively higher than the insurance firms. So, the sub-sector was examined separately so to determine if banking characteristics suppressed the behaviour of the insurance sub-sector or otherwise. Moreover, insurance industry has the highest number of firms (22 companies) in the study's sample making it more interesting to examine the industry discretely.

In Table 4.16, PMG (1B) is the best estimator for the symmetric model. The table revealed that oil price changes reduced the stock returns of insurance companies. One percent change in oil price resulted in about 0.29% reduction in insurance stock returns. This implied that Nigeria investors did not see insurance industry stock as an investment option to mitigate oil price risk. Exchange rate posed greater risk problem in reducing the sub-sector stock returns by about 1.25% given a percentage change in the exchange rate risk. This signified that investors did not see investment in insurance companies as panacea to maintain the value of their assets during inflation. World stock market risk is significant but wrongly signed. This implied that global market risk affected insurance stock returns in Nigeria. The NSE market liquidity did not influence insurance stock returns in the long run.

Table 4.16: Insurance Sub-sector stock return-oil price change relation

VARIABLES	SYMMETRIC MODELS		ASYMMETRIC MODELS	
	(1A) mg_symmetric	(1B) pmg_symmetric	(2A) mg_asymmetric	(2B) pmg_asymmetric
Short run estimates				
Ec	-0.0868**	-0.0167***	-0.0180***	-0.0171***
	(0.0689)	(0.00820)	(0.00865)	(0.00795)
D.lop	-0.0769**	-0.00556		
	(0.0445)	(0.0523)		
D.lexr	-0.0233***	-0.0266***	-0.0218***	-0.0218***
	(0.00813)	(0.00814)	(0.00751)	(0.00748)
D.lgbr	0.0102	0.0113	0.0106	0.0107
	(0.0152)	(0.0150)	(0.0147)	(0.0154)
D.mktl	-6.10e-07***	-5.94e-07**	-6.18e-07***	-4.94e-07**
	(2.16e-07)	(2.79e-07)	(2.27e-07)	(2.65e-07)
D.r_{it-1}	-0.0922	-0.6224	-0.5910	-0.74001
	(0.0547)	(0.2992)	(0.0446)	(0.06242)
D.lop_p			-0.189***	-0.183**
			(0.0508)	(0.0340)
D.lop_n			-0.0972**	-0.0844**
			(0.0486)	(0.0466)
Long run estimates				
Lop	-0.181	-0.292**		
	(0.258)	(0.027)		
Lexr	-0.795	-1.257***	-0.242	-1.065**
	(0.542)	(0.0050)	(0.531)	(0.0106)
Lgbr	-0.571	1.174**	-1.246	1.432**
	(1.030)	(0.0182)	(1.160)	(0.0164)
Mktl	0.000123***	6.48e-05	0.000180***	6.53e-05
	(1.66e-05)	(6.88e-05)	(3.12e-05)	(6.02e-05)
r_{it-1}	-0.07922	-0.8866	-1.5322	-5.5017
	(0.01142)	(0.06409)	(0.000411)	(0.004878)
lop_p			-8.276	2.127
			(10.71)	(2.156)
lop_n			-64.53***	4.997**
			(0.036)	(0.0397)
Constant	0.00143***	0.0282***	0.0777***	0.100**
	(0.0262)	(0.0174)	(0.0573)	(0.0505)
Hausman test	**Symmetric**		**Asymmetric**	
$\ddot{X}_N^2$	5.83		16.26	
p-value	0.1202		0.0027	
Observations	56,496	56,496	56,472	56,472

P-values are in parentheses; *** p<0.01, ** p<0.05, * p<0.1

In the asymmetric model, MG (2A) is preferred to PMG (2B) estimator. The companies' stock return responded asymmetrically to oil price changes. Though, the positive oil variation indicated wrong sign in both the short run and long run with estimated coefficients of -0.18 and -8.27 respectively. Although, the estimated coefficient was not significant in the long run but the inverse relationship in both periods (short run and long run) suggested that investors preferred investing in other sectors stocks than investing in insurance stocks during positive oil price variation. This could be attributed to lack of confidence in insurance companies by investors due to low level of insurance development in Nigeria. The under development of insurance company in Nigeria was evident in the relatively low market capitalization and turnover ratio associated with the sub-sector.

However, negative oil price changes had the right sign in both the short run and long run given its apriori expectation for oil exporting economies. The crux of the matter here was that the estimated coefficients and magnitude of negative oil price changes was higher than positive oil price risk in the long run. It is therefore concluded that insurance sub-sector reacts to negative oil price risk (-64.55 %) than positive oil price risk (-8.27%).

4.4 Size Effect of Oil Price Risk on Firm's Stock Returns

The study examined if size of the firm (using company's market capitalization) is a determinant of how oil price dynamics affects the company's stock returns. The firms used in the study were partitioned into four groups and tested the responses of their stock prices to oil price risk. The first group is the most capitalized firms. The second quartile is the second most capitalized firms. It followed in that order until the last quarter (4^{th} quartile) which is the least capitalized companies in the NSE during the period under review.

4.4.1 First quartile of stock returns-oil price change relation

According to the Hausman test results, the MG (1A) is the true estimator in the symmetric model as shown in Table 4.17. Stock returns of the highly capitalized firms responded to oil price fluctuations in both the short run and long run. The remarkable observation for this quartile is that oil price changes influenced the group positively in the short run (0.37%) and negatively in the long run (-2.87%) but the negative value was higher in the long run when compared it to the positive value in the short run (0.37%). Hence, it may be difficult to determine the real impact of the oil price changes in this quarter.

When oil price risk was partitioned, PMG (model 2B) became the consistent estimator, given the Hausman test statistic. Both positive and negative oil price movement were significant in the short run. Positive oil price risk is inversely related to the group's stock return (-0.10) while negative oil price changes has the expected sign (-0.09). In the long run, the impact of positive oil price risk is directly related to stock returns for the group. One percent increase in positive oil price risk gave rise to about 1.23% in stock returns of this quartile. Negative oil price risk increased in magnitude and depressed the returns of the samples in the quarter. Specifically, a percentage drop in oil price movement resulted in 54.48% decrease in the returns for these companies. This implied that companies in this quarter are affected more by negative oil price fluctuation. This observation seems plausible given the fact that most of the firms in this first quarter are banks and oil and gas sectors that investors presumed to be a fragile and critical sector to oil price changes due to their direct connection to international oil market. Hence, investors are expected to react to negative oil price change quickly. When investors have the same behavioural attitude and react accordingly, negative oil price change may have such negative high estimated coefficient.

Table 4.17: First Quartile stock returns relation to oil price changes in NSE

VARIABLES	SYMMETRIC MODELS		ASYMMETRIC MODELS	
	Model(1A) mg_symmetric	Model(1B) pmg_symmetric	Model(2A) mg_asymmetric	Model(2B) pmg_asymmetric
Short run estimates				
Ec	-0.00698***	-0.00481***	-0.00648***	-0.00440***
	(0.000881)	(0.000589)	(0.000669)	(0.000331)
D.lop	0.0379**	0.0386**		
	(0.0137)	(0.0035)		
D.lexr	-0.0335***	-0.0346***	-0.0267***	-0.0274***
	(0.00666)	(0.00065)	(0.00648)	(0.00049)
D.lgbr	0.4193	0.00854	0.00786	0.00919
	(0.0104)	(0.42106)	(0.4109)	(0.4110)
D.mktl	-6.52e-09	9.77e-08	5.52e-08	4.08e-08
	(1.70e-07)	(1.41e-07)	(1.56e-07)	(1.34e-07)
$D.r_{it-1}$	4.2251	3.0919	1.72509(0.0736)	3.3038
	(0.2625)	(0.14811)		(0.00654)
D.lop_p			-0.0988**	-0.102**
			(0.0261)	(0.0217)
D.lop_n			-0.102**	-0.0918**
			(0.0189)	(0.0169)
Long run estimates				
Lop	-2.875**	1.096**		
	(0.05370)	(0.0053)		
Lexr	0.2682	1.488**	-3.149	0.470**
	(1.055)	(0.0050)	(3.132)	(0.0251)
Lgbr	-0.994	0.256	4.639	0.0474
	(0.416)	(0.277)	(3.975)	(0.364)
Mktl	0.000329	4.06e-05	-0.000634	0.000124
	(0.262)	(0.000104)	(0.000688)	(0.000134)
r_{it-1}	0.5502	3.7073	2.6663	0.2088
	(0.1331)	(0.322)	(0.2202)	(0.5455)
lop_p			9.273	1.232**
			(0.226)	(0.05397)
lop_n			-15.31	-54.88**
			(0.243)	(0.0423)
Constant	-0.0477***	-0.0536***	0.000184**	0.00401***
	(0.0149)	(0.00651)	(0.0126)	(0.00136)
Hausman test	**Symmetric**		**Asymmetric**	
$\ddot{X}_n^2$	25.54		1.37	
p-value	0.0000		0.8486	
Observations	64,200	64,200	64,150	64,150

P-values are in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Conversely, it is also expected that the reaction of investors towards positive oil price fluctuation may not be prompt and uniform because investors may have reservations due to delicate link between oil market and oil & gas sector and banking. Investors try to interpret and understand the rationale behind positive movement in oil price and react slowly in order not to trap their investment in an orchestrated behaviour of the capital market.

Another observable feature of Table 4.17 was that both in model 1A and 2B, it was only oil price risk and exchange rate that explained stock market return for this quarter. It may not be surprising given the fact that the role exchange rate plays in crude oil export and refined oil import. Exchange rate is significant given that the group is made up of the entire oil and gas sector considered in the sample's study. Furthermore, banking is the medium through which all transactions are made and 9 out of 13 banks considered in the analysis falls under this quartile. It implied that investors looked beyond domestic market liquidity and global market risk while investing in this quarter.

4.4.2 Second quartile of stock return-oil price change relation in NSE

MG estimator was the best estimator for both the symmetric and asymmetric models in Table 4.18. From model 1A, it was observed that stock returns of the second most capitalized companies did not respond to oil price variation in the short run and long run. Market liquidity and exchange rate explained most of the behaviour of stock returns in the group. One percent change in exchange rate brought about a decline of about 0.027 and 1.16% in the stock returns of the quartile in the short run and long run respectively. While a unit change in market liquidity marginally increased the group's stock returns by 0.000055% in the long run. In the short run, market liquidity was significant but wrongly signed.

Table 4.18: Second Quartile stock returns relation to oil price changes in NSE

VARIABLES	SYMMETRIC MODEL		ASYMMETRIC MODEL	
	Model(1A) mg_symmetric	Model(1B) pmg_symmetric	Model(2A) mg_asymmetric	Model(2B) pmg_asymmetric
Short run model				
Ec	-0.0150***	-0.0111***	-0.0147***	-0.0121***
	(0.00288)	(0.00256)	(0.00352)	(0.00326)
D.lop	0.00679	0.00570		
	(0.0140)	(0.0148)		
D.lexr	-0.0267**	-0.0308**	-0.0228***	-0.0260**
	(0.0100)	(0.0102)	(0.00976)	(0.0102)
D.lgbr	0.0110	0.0121	0.00829	0.00929
	(0.0156)	(0.0153)	(0.0152)	(0.0147)
D.mktl	-5.67e-07***	-4.67e-07**	-5.93e-07***	-5.12e-07***
	(1.55e-07)	(1.87e-07)	(1.77e-07)	(1.88e-07)
$D.r_{it-1}$	0.05334	0.66551	0.02209	0.9907
	(0.0088)	(0.02467)	(0.0722)	(0.0549)
D.lop_p			0.0562**	-0.0633**
			(0.0310)	(0.0276)
D.lop_n			-0.0750**	-0.0542
			(0.0202)	(0.0351)
Long run model				
Lop	0.134	0.196**		
	(0.170)	(0.0105)		
Lexr	-1.162***	-0.798***	-1.244***	-0.977***
	(0.00275)	(0.00146)	(0.00244)	(0.0010)
Lgbr	0.419	0.00740***	0.377	1.042**
	(0.333)	(0.00171)	(0.372)	(0.0157)
Mktl	5.50e-05**	1.68e-05	6.98e-05**	3.24e-05
	(2.29e-05)	(6.47e-05)	(2.76e-05)	(5.82e-05)
r_{it-1}	0.8134	1.7602	4.5173	2.0654
	(0.0645)	(0.0532)	(0.0741)	(0.0253)
lop_p			0.729**	-2.924
			(0.0502)	(0.0089)
lop_n			-26.81**	10.91***
			(0.0254)	(0.00310)
Constant	0.0308**	-0.00991***	0.0199***	-0.0182***
	(0.0212)	(0.00822)	(0.0441)	(0.0120)
Hausman test	**Symmetric**		**Asymmetric**	
$\ddot{X}_n^2$	12.63		22.08	
p-value	0.0132		0.0002	
Observations	64,200	64,200	64,150	64,150

p-values are in parentheses; *** p<0.01, ** p<0.05, * p<0.1

The group showed the presence of oil price asymmetries in both the short run and long run in model 2A. Model 2A indicated that the coefficient of negative oil price change (-0.075) is higher than positive oil price change (0.056) in absolute term in the short run. The same pattern was also observed in the long run model. This implied that the magnitude of the estimated coefficient of negative oil price movement is greater than the positive oil price change for this quarter. Another spectacular observation in this group was that both positive and negative oil price fluctuations have the same expected sign. Market liquidity and exchange rate were also important variable in explaining the changes in stock returns for the group. One percent change in exchange rate caused the sector's stock return to drop 0.022% and 1.24% in the short run and long run respectively. When domestic market liquidity improved by one unit, stock returns of this group gained 0.000070% in the long run.

4.4.3 Third quartile of stock return-oil price change relation in NSE

In Table 4.19, models 1A and 2B are the efficient symmetric and asymmetric model respectively in this group. In model 1A, oil price fluctuation inversely determined stock returns in the long run. This implied that a percentage change in international oil price led to about 0.60% fall in the returns of the third most capitalized companies in NSE. Obviously, other variables considered in the study are important explanatory variables to the returns of this quartile with the expected signs except exchange rate.

To determine the direction of the influence of the change in oil price to stock returns of the group, model 2B was preferred. In the short run, only exchange rate explained stock market returns in this group. Oil price did not have explanatory power over the stock returns of the quartile asymmetrically given the insignificant of the estimates. Positive and negative oil price variation contributed in determining stock returns in this group in the long run; however, negative oil price movement was wrongly signed. When oil price appreciate or depreciate by one percent, stock returns of the group appreciated by about 4.4% or 15.69% respectively.

Table 4.19: Third quartile stock returns relation to oil price changes in NSE

VARIABLES	SYMMETRIC MODEL		ASYMMETRIC MODEL	
	Model(1A) mg_symmetric	Model(1B) pmg_symmetric	Model(2A) mg_asymmetric	Model(2B) pmg_asymmetric
Short run model				
Ec	-0.0185**	-0.0142**	-0.0174**	-0.0117**
	(0.00791)	(0.00718)	(0.00799)	(0.00488)
D.lop	0.0604	0.0590		
	(0.0458)	(0.0455)		
D.lexr	-0.0106	-0.0152**	-0.0104	-0.0159***
	(0.00719)	(0.00654)	(0.00717)	(0.00573)
D.lgbr	-0.000613	-0.000250	0.00141	0.00276
	(0.00519)	(0.00419)	(0.00508)	(0.00295)
D.mktl	-4.78e-07***	-3.47e-07	-3.70e-07	7.07e-08
	(2.55e-07)	(3.48e-07)	(2.53e-07)	(1.73e-07)
D.r_{it-1}	-0.3536	0.06587	-1.5975	0.2858
	(0.188)	(1.0343)	(0.17733)	(0.1856)
D.lop_p			0.00920	-0.0148
			(0.0277)	(0.0302)
D.lop_n			0.0506	-0.0136
			(0.0402)	(0.0466)
Short run model				
Lop	-0.609***	-0.264***		
	(0.00147)	(0.0960)		
Lexr	-1.601***	-1.409***	-1.186***	-1.043***
	(0.0298)	(0.0132)	(0.00246)	(0.0101)
Lgbr	-0.654**	0.886***	0.156	-0.457***
	(0.0309)	(0.0163)	(0.452)	(0.0160)
Mktl	0.000105***	8.71e-05	0.000107***	4.13e-05
	(2.13e-05)	(6.85e-05)	(2.61e-05)	(6.62e-05)
r_{it-1}	-0.0272	-0.05577	0.06722	0.0441
	(0.1888)	(0.14919)	(0.14991)	(2.0575)
lop_p			0.905	4.419***
			(5.502)	(0.00875)
lop_n			19.09***	15.69***
			(0.0588)	(0.00994)
Constant	0.0787*	0.0203***	0.0508*	0.0264***
	(0.0533)	(0.00662)	(0.0661)	(0.00774)
Hausman test	**Symmetric**		**Asymmetric**	
$\ddot{X}_n^2$	14.68		2.78	
p-value	0.0054		0.5950	
Observations	64,200	64,200	64,190	64,190

P-values are in parentheses; *** p<0.01, ** p<0.05, * p<0.1

The behaviour of the stock price in this quartile in the short run could be traced to the natureand components of the companies that constituted the group. Most of the companies in the group are from construction, insurance, natural resources, industrial and Agricultural sector. These sectors do not have direct link to oil market. During oil price distortion, investors are not in hurry to pull out or invest in these sectors because they believe they areisolated or not immuned from oil price risk in the short run.

But in the long run, positive oil price change resulted in increase in returns of this group due to increase in household income resulting from improved government expenditure. When oil price dipped, investors in this group did not pull out their investment as seen in some other sectors that have direct link to oil price. The estimated coefficient of negative oil price showed that investors withdrew their investment but in a rate that it did not negatively affect stock returns. This is because investors see some of the sectors in the group as a buffer hence the positive sign.

Generally, positive oil price variation had greater effect on this third quarter than negative oil price shock. Exchange rate and global market risk impacted negatively on stock returns of this group. If global market risk changes by one percent, stock returns in third quintiles responded negatively by about 0.45%. The inverse relationship between exchange rate and stock returns in this group can be attributed to the incessant depreciation and different exchange rate to different people/sector introduced by federal government. Government did not allow free flow or market determine exchange rate and this was reflected in the estimated coefficients of exchange rate obtained.

4.4.4 Forth Quartile of stock return-oil price change relation in NSE

Similarly, Table 4.20 presents the estimates of the quarter with the lowest market capitalization in NSE. As usual, the PMG and MG are considered as the efficient estimators for the symmetric and asymmetric models respectively following the estimates of Hausman test statistics.

As regards to PMG – symmetric (model 1B), it was observed that oil price change did not have any influence on stock returns in the short run while in the long run, a percentage change in oil price risk, necessitated about 0.49% fall in stock returns of the quartile. Table

4.20 further showed that market liquidity and exchange rate were significant in short and long run respectively, although, none of the two variables has the expected sign. Insignificance of oil price risk in this group could have resulted from the components of the quartile that comprised more of health, ICT, Insurance and service firms. It was observed in the health, ICT and services results that oil price fluctuations did not explain stock returns of these sectors. The result supported the outcome of our descriptive statistics which showed these sectors are relatively less volatile sectors (see: Table 4.1). In such sectors, oil price may not be significant because investors look beyond oil risk while investing in them. These sectors do not have direct link with oil, investors invest in them because of other interest other than oil price. Significance of market liquidity is not surprising because when investors observe that the market is liquid, they prefer investing in companies that guarantee them relative stability for their assets than highly sensitive firms.

In the asymmetric model (model 2A), an upward movement of oil price by 1% caused stock returns of the quarter to dip by about 0.12% while negative oil price variation resulted in downward movement of stock prices by about 0.03% (but not significant) in the short run. Then in the long run, increase in oil price had a positive but insignificant impact on stock returns of the group (4.94%) while negative oil price fluctuation equally had an inverse relationship on the stock returns of this group of least capitalized firms. The estimated coefficient of the negative oil price fluctuation showed that 1% drop in oil price led to about 28.68% rise in the stock returns of the quartile.

Table 4.20: Fourth quartile stock returns relation to oil price changes in NSE

VARIABLES	SYMMETRIC MODELS		ASYMMETRIC MODELS	
	Model(1A) mg_symmetric	Model(1B) pmg_symmetric	Model(2A) mg_asymmetric	Model(2B) pmg_asymmetric
Short run model				
Ec	-0.0716**	-0.00818***	-0.0125***	-0.00681***
	(0.0583)	(0.00153)	(0.00403)	(0.00187)
D.lop	-0.0266	0.0379		
	(0.0304)	(0.0343)		
D.lexr	-0.00480	-0.00724	-0.00372	-0.00945
	(0.00725)	(0.00785)	(0.00729)	(0.00716)
D.lgbr	-0.00373	-0.000967	0.000111	-0.00128
	(0.0134)	(0.0134)	(0.0139)	(0.0139)
D.mktl	3.60e-07**	-4.89e-07***	-3.48e-07***	-4.23e-08
	(1.41e-07)	(9.39e-08)	(1.18e-07)	(6.22e-08)
D.r_{it-1}	-0.7115	-0.6402	-1.1878	-0.5099
	(0.2204)	(0.1744)	(1.0029)	(0.2219)
D.lop_p			-0.124**	-0.139**
			(0.0360)	(0.0259)
D.lop_n			-0.0388	-0.100**
			(0.0283)	(0.0259)
Long run model				
Lop	-0.303	-0.499***		
	(0.0235)	(0.0137)		
Lexr	-2.180***	-2.481***	-1.771**	-0.983**
	(0.0057)	(0.0197)	(0.0455)	(0.0147)
Lgbr	-0.266	-0.0913	-0.418	0.182
	(0.806)	(0.232)	(0.683)	(0.222)
Mktl	-1.06e-05	0.000104	2.29e-06	3.38e-05
	(0.000127)	(8.95e-05)	(0.000117)	(8.48e-05)
r_{it-1}	-0.0779	-0.4780	-2.6882	-3.0408
	(0.10611)	(0.0827)	(0.298)	(0.10931)
lop_p			4.942	14.62***
			(5.816)	(0.0795)
lop_n			28.68**	29.63*
			(0.0276)	(0.074)
Constant	0.107***	0.135***	0.0878***	0.0361***
	(0.0351)	(0.0264)	(0.0287)	(0.0127)
Hausman test	**Symmetric**		**Asymmetric**	
$\ddot{X}_n^2$	1.44		38.04	
p-value	0.8377		0.0000	
Observations	64,200	64,200	64,102	64,102

P-values are in parentheses; *** p<0.01, ** p<0.05, * p<0.1

One substantial feature of this group is that stock returns responded to upwards and downwards oil price variation in the same direction in the short run (negative) and long run (positive). This unique feature showed psychological intuition of investors regarding oil price changes. Most of the investors did not have adequate information on stock market dynamics. Either that investors reacted to stock market changes through unguarded and inexperienced stock brokers or via their personal intuition. This asymmetric result can be interpreted thus: at the initial oil price change (whether upward or downward), investors are likely to pull out their investment thereby causing dwindling of stock returns. Here, investors do not consider various differences across sectors and companies. As oil price risk persists, they begin to consider differences across companies which include market capitalization. At this point, investors begin to invest in relatively secured and stable sectors to oil price changes which included health, insurance, ICT, service sectors that constituted this group. Hence, the returns of the group gained irrespective of the direction of the changes. They see these companies as safe haven for investment which happened to be the least capitalization firms.

Generally, this lowest capitalized group exhibited asymmetries as depicted in Table 4.20. Negative oil price change has higher impact considering the magnitude of the coefficient (28.68) than positive impact (5.81) in absolute term with a wrong sign. Control variables here played less role in determining the stock returns except exchange rate as shown in model 2B. Summarily, it can be inferred that in all the quartiles, oil price variations affected stock market returns asymmetrically. Though, oil price distortion had much impact on the highermarket capitalized companies than least market capitalized companies after taking cognizance of magnitude of their coefficients. The study concluded that least capitalized firms were more stable to oil price risk in the NSE.

4.5 Discussion and Synthesis of the Results

In this section, a discussion of the empirical results addressing the dynamics of oil price variation on sectoral's stock returns in Nigeria Stock Market is documented. Available information in the literature suggested that the reaction of stock market returns to oil price dynamics depends on whether the country is net oil exporter or net oil importer in the world oil market (see: Ramos and Veiga, 2013; Wang et al., 2013; Salisu and Isa, 2017). Table 4.21 is used for the discussions.

4.5.1 Synthesis of the result for the aggregate market

Firstly, the study discussed the relation between aggregate stock market returns and oil price variation in Nigeria. There was inverse relationship between oil price change and stock returns in Nigeria in symmetric form. This result reinforces the result of our descriptive statistics in Table 2.7 of our background chapter where the magnitude of negative impact of oil price risk dominated the positive impact in aggregated level. Babatunde et al. (2012) found similar result in Nigeria but with insignificant coefficient for oil price variable. The difference in results between Babatunde et al. (2012) and present study could be traced to differences in data sample. Babatunde et al. (2012) used quarterly series of All Share Index while the present study applied daily returns data from the NSE. Empirical evidence of similar findings was documented by Adeleke (2010) for Nigeria, Ghosh and Kanjillal (2014) for India and Bachmeier (2008) for United State of America. One general characteristic among these aforementioned findings is that they did not consider asymmetries associated with oil price. There are relatively new findings in the literature that argued that the actual impact of oil price change on stock returns can be estimated only with recourse to the asymmetric nature of oil price (Narayan and Gupta, 2014; Broadcast and Fillis, 2014).

Thus, this study estimated the same relation while taking cognizance of oil price asymmetries; as it was established in the literature (Ramos and Veiga, 2014; chuku et al., 2010). There was evidence that oil price dynamics (changes) significantly and positively affect stock returns in Nigeria stock market whether the changes was positive or negative as shown in Table 4.21. This implied that there was positive relationship between oil price variation and aggregate stock return in Nigeria irrespective of the direction of oil price changes in the long run. This result first revealed that oil price fluctuations explained stock market returns in Nigeria. It also showed that Nigeria stock market returns exhibited oil price asymmetries. Moreover, negative oil price asymmetries had more influence (25.46%) than positive oil price asymmetries (5.13%) in model 2B of Table 4.3 in the long run. Phan et al. (2014) reported corresponding results for oil producing countries. Although, our finding is in contrast with much of the available information from the prior literature which generally summited that positive oil price changes improved stock returns of oil exporting countries while negative oil price changes had little or no effect on the stock returns of oil exporting countries. They claimed that negative oil price variation impacted negatively only on oil importing countries (inter-alia: Ramos and Veiga, 2013; Sim and Zhou, 2015; Narayan and Gupta, 2014; Salisu and Isa, 2017). From the background chapter of this study, it was documented that Nigeria is a net exporter of oil and in contrast, Nigeria imports more than 70% of its petroleum products for domestic use; which ranks her among the world's top 15 countries where fuel importation comprises large share of total imports (NNPC, 2017). Therefore, Nigeria can be classified as 'oil-exporting-importing economy'.

The positive interaction found in the oil price asymmetries and aggregate stock returns in the study is discussed in the context of the Nigerian economy. In Nigeria, government purchases and household consumption are unarguably complementary. Hence, during oil price increases, the country usually experiences increase in revenue arising from transfer of wealth from the country's oil trading partners. Improvement in government revenue always follows increase in foreign reserves[59], Excess Crude Account[60] (ECA) and government purchases. The rise in government expenditure leads to higher household consumption (income) thereby facilitating firms' cash flows, productivity and ultimately profitability. This scenario will unavoidably increase the value of stock prices and enthrone bullish behaviour in the stock market. Consequently, given the fact that external reserves and ECA are increasing, equally serves as buffer thereby enhancing (foreign) investor's confidence in the economy including stock market[61]. The converse is the case for negative oil price changes. The link established above indicated that stock market returns and oil

[59] The recent build up in Nigeria's external reserves was attributed mainly to the upsurge in oil prices sustained by fiscal prudence (CBN, 2019).
[60] Excess Crude Account (ECA) is an account created by Nigeria government to save revenue in excess of budgetary benchmark price of sale of oil in order to shore up the economy against incessant international oil volatility.
[61] Financial investors perceive it as positive news for investment when a country conserves huge external reserves.

price asymmetries (either positive or negative oil price variation) are positively related in Nigeria.

As regards to the control variables used in the study, stock returns in Nigeria stock market signaled exposure to bilateral exchange rate risk. Aggregate stock returns reacted to the exchange rate risk with average estimated coefficients of -0.02 and -0.82 in the short run and long run respectively in model 2B of Table 4.3. These values revealed that every percentage depreciation in naira on daily basis as a result of dollar appreciation led to 0.02 and 0.82% fall in the value of stocks in NSE in the short and long run, respectively. This result seems plausible given the fact that majority of Nigeria firms and households are importers of inputs and consumables (and even luxuries) respectively. This implied that over dependence of Nigerians on importation of inputs and consumables worsened exchange rate and this negatively affected stock returns. Further, it is likely that government policy on exchange rate in Nigeria where different exchange rate is applied to different transactions and sector could also contribute to the inverse relationship. The result of the study conforms to the findings of Olowookere (2012). According to Olowookere (2012), exposure to the bilateral exchange rate and purchasing power parity deviation results in a fall of about 1.7% and 1.1% respectively on Nigeria stocks monthly. Global market risk was inversely related to aggregate stock market as expected in the long run from model 2B of Table 4.3. The estimated coefficient revealed that if world stock market risks worsen by 1%, returns on Nigeria stock will drop about 0.45% in the long run.

The study recorded insignificant of market liquidity in the long run although with the right sign from model 2B in Table 4.3. This simply means that turnover ratio in the Nigeria stock market may be unable to explain return on stocks. It is expected that fundamental earnings analysis and the forces of demand and supply should be the focal point at which investors invest in stock market. However, Shiller (2000), identified subtle reaction by investors who invest on stocks simply because few other agents (investors) are buying stocks. Here, the increase in stocks turnover is not necessarily that the true value of the assets had risen; rather, investors believe that asset value is high when they observe other investors buying. This is called herding in finance parlance. The situation can be used to explain insignificance of liquidity ratio in Nigeria stock market which usually experiences massive influx and later massive exit of investors due to herding tendency. These (herding) investors ignore market fundamentals but follow market-crowd-behaviour. Such uninformed behaviour results when investors do not understand stock market dynamics and operation. This may be the characteristics of Nigeria investors and why liquidity ratio was not significant in the true model of this study.

4.5.2 Synthesis of the results for sectoral analysis

Prior literature documented that oil price risk has varied influence across sectors and industries (Broadstock and Filis, 2014). Arouri et al. (2012) stated that the use of sectoral level indices in assets or equity analysis tends to be plausible because market aggregation may mask or suppress the characteristics of some sectors. Therefore, the study focused on sectoral analysis of the effect of oil price asymmetries to equity returns in Nigeria. In this sectoral's analysis, the discussion focused on the asymmetric results of oil price changes in each sector both in the short run and long run. The discussion revealed the similarity and dissimilarity among the sectorals' results and equally compared them to aggregate stock market result in column 4&5, row 4 of Table 4.21.

The result revealed that oil price asymmetry did not have any significance impact on AGRICULTURAL, ICT, INDUSTRIAL, NATURAL RESOURCES AND SERVICE SECTOR stock returns in both the short run and long run in the study. Although, industrial and ICT sector stocks recorded positive and negative significant response respectively to negative oil price variation in the short run. The study concluded that oil price asymmetries did not determine the stock price of these sectors in the long run. The result supported the findings of Cong et al. (2008) which concluded that oil price changes did not show statistically significant effect on the stock returns of most Chinese sectoral stock market except manufacturing and oil companies. However, these five sectoral results are in contrast to aggregate stock returns results (column 4&5, row 4 of Table 4.21) that affirmed responsiveness of stock market returns to oil price asymmetries in Nigeria. This could account for the reason why, 3 of the 5 sectors exhibited the least volatility among the sectors in the study's descriptive statistics in Table 4.1. As observed in the study's result, oil price changes did not explain the behaviour of the stock returns in these sectors.

This implied that there is evidence of some big firms or sectors masking the effect of oil price changes to equity returns in Nigeria when aggregate market indices were used.

The next category of result obtained showed that CONGLOMERATES, CONSTRUCTION AND HEALTH SECTOR stock indices reacted differently to oil price changes in different horizons. CONGLOMERATES sector responded to positive oil price change positively and did not react to negative oil price change in the short run. Whereas in the long run, CONGLOMERATES sector was directly and inversely related to positive and negative oil price fluctuation respectively. Positive and negative oil price change did not explain behaviour of CONSTRUCTION sector stock returns in Nigeria in the short run. Although, in the long run, oil price asymmetry had an inverse relationship with CONSTRUCTION sector stock returns in Nigeria. The result equally suggested that positive oil price fluctuation did not account for HEALTH sector's stock return in Nigeria both in the short run and long run. While negative oil price change affected HEALTH sector's equity returns positively in the short run and long run. This result implied that asymmetries in oil price fluctuation affected different sectors differently depending on their market structure[62] to oil price risks. Huang et al. (2015) study had similar finding that Brent crude oil had various temporary and persistent effects on Chinese stock market.

The results of CONSUMER GOODS, FINANCIAL, AND OIL & GAS SECTORS reported a positive relationship between oil price asymmetry and returns on stocks in the long run. However, the responses of stock returns to asymmetric oil price of these sectors varied in the short run. CONSUMER GOODS, FINANCIAL and OIL & GAS stock returns reacted to positive oil price risk negatively, positively and insignificance, respectively as indicated in Table 4.21. Then, negative oil price change affected CONSUMER GOODS, FINANCIAL and OIL & GAS sector stock returns positively, positively and negatively, respectively. The returns on stocks of the three (3) sectors responded positively to oil price asymmetry (positive and negative oil price fluctuation) in the long run. The descriptive statistics as documented in Table 4.1 revealed that the sectors are the most volatile and oil and gas sectors earned the highest return in NSE; thereby

[62] Such as firm's or sectoral's utilization of energy, nature of the firm's product, managerial ability of the sector etc.

supporting their sensitivity to oil price changes. This implied that oil price fluctuation explained the behaviour of these sectors. Li et al. (2012) finding for China was similar to the study's result. Huang et al. (2015) found the same result for financial and consumer goods sector but a contrast result for Energy (oil and gas) sector for China. Sonenshine and Cauvel (2017) found opposite result for consumer goods in US.

Table 4.21: Summary analysis of stock returns dynamics and Oil price movement

Oil Price-Stock Returns Relation in Sectoral Level in Nigeria				
Sectors	Asymmetric Short Run Model		Asymmetric Long Run Model	
	Positive Relation	Negative Relation	Positive Relation	Negative Relation
Aggregate Stocks	-0.114***	-0.104**	5.131**	-25.46**
Agriculture	0.0258	0.00476	-1.849	1.614
Conglomerates	0.0969**	-0.0781	5.97**	9.39**
Construction	0.0108	-0.0226	-2.939**	2.464**
Consumer Goods	-0.0383**	-0.0383**	1.309***	-39.59**
Financial	0.186**	-0.140**	3.837***	-18.81**
Health	0.0019	-0.0581**	2.812	-0.294***
ICT	0.0146	0.164**	-3.303	-0.83
Industrial	-0.0258	-0.0458**	0.658	3.334
Natural Resources	0.0027	0.0531	1.772	-2.254
Oil & Gas	0.0188	0.0612**	2.377**	-1.726***
Services	0.004	-0.0322	-2.239	0.0583
Firm's Size Effect				
First Quartiles	-0.102***	-0.102***	1.232**	-54.88***
Second Quartiles	0.0562**	-0.0750***	0.729***	-26.81***
Third Quartiles	-0.0148	-0.0136	4.419**	15.69***
Forth Quartiles	-0.124***	-0.0388	4.942	28.68**

Where *** p<0.01, ** p<0.05, * p<0.1

A striking common characteristic of the three sectorals' stocks was their asymmetric responses to oil price changes were similar to the result of the aggregate stock market[63]. This remarkable observation may not be unconnected to the fact that the three sectors (consumer goods, financial and oil & gas) constituted more than 70% and 75% of the total market capitalization in the Nigeria Stock Exchange and the study's sample respectively. The result suggested that firm's or sectoral's characteristics could actually influence the result obtain when considering aggregate studies. Prior empirical studies had acknowledged that firm's characteristics may be suppressed or masked when using aggregate indices in such analysis like oil price-stock returns nexus (see: Phan et al., 2014). The relationship between the three sectors' result may have played a key role in the result of aggregated stock market. Hence, the result gives credence to the sectoral analysis being undertaken in this study as to reveal respective sectoral response to oil price fluctuations.

4.5.3 Discussions and synthesis of quartiles analysis results

The analysis adopted the true-asymmetric model for each quartile in this discussion. The first quartile – the most capitalized firms in the NSE considering the study's sample had varied results in the short run. Positive oil price movement was inversely related to stock returns in the group while negative oil price change had the expected effect as documented in Table 4.21. Most capitalized-firms' stock prices exhibited asymmetric behaviour with theoil price change in the long run.

For the second most capitalized firms, upward or downward oil price variations was positively related to the stock returns of the group in both the short run and long run. This implied that when oil price moves up, the quartile stocks moves up too and vice versa across the period. The third quartile of the most capitalized firms in NSE did not show any response to oil price movement in the short run. This showed that international oil price change did not explain the behaviour of stock prices in this group. Perhaps, this may be due to the components of the firms in the group that are mainly from health, services and agricultural sectors that were unresponsive to oil price changes. Although, positive oil price variation impacted positively to the quartile's stock returns in the long run. While negative oil pricen fluctuation had an inverse relationship.

[63] Increase and decrease in oil price changes had positive relation to stock market returns in Nigeria in the long run.

The group of least capitalized firms has an interesting behaviour. In the short run, positive oil price movement negatively affected the group's stocks with significant coefficient and negative oil price change showed no impact in the short run. Turning to the long run, the quartile recorded no influence of positive oil price movement. Negative oil price movement was inversely related to the group, revealing that when oil price declines, the low capitalized firm's stocks gained value.

Generally, the study inferred that international oil price variations affected first most capitalized firms stocks more than the least capitalized firms in the study. This implied that firm's size is a determinant of how oil price risk affects stock returns of firms in the NSE. From the analysis, least capitalized firms insulate firm's stocks from oil price risk than most capitalized firms in the NSE.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary

International oil market is characterized by incessant price variations mainly arising from demand and supply shocks. Variations in oil price results in foreign exchange liquidity challenges and financial imbalances and finally affects capital market through portfolio investment. In Nigeria, episode of oil price variation (such as continuous decrease in oil price) results in dwindling of government revenue base. Reduction in government income leads to depletion of country's foreign reserve. This often times triggers foreign portfolio divestment thereby, forcing exchange rate, portfolio investment, stock price and finally stock returns to depreciate.

Therefore, the study focuses on estimating the relationship between oil price asymmetry (positive and negative oil price change) and stock returns in Nigeria at sectoral level. The study considered eleven sectors from the NSE which includes: Agriculture, Conglomerates, Construction, Consumer Goods, Financial, Health, ICT, Industrial, Natural Resources, Oil & Gas and services. The second objective of the study is to find out if firm's size determines how oil price risk affects her stock returns. The empirical method applied in this panel time series analysis is Nonlinear Autoregressive Distributed Lag framework that is based on estimating both short run and long run dynamics of the control variables using Mean Group (MG) and Pool Mean Group (PMG) estimators. The study carried out the same analysis in linear form (where oil price was not divided into positive and negative oil price change) which was being considered as a spurious regression. Furthermore, the Hausman test was conducted in both symmetric and asymmetric model in order to establish the efficient model between the MG and PMG estimators.

A good number of interesting results emerged from the exercise. The results of descriptive statistics showed that the different sectors had different average returns. Oil and Gas sector had the highest return followed by Construction sector. Service sector stocks earned lowest returns in the NSE. The summary statistics also revealed that oil and gas sector is the most volatile sector, followed by consumer goods and financial sector in that other while the least volatile sector is natural resources, then followed by Construction and ICT sector. The study deduced from the summary statistics that the most volatile sector earns highest returns. This could imply that equity holders are compensated for the extra risk they take. Hence, returns and level of risk exposure seem to be positively related in the NSE going by the descriptive analysis. Concerning the correlation of the various risks (premiums) to stock returns across sectors, oil price risk showed positive association with stock returns in all the sectors except conglomerates. Amazingly, the correlation was very weak across all sectors. The positive correlation could suggest the outcome of income effect of rising oil price in net oil-exporting countries like Nigeria (Ramos and Veiga, 2013).

The relationship between exchange rate risk and sectoral stock returns in the study was negative in the descriptive analysis. The inverse relationship could be attributed to relative poor management of exchange rate policy by monetary authority in Nigeria. Changes in world market risk showed a weak correlation in all sectoral stock returns in this study. Although, some of the sectors namely: conglomerates, construction, consumer goods and industrial documented positive correlation while agriculture, health, ICT, natural resources, services, oil and gas sectors indicated negative correlation. Domestic market liquidity, in all the sectors indicated positive correlation. This is expected because if it is easy and less time consuming to convert stocks to money, there will be an improvement in turnover ratio and stock returns.

For the test of the statistical properties of the variables in the empirical model, the study adopted three unit root tests meant for long panel analysis. The first category was based on the null hypothesis of Unit root with common process. The second category rested on the null hypothesis of Unit root with individual unit root process. Then, the third, however, tested the null hypothesis of no unit root with common unit root process. Generally, from the observed characteristics of the variables across all sectors when subjected to various panel unit root test, it was inferred that the stationarity status of the series showed mixed order of integration of not more than I(1) which is I(0) and I(1). Hence, this characteristic underscored the choice of ARDL model as the suitable technique for this study. Moreover, since oil price was decomposed partially into positive and negative oil price, it also validated the adoption of NARDL as the appropriate estimation framework for the study.

The results of empirical analysis in aggregate level revealed that oil price risk significantly and positively affected stock returns in Nigeria stock market whether the changes was positive or negative. It also showed that Nigeria stock market returns exhibited oil price asymmetries. Negative oil price asymmetries had more influence (25.46%) than positive oil price asymmetries (5.13%) as shown in Table 4.3. Exchange rate risk was negatively related to aggregate stock returns in both long run and short run. Similarly, global market risk worsened returns on the NSE. Domestic Market liquidity did not explain the behaviour of Nigeria stock market returns in the long run.

However, there were obvious differing responses of sectoral stock returns to oil price risk when the sampled firms were disaggregated. In the result, oil price asymmetry did not have any significance impact on AGRICULTURAL, ICT, INDUSTRIAL, NATURAL RESOURCES and SERVICE SECTORS' stock returns in both the short run and long run. The study concluded that oil price asymmetries do not determine the stock price of these sectors in the long run.

CONGLOMERATES, CONSTRUCTION AND HEALTH SECTORS' stock indices reacted differently to oil price risk in different periods. In the long run, CONGLOMERATES sector stock price was positively and inversely related to positive and negative oil price variation respectively. Positive and negative oil price dynamics did not explain the behaviour of CONSTRUCTION sector stock returns in the short run. However, in the long run, oil price asymmetry had an inverse relationship with CONSTRUCTION sector stock returns in Nigeria. The result equally suggested that positive oil price fluctuation did not account for HEALTH sector stock return in Nigeria both in the short run and long run. While negative oil price change influenced HEALTH sector equity returns positively in short run and long run.

The results for the CONSUMER GOODS, FINANCIAL, and OIL & GAS sectors were similar to the aggregate stock market result. CONSUMER GOODS and FINANCIAL sector stock returns reacted to positive oil price risk negatively and positively respectively in the short run while OIL and GAS sector was unresponsive to positive oil price shock in the short run. Negative oil price risk affected CONSUMER GOODS, FINANCIAL and OIL & GAS sector stock returns positively, positively and negatively respectively in the short run. In the long run, oil price risk influenced CONSUMER GOODS, FINANCIAL, AND OIL & GAS SECTOR stocks positively

In addressing the second objective on whether firm's size contributes in determining how oil price risk impact on stock returns, our sampled firms were decomposed into four quartiles. The focus of the analysis here rested on the efficient asymmetric model. First quartile is the most capitalized firm, second quartile is the second most capitalize firms in our sample and it follows in that order. In the long run, the most capitalized firms' (first quartile) stock prices was positively related to oil price change be it positive or negative oil price change. It was only exchange rate risk that was significant amongst the control variables in this group in both the short and long run. For the second quartile, oil price asymmetry was positively related to the stock returns of the group in both the short run and long run. Exchange rate and market liquidity were equally significant in both the short run and long run. Turning to the third quartile, oil price change did not explain the group's stock returns in the short run. But, positive oil price variation impacted positively to the quartiles stock returns in the long run, while negative oil price fluctuation had an inverse relationship. Exchange rate risk was significantly related to stock market returns in this group in short and long run while global market risk explained part of the behaviour of stock returns in the long run. For the last group, the quartile recorded no influence of positive oil price change while negative oil price change was inversely related to the group stockprices. However, none of the control variables was significant in the short run but, in the long run; exchange rate was significantly and inversely related to the quartiles stock returns.

5.2 Conclusion

One of the major conclusions that can be drawn from the study is that oil price risk is critical in influencing the behaviour and performance of stock market returns in the NSE. The empirical evidence established in this study supports the presence of asymmetries in oil price-stock returns relation in aggregated level.

Regarding the first objective of the study which tested if sectoral stock returns react to oil price changes asymmetrically, the study concluded that different sectors responded to oil price change differently. Three of the eleven sectors examined did not respond to oil price in both symmetric and asymmetric form in Nigeria. These sectors are AGRICUTURE, NATURAL RESOURCES AND SEVICES sectors. Among sectors that reacted asymmetrically to oil price risk, INDUSTRIAL and ICT sectors only reacted to oil price change in the short run. The study also found that positive and negative oil price risk had positive and inverse relationship with CONGLOMERATES stock returns respectively in the long run. CONSTRUCTION sector stock return was inversely correlated to positive and negative oil price variation in the long run. Negative oil price risk affected HEALTH sector stocks positively in the long run while positive oil price risk had no impact in the sector. Results from CONSUMER GOODS, FINANCIAL, AND OIL & GAS SECTORS indicated that positive and negative oil price risk had positive relationship with the sectorals' stocks in the long run. This implied that there is positive relation between oil price risk and stock prices of the three sectors.

The empirical results regarding the second objective of the study indicated that firm size mattered on how oil price risk impact on stock returns. The more capitalized and big firms reacted to international oil price fluctuation than small capitalized firms. The result showed that risk from oil price negatively affects big firms' stocks more, than the small capitalized firms. From the forgoing, least capitalized firms tend to insulate or safeguard firms' stocks from oil price risk in NSE. Moreover, the study also observed that downward oil price risk impacted more on stocks' returns than positive oil price movement across the quartiles in the long run considering the estimated coefficients. Exchange rate accounted significantly to the behaviour of stock market returns irrespective of the size of the firm. Market liquidity influenced stocks of the most capitalized firms than the least capitalized firms. Global market risk was not significant across the quartiles except the third quartile with the expected sign.

5.3 Policy Recommendations

The study had shown that the effect of oil price variation has significant impact in explaining the returns of Nigeria financial market. However, this effect has been established to be sector-specific in the market. Therefore, these findings will be useful to financial manages in considering sectoral specific risk in constructing and managing risk associated with oil price risks.

Specifically, the study found that the impact of positive and negative oil price changes varies in magnitude and across sectors confirming the evidence of oil price asymmetry in the NSE. Hence, this result brings to the fore the need for requisite hedging strategy according to the asymmetric impact of the oil price risk by the financial managers in Nigeria. Indeed, derivative market has not been well developed in Nigeria, with the information about the asymmetric nature of oil price risk across sectors as evidence in the study, financial managers should do well to incorporate the asymmetric oil price risk information and develop better hedging strategy that will insulate each sector from asymmetric oil price risk accordingly.

The results showed that instability in oil price affects more capitalized and big firms than least capitalized firms. It is obvious that these big firms are very critical in the development of stock market and economy generally. For example, the results from oil and gas, financial and consumer goods sector were believed to influence the result of aggregate stock return result in this analysis. Therefore, financial authority should do well to monitor and have effective securities' law that will ensure that these firms play according to the rule. Developing markets are known to characterize with market imperfections ranging from poor information disclosure, poorly enforced legal right, bribery and corruption and obstacle to settlement arrangement. These impediments hamper stock market effectiveness especially when they are associated with big firms (critical sectors). The financial market authority should put in place the legal and enforcement policies that will address such issues especially when it concerns big firms so to give the same enabling environment to the small firms and protect the stock market and economy from collapsing.

One of the fundamental problems against financial investment in Nigeria has been exchange rate risk as evidenced in the results. Activities of the stock market across all the sectors are associated with the problem of exchange risk exposure and pricing in the NSE. Therefore, government is encouraged to put adequate measure in mitigating instability against exchange rate. Moreover, policy of differing exchange rate to different transactions and sectors in Nigeria is not investment friendly especially with stock market performance as this occasioned more instability and hampers stock market viability.

Building financial infrastructure is a panacea for effective and vibrant stock market as this will enhance market liquidity and turnover ratio that is relatively low in NSE. Investors from both domestic and foreign economies are naturally hesitant about investing in countries where minimum basic growth indices such as good roads, health, and power e.t.c. are lacking. This is because these infrastructural facilities are germane for development of productive firms, stock market and economy as a whole. Therefore, any government that wants to improve on the performance of the stock market and attract international portfolio investment must be clear about the importance of creating some basic preconditions for a viable capital market. Hence, the study calls for provision and upgrading of better infrastructural facilities in order to deepen the activities in the stock market and economy generally by the government.

In devising means to attract foreign investors, government should take cognizance that financial integration may come with mixed blessings especially in this era of financial internationalization. In as much as the study encourages the activities of financial integration among Africa like what we are witnessing in the West Africa Monetary Institute and beyond, to improve market liquidity and operations, they should be mindful of the associated risk with such openness. The associated risks can be from sudden loss of investor’s confidence in one of the countries stock market may trickle down or instigate divestment to another country’s market and this could have disastrous effect in the market. However, global market risk variable in our study did not have much impact across the sectors in the long run. Nevertheless, government should endeavor to pursue polies that will enable them to benefit from world capital flows and avoid associated risks.

5.4 Contributions to knowledge

There are few studies that have investigated oil price-stock returns nexus in Nigeria. It is undisputable that none of these studies had used NARDL to examine oil price-stock return link on disaggregated level while considering the asymmetric features of oil price. Hence, the study contributed to knowledge by showing how various sectors in NSE responded to oil price risk in both symmetric and asymmetric form. It is instructive to state that the study will help monetary authorities to develop the appropriate financial instruments to hedge oil price risk sectorally. The act will improve financial deepening and enthrone economic growth. Apart from empirical contribution, theoretically, the study adds to knowledge by modifying APT theory and infused negative and positive oil price change as a pervasive factor into the theory.

5.5 Limitations of the Study

It is obvious that the objectives set out in this study have been achieved. Sectoral analysis taken in this area of study is novel, hence, obtaining information especially stock price data in disaggregated level was vary tasking. Poor disclosure of information on stock market in Nigeria especially on sectoral level was a serious challenge in the course of the study.

Sectoral level analysis is quite applauding in this area, but one of the findings showed that firms react to oil price risk base on their sizes. Hence, it could be intuitively argued that oil price risk can affect firms in the same sector differently. Therefore, firm analysis may relatively give more robust result than sectoral one. One major limitation of the study is that we concentrated on sectoral level whereas firm's level will pin down firm's specific effect with the associated specific policy.

5.6 Suggestions for further Research

Future studies may consider the impact of oil price dynamics on sectoral stock returns while considering some sectoral's fundamentals like book to market rations, sectoral liabilities, earnings per share and credit risk as control variables. Another important extension of this study is to carry out firm level study in the Nigeria Stock Market. Future research can be carried out on the performance of stock market across West Africa Countries especially countries under the West Africa Monetary Institute

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APPENDIX SECTION

Appendix A1

Average Oil Price Dynamics and performance of selected Macroeconomic Variables, 1981-2015

Years	*Average GDP Growth (%)	Current Account (% GDP)	*Net Foreign Assets (N' B)	**Current Account ($US/B)	Total Reserve (% of Ext. Total Debt)	*Total reserves minus Gold	*Total external debt ($US/ B)	**Capital Formation (N' B) from CBN	***Bonny Light Price ($US/B)	*Export % GDP	*Import % GDP	**Total Import (N' B)	**Total Export (N' B)	*Export Growth Rate (%)	*Import Growth Rate (%)
1981-1985	-2.59	-5.51	1.53	-3.07	15.83	1.93	15.49	13.33	30.98	17.53	14.99	9.35	9.51	0.12	-16.88
1986-1990	1.45	4.03	15.78	1.18	6.70	1.71	28.89	22.22	17.97	28.49	14.33	24.37	47.67	4.98	-3.50
1991-1995	0.50	-2.72	25.73	-0.40	6.68	1.92	32.09	92.08	18.14	34.62	22.60	263.24	340.53	-1.22	0.59
1996-2000	3.26	3.14	479.53	1.55	23.16	6.82	30.33	250.38	19.89	37.86	27.73	818.66	1287.55	8.32	11.19
2001-2005	11.15	12.83	2082.94	12.06	46.46	14.03	33.11	681.03	34.33	36.60	27.32	1947.80	3709.87	6.16	24.22
2006-2010	7.22	13.49	7115.88	24.06	359.45	45.26	13.26	2520.00	77.68	34.55	25.15	5251.66	9327.99	18.83	21.88
2011-2015	4.70	1.39	7104.55	6.45	189.16	38.86	22.14	5643.89	99.11	21.98	14.13	10185.16	14649.62	4.94	-9.87

Sources: *World Development Indicator (2017), **CBN Statistical Bulletin (2016), ***NNPC Annual Statistical Bulletin (various issue) and Author's Computation

Appendix A2

Indicators of NSE performance and Macroeconomic Fundamentals, 1990-2015

Years	GDP Growth Rate (%)	M2/ GDP (%)	PUBLIC EXP. /GDP (%)	Total Public Debt (N' B)	Exchange Rate (%)	CPI %	Treasury Bill (%)	*MKT CAP (N'B)	* ASI
1990	12.8	11.2	70.5		8.0	7.0	17.5	12.1	423.7
1991	-0.6	13.8	49.1	382.7	9.9	13.0	15.0	18.4	671.6
1992	0.4	12.7	54.6	444.7	17.3	44.0	21.0	26.2	931.0
1993	2.1	15.2	59.4	722.2	22.1	57.1	26.9	41.8	1229.0
1994	0.9	16.5	63.3	907.0	21.9	57.0	12.5	61.0	1913.2
1995	-0.3	9.9	61.0	1056.4	21.9	72.8	12.5	175.1	3815.1
1996	5.0	8.6	64.7	1194.6	21.9	29.3	12.3	279.8	5955.1
1997	2.8	9.9	64.7	1037.3	21.9	8.8	12.0	276.3	7638.6
1998	2.7	12.2	75.4	1097.7	21.9	9.9	13.0	256.8	5961.9
1999	0.5	13.4	62.4	1193.9	92.7	6.6	17.0	294.5	5264.2
2000	5.3	13.1	47.7	3372.2	102.1	6.9	12.0	466.1	8111.0
2001	4.4	18.4	64.7	3995.6	111.9	18.8	13.0	648.4	10963.1
2002	3.8	19.3	83.6	4193.3	121.0	12.8	18.9	748.7	12137.7
2003	10.4	19.7	84.3	5098.9	129.4	14.0	15.0	1262.8	20128.9
2004	33.7	18.7	90.2	5808.0	133.5	14.9	14.2	1850.5	23844.5
2005	3.4	18.1	88.2	6260.6	132.1	17.8	7.0	2463.3	24085.8
2006	8.2	20.5	79.0	4221.0	128.7	8.2	8.8	4164.1	33189.3
2007	6.8	24.8	98.3	2204.7	125.8	5.3	6.9	9381.3	57990.2
2008	6.3	33.0	86.5	2608.5	118.6	11.5	7.0	6668.5	31450.8
2009	6.9	38.0	102.1	2843.6	148.9	11.5	3.7	4957.1	20827.2
2010	7.8	20.2	150.4	3818.5	150.3	13.7	5.6	7862.8	24770.5
2011	4.9	19.3	153.5	5241.7	153.9	10.8	11.2	6353.9	20730.6
2012	4.3	19.4	145.9	6519.7	157.5	12.2	13.6	8700.8	28078.8
2013	5.4	18.9	181.4	7564.4	157.3	8.4	12.0	12608.9	41329.2
2014	6.3	19.9	95.2	8492.6	158.6	8.0	10.4	10675.9	34657.2
2015	2.7	19.5	100.2	9535.5	192.4	9.0	9.3	9367.8	27245.5

Sources: CBN statistical Bulletin (various issues). * NSE FACT BOOK (various issues)

Appendix A3

Classification of the firms in Quartiles base on Market Capitalization, 2017

1st quartile	2nd quartile	3rd quartile	4th quartile
GUARANTY	PZ	UAC-PROP	ROYALEX
NESTLE	ASHAKACEM	STACO	DUNLOP
ZENITHBANK	JBERGER	STDINSURE	NNFM
NB	BETAGLAS	UNHOMES	AGLEVENT
ACCESS	DIAMONDBNK	PREMBREW	MORISON
STANBIC	FCMB	LASACO	NEIMETH
ETI	CCNN	LAWUNION	NIG-GERMAN
FBNH	WEMABANK	MBENEFIT	PHARMDEKO
FIDELITYBK	UACN	MAYBAKER	ABCTRANS
UBA	CAP	CHELLARM	ACADEMY
UNILEVER	CADBURY	SCOA	LEARNAFRCA
DANGSUGAR	CONOIL	CORNERST	RTBRISCOE
GUINNESS	NEM	UNION DICON	TRANSEXPR
UBN	GLAXOSMITH	NIGERINS	UPL
WAPCO	CHAMPION	GNI	JOSBREW
OKUMUOIL	SKYEBANK	BERGER	FIRSTALUM
LIVESTOCK	WAPIC	ALEX	NCR
MOBIL	NAHCO	CUTIX	TRIPPLEG
OANDO	CILEASING	BOCGAS	DEAPCAP
TOTAL	LINKASSURE	STDINSURE	UTC
7up	AIICO	SOVRENINS	INTENEGINS
TRANSCORP	VITAFOAM	GUINEAINS	UNIC
FLOURMILL	PRESCO	JAPAULOIL	EVANSMED
NASCON	PRESTIGE	PREMPAINTS	DNMEYER
STERLNBANK	ELLAH LAKES	ALUMACO	JOHNHOLT

Source: Compiled by the author using NSE MCAP.

Appendix A4

Construction sector

** mean group symmetric**************

Mean Group Estimation:

D.lstkr	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
ec						
lop	.1553648	.0628153	2.47	0.013	.032249	.2784806
lexr	-1.265657	.5150862	-2.46	0.014	-2.275208	-.2561066
lgbr	.6624991	.3504728	1.89	0.059	-.024415	1.349413
mktl	.0000401	.0000112	3.57	0.000	.0000181	.000062
r_{it-1}	5.05417	.0151507	2.24	0.258	.0042359	.0636254
SR						
ec	-.0376188	.0236664	-1.59	0.0237	-.0840041	.0087666
lop						
D1.	-.0577287	.0350053	-1.65	0.0350	-.1263378	.0108805
lexr						
D1.	.0211003	.0340045	0.62	0.535	-.0455473	.0877479
lgbr						
D1.	-.0013487	.0040217	-0.34	0.737	-.0092312	.0065337
mktl						
D1.	-7.66e-07	7.16e-07	-1.07	0.285	-2.17e-06	6.37e-07
r_{it-1}						
D1.	.0352133	.0139985	2.52	0.120	.0077768	.0626498
_cons	.370536	.3919324	0.95	0.344	-.3976374	1.138709

** pooled mean group symmetric ******************************

Log Likelihood = 9646.51

D.lstkr	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
ec						
lop	.2054001	.0774906	2.65	0.008	.0535213	.3572788
lexr	-2.264359	.1056398	-21.43	0.000	-2.47141	-2.057309
lgbr	-.0148941	.1272418	-0.12	0.127	-.2642834	.2344951
mktl	.0000611	.0000746	0.82	0.413	-.0000852	.0002074
r_{it-1}	-5.054186	.0128595	-3.11	0.258	-.0652226	-.0148145
SR						
ec	-.031162	.0268387	-1.16	0.026	-.0836751	.0215308
lop						
D1.	-.0554303	.0370869	-1.49	0.037	-.1281194	.0172587
lexr						
D1.	.0201235	.0337986	0.60	0.552	-.0461205	.0863675
lgbr						
D1.	.0031145	.0018778	1.66	0.0017	-.0005659	.0067949
mktl						
D1.	-7.28e-07	7.43e-07	-0.98	0.327	-2.19e-06	7.28e-07
r_{it-1}						
D1.	.6859454	.4073218	1.68	0.192	-.1123907	1.484281
_cons	.4150793	.3549277	1.17	0.242	-.2805662	1.110725

```
* choosing between mg & pmg **************************

. hausman mg_symmetric pmg_symmetric, sigmamore

                 ---- Coefficients ----
             |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
             |  mg_symmetric pmg_symmet~c    Difference          S.E.
-------------+----------------------------------------------------------------
         lop |    .1553648    .2054001      -.0500353              .
        lexr |   -1.265657   -2.264359       .9987024        .5052918
        lgbr |    .6624991   -.0148941       .6773932        .3273842
        mktl |    .0000401    .0000611       -.000021              .
------------------------------------------------------------------------------

                  chi2(4)  =  (b-B)'[(V_b-V_B)^(-1)](b-B)
                           =        3.79
                Prob>chi2 =      0.4351
                (V_b-V_B is not positive definite)
```

```
**** mean group asymmetric**********************************
------------------------------------------------------------------------------
     D.lstkr |      Coef.  Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
ec           |
       lop_p |  -5.955913  3.696763   -1.61   0.107   -13.20144    1.289609
       lop_n |  7.550239  3.546758    2.13   0.033    .5987209    14.50176
        lexr |  -1.375344  .5342124   -2.57   0.010   -2.422381   -.3283072
        lgbr |  .5925151  .3242524    1.83   0.068   -.0430078    1.228038
        mktl |  .0000458  .0000113    4.04   0.000    .0000236     .000068
      r_it-1 |  .7620144  .1856849    2.60   0.137    .1196786    .8475502
-------------+----------------------------------------------------------------
SR           |
          ec |  -.0369039  .0230884   -1.60   0.023   -.0821564    .0083485
       lop_p |
         D1. |   .036006  .0173248    2.08   0.018      .00205     .069962
       lop_n |
         D1. |  -.0557082  .0409437   -1.36   0.040   -.1359563      .02454
        lexr |
         D1. |  .0214229  .0337343    0.64   0.525   -.0446951    .0875408
        lgbr |
         D1. |  -.0013743  .0039813   -0.35   0.730   -.0091775    .0064288
        mktl |
         D1. |  -8.68e-07  7.66e-07   -1.13   0.257   -2.37e-06    6.34e-07
      r_it-1 |
         D1. |  1.08914   .4073218    1.68    0.202   -.1123907    1.484281
             |
       _cons |  .4280648  .4190827    1.02   0.307   -.3933221    1.249452
------------------------------------------------------------------------------
```

** pooled mean group asymmetric ******************************

D.lstkr	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
ec						
lop_p	-2.939176	1.405135	-2.09	0.036	-5.693191	-.1851622
lop_n	2.463731	1.411184	1.75	0.081	-.3021393	5.229601
lexr	0.0203463	.0887743	-27.21	0.000	-2.589457	-2.241468
lgbr	0.00276	.1307124	-0.08	0.936	-.2667416	.2456416
mktl	.0000651	.0000765	0.85	0.395	-.0000849	.0002151
r_{it-1}	.4764632	.307815	1.55	0.122	-.126843	1.07977
SR						
ec	-.0305363	.0260626	-1.17	0.024	-.0816181	.0205455
lop_p						
D1.	.0107732	.0416652	0.26	0.041	-.0708892	.092435
lop_n						
D1.	-.0226253	.0555761	-0.41	0.05	-.1315524	.0863019
lexr						
D1.	.0203493	.0334394	0.61	0.543	-.0451907	.0858892
lgbr						
D1.	.0027777	.0018543	1.50	0.134	-.0008566	.006412
mktl						
D1.	-8.14e-07	8.07e-07	-1.01	0.313	-2.40e-06	7.67e-07
r_{it-1}						
D1.	4.222755	.4942015	2.47	0.190	.2541377	2.191372
_cons	.4603513	.3891896	1.18	0.237	-.3024462	1.223149

*** choosing between mg & pmg **************************

	(b) mg_asymmet~c	(B) pmg_asymme~c	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
lop_p	-5.955913	-2.939176	-3.016737	3.430887
lop_n	7.550239	2.463731	5.086508	3.26513
lexr	-1.375344	-2.415463	1.040119	.5283546
lgbr	.5925151	-.01055	.6030651	.2977653
mktl	.0000458	.0000651	-.0000193	.

= 3.78
Prob>chi2 = 0.4360
(V_b-V_B is not positive definite)

Industrial sector

Mean Group symmetric

D.lstkr	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
ec						
lop	-.3974265	.2401733	-1.65	0.040	-.8681576	.0733045
lexr	-1.392326	.3819636	-3.65	0.000	-2.140961	-.643691
lgbr	.7106529	.2572404	2.76	0.006	.2064709	1.214835
mktl	.0001073	.0000454	2.36	0.018	.0000182	.0001964
r_{it-1}	-.8145218	.0008622	-1.62	0.117	-.200172	-.002284
SR						
ec	-.0081609	.0009685	-8.43	0.000	-.0100592	-.0062626
lop						
D1.	-.011393	.0305606	-0.37	0.030	-.071297	.0484984
lexr						
D1.	.0194716	.0112181	1.74	0.011	-.0025155	.0414587
lgbr						
D1.	-.0009924	.0011057	-0.90	0.001	-.0031595	.0011747
mktl						
D1.	-2.92e-07	1.59e-07	-1.84	0.006	-6.03e-07	1.98e-08
r_{it-1}						
D1.	-2.670004	.399337	-6.69	0.278	-3.45269	-1.887318
_cons	.0399222	.0236854	1.69	0.092	-.0065004	.0863448

Pooled Mean Group symmetric Regression

D.lstkr	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
ec						
lop	-.1233361	.1796276	-0.69	0.180	-.4753997	.2287275
lexr	-.9421701	.2559676	-3.68	0.000	-1.443857	-.4404829
lgbr	.7044694	.2844906	2.48	0.013	.1468782	1.262061
mktl	.0000792	.0001661	0.48	0.633	-.0002463	.0004047
r_{it-1}	.033481	.0138128	2.64	0.248	.0094088	.0635538
SR						
ec	-.0064606	.0007378	-8.76	0.000	-.0079066	-.0050146
lop						
D1.	-.0128972	.0298182	-0.43	0.029	-.0713398	.0455454
lexr						
D1.	.0174754	.0107649	1.62	0.010	-.0036233	.0385742
lgbr						
D1.	-.00062	.0009852	-0.63	0.000	-.0025508	.0013109
mktl						
D1.	-2.29e-07	5.26e-08	-4.35	0.000	-3.32e-07	-1.26e-07
r_{it-1}						
D1.	.067841	.01499	2.26	0.642	.0044611	.0632208
_cons	.0107244	.0032082	3.	0.001	.0044365	.0170123

****** mean group asymetric ***********************************

D.lstkr	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
ec						
lop_p	1.266998	2.46351	0.51	0.464	-3.561393	6.095388
lop_n	.2347343	3.442971	0.07	0.243	-6.513365	6.982833
lexr	-1.108381	.2236466	-4.96	0.000	-1.54672	-.6700417
lgbr	.6081707	.2983479	2.04	0.042	.0234195	1.192922
mktl	.0001175	.0000474	2.48	0.013	.0000246	.0002103
r_{it-1}	-.0394984	.0130992	-3.02	0.223	-.0651723	-.0138245
SR						
ec	-.0073797	.0008829	-8.36	0.000	-.0091102	-.0056491
lop_p						
D1.	-.0281733	.0425043	-0.66	0.042	-.1114803	.0551337
lop_n						
D1.	-.0423923	.0231211	-1.83	0.023	-.0877087	.0029241
lexr						
D1.	.0183921	.0109643	1.68	0.011	-.0030974	.0398817
lgbr						
D1.	-.0004279	.0010097	-0.42	0.001	-.0024069	.0015511
mktl						
D1.	-2.86e-07	1.35e-07	-2.12	0.034	-5.51e-07	-2.10e-08
r_{it-1}						
D1.	-.9453322	.5708837	-1.66	0.098	-2.064244	.1735794
_cons	.0185193	.0105139	1.76	0.078	-.0020876	.0391262

*** pooled mean group asymmetric*******************************

D.lstkr	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
ec						
lop_p	.6580889	2.997253	0.22	0.826	-5.216419	6.532597
lop_n	3.334168	3.078026	1.08	0.279	-2.698653	9.366989
lexr	-.8043485	.2003274	-4.02	0.000	-1.196983	-.411714
lgbr	.6716145	.2795694	2.40	0.016	.1236686	1.21956
mktl	.0000791	.0001632	0.49	0.628	-.0002407	.0003989
r_{it-1}	.4993334	3.791373	0.13	0.625	-6.931622	7.930288
SR						
ec	-.0063892	.000796	-8.03	0.000	-.0079492	-.0048291
lop_p						
D1.	-.0257761	.0425924	-0.61	0.042	-.1092556	.0577035
lop_n						
D1.	-.0458341	.0175108	-2.62	0.017	-.0801546	-.0115137
lexr						
D1.	.0172074	.0107575	1.60	0.010	-.003877	.0382917
lgbr						
D1.	-.0004841	.000935	-0.52	0.000	-.0023168	.0013486
mktl						
D1.	-2.05e-07	5.58e-08	-3.67	0.000	-3.14e-07	-9.53e-08
r_{it-1}						
D1.	.7491078	.4435463	1.69	0.191	-.120227	1.618443
_cons	.0049266	.003084	1.60	0.110	-.001118	.0109712

ICT SECTOR

. **************** mean group symmetric************************************

D.lstkr	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
ec						
lop	-.1789899	.5370424	-0.33	0.536	-1.231574	.8735938
lexr	-1.174944	1.344754	-0.87	0.345	-3.810613	1.460725
lgbr	-.2030243	.3508889	-0.58	0.356	-.8907539	.4847053
mktl	.0000316	.0000741	0.43	0.228	-.0001137	.0001769
r_{it-1}	-.9453322	.5708837	-1.66	0.198	-2.064244	.1735794
SR						
ec	-.0309248	.0197944	-1.56	0.018	-.0697211	.0078716
lop						
D1.	.0349691	.0137475	2.54	0.013	.0080245	.0619137
lexr						
D1.	.0140697	.001752	8.03	0.000	.0106358	.0175036
lgbr						
D1.	.006699	.0013116	5.11	0.000	.0041282	.0092697
mktl						
D1.	4.29e-07	9.99e-07	0.43	0.668	-1.53e-06	2.39e-06
r_{it-1}						
D1.	1.90933	8.217455	5.10	0.129	2.80341	8.01525
_cons	.0846115	.1535994	0.55	0.054	-.2164378	.3856607

* pooled mean group symmetric*******************************

D.lstkr	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
ec						
lop	.3272933	.1606929	2.04	0.042	.012341	.6422456
lexr	.115172	.2195585	0.52	0.220	-.3151547	.5454986
lgbr	.1201133	.2641652	0.45	0.264	-.397641	.6378676
mktl	-.0000398	.0001544	-0.26	0.154	-.0003424	.0002629
r_{it-1}	-.1558082	.0267071	-5.83	0.291	-.2081531	-.1034632
SR						
ec	-.0263451	.0242229	-1.09	0.024	-.0738211	.0211309
lop						
D1.	.0297385	.0073258	4.06	0.000	.0153802	.0440967
lexr						
D1.	.0080672	.0089672	0.90	0.368	-.0095082	.0256426
lgbr						
D1.	.0055412	.0005393	10.28	0.000	.0044843	.0065981
mktl						
D1.	7.12e-07	6.41e-07	1.11	0.266	-5.44e-07	1.97e-06
r_{it-1}						
D1.	-.1355227	.0312765	-4.33	0.217	-.1968236	-.0742218
_cons	-.0204978	.0163001	-1.26	0.016	-.0524455	.0114499

** mean group asymmetric***********************************

D.lstkr	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
ec						
lop_p	-3.058568	.1923025	-15.90	0.000	-3.435474	-2.681662
lop_n	-.911356	.056216	-16.21	0.000	-1.021537	-.8011746
lexr	-1.045771	.9401413	-1.11	0.266	-2.888414	.7968719
lgbr	-.3085896	.5176993	-0.60	0.551	-1.323262	.7060824
mktl	.0000374	.0000786	0.48	0.634	-.0001167	.0001914
r_{it-1}	-.0321475	.0129041	-2.49	0.113	-.0574391	-.0068559
SR						
ec	-.0286537	.0196331	-1.46	0.019	-.0671339	.0098265
lop_p						
D1.	.014019	.0125423	1.12	0.264	-.0105634	.0386014
lop_n						
D1.	.1668755	.0988048	1.69	0.018	-.0267783	.3605293
lexr						
D1.	.0160033	.0060573	2.64	0.008	.0041312	.0278755
lgbr						
D1.	.0067976	.0022799	2.98	0.003	.0023291	.0112661
mktl						
D1.	3.99e-07	8.79e-07	0.45	0.650	-1.32e-06	2.12e-06
r_{it-1}						
D1.	.0357261	.0160265	2.23	0.126	.0043147	.0671374
_cons	.107769	.0523667	2.06	0.040	.0051322	.2104057

** pooled mean group asymmetric******************************

D.lstkr	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
ec						
lop_p	-3.302548	2.971731	-1.11	0.266	-9.127033	2.521938
lop_n	-.8304275	2.992967	-0.28	0.299	-6.696534	5.035679
lexr	-.1534025	.1889661	-0.81	0.189	-.5237692	.2169642
lgbr	.1561471	.2777467	0.56	0.278	-.3882265	.7005207
mktl	-.0000362	.000162	-0.22	0.823	-.0003537	.0002813
r_{it-1}	3.956227	.756263	0.45	0.651	-1.20573	1.11819
SR						
ec	-.0253458	.0226806	-1.12	0.022	-.069799	.0191074
lop_p						
D1.	.0145921	.021602	0.68	0.499	-.027747	.0569311
lop_n						
D1.	.1637495	.0994903	1.65	0.019	-.031248	.3587469
lexr						
D1.	.0120479	.0111881	1.08	0.282	-.0098805	.0339762
lgbr						
D1.	.0055022	.0003374	16.31	0.000	.0048409	.0061636
mktl						
D1.	6.23e-07	5.23e-07	1.19	0.233	-4.01e-07	1.65e-06
r_{it-1}						
D1.	.0910847	.5220727	0.17	0.861	-.932159	1.114328
_cons	.04445	.0429413	1.04	0.041	-.0397134	.1286134

HEALTH SECTOR

*** mean group symmetric***********************************

D.lstkr	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
ec						
lop	-.5712605	.4271916	-1.34	0.181	-1.408541	.2660197
lexr	-2.927589	1.243324	-2.35	0.019	-5.364458	-.4907195
lgbr	.8530648	.7085311	1.20	0.229	-.5356307	2.24176
mktl	.0000421	.0001325	0.32	0.751	-.0002176	.0003018
r_{it-1}	.7723645	.696956	3.75	0.311	5.16705	2.3777
SR						
ec	-.0083189	.0024274	-3.43	0.001	-.0130765	-.0035612
lop						
D1.	-.0282029	.0225635	-1.25	0.211	-.0724264	.0160207
lexr						
D1.	.0030049	.0142641	0.21	0.833	-.0249522	.030962
lgbr						
D1.	-.0004725	.0026149	-0.18	0.857	-.0055976	.0046526
mktl						
D1.	2.20e-07	3.82e-07	0.58	0.564	-5.28e-07	9.69e-07
r_{it-1}						
D1.	-.2745515	.7085562	-0.39	0.264	-1.663296	1.114193
_cons	.0550863	.0251397	2.19	0.028	.0058135	.1043591

**** pooled mean group symmetric ******************************

D.lstkr	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
ec						
lop	-.3720955	.2100535	-1.77	0.021	-.7837928	.0396018
lexr	-2.308667	.2942942	-7.84	0.000	-2.885473	-1.731861
lgbr	-.0534094	.3439206	-0.16	0.344	-.7274814	.6206626
mktl	.0000646	.0001988	0.32	0.745	-.000325	.0004541
r_{it-1}	-.1722105	.019683	-8.75	0.111	-.2107884	-.1336326
SR						
ec	-.0060918	.0013223	-4.61	0.000	-.0086835	-.0035
lop						
D1.	-.0266634	.0201663	-1.32	0.186	-.0661887	.0128619
lexr						
D1.	.0031949	.0138359	0.23	0.137	-.0239229	.0303128
lgbr						
D1.	.0015123	.0025785	0.59	0.558	-.0035414	.006566
mktl						
D1.	2.26e-08	1.72e-07	0.13	0.895	-3.14e-07	3.59e-07
r_{it-1}						
D1.	-.003464	.0004116	-8.42	0.257	-.0042708	-.0026572
_cons	.0915985	.0185161	4.95	0.000	.0553076	.1278893

```
******* mean group asymmetric***********************************

------------------------------------------------------------------------------
     D.lstkr |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
ec           |
       lop_p |   2.811599  4.397618     0.64   0.439    -5.807574   11.43077
       lop_n |   .2944159  5.169553     0.06   0.017    -9.837721   10.42655
        lexr |  -2.308115  .7534931    -3.06   0.002    -3.784935  -.8312958
        lgbr |   .5379231  .5596204     0.96   0.336    -.5589129   1.634759
        mktl |   .0000242  .0001156     0.21   0.834    -.0002024   .0002507
     r_it-1  |  -.2200799  .0131991    -2.88   0.171    -.0638696  -.0121302
-------------+----------------------------------------------------------------
SR           |
          ec |  -.0080108  .0022828    -3.51   0.000     -.012485  -.0035365
       lop_p |
         D1. |   .0018995  .0150844     0.13   0.151    -.0276654   .0314644
       lop_n |
         D1. |  -.0580802  .0244183    -2.38   0.017    -.1059391  -.0102212
        lexr |
         D1. |   .0019774   .014603     0.14   0.146     -.026644   .0305987
        lgbr |
         D1. |  -.0003399  .0026908    -0.13   0.269    -.0056137    .004934
        mktl |
         D1. |   1.95e-07  3.76e-07     0.52   0.604    -5.42e-07   9.33e-07
     r_it-1  |
         D1. |  -.3796666  .0288658    -4.70   0.882    -.1922424  -.0790907
             |
       _cons |   .0549661  .0147773     3.72   0.000     .0260031    .083929
------------------------------------------------------------------------------
```

*** pooled mean group asymetric*******************************

D.lstkr	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
ec						
lop_p	-.1779481	3.910558	-0.05	0.111	-7.842501	7.486605
lop_n	5.051601	4.069448	1.24	0.214	-2.92437	13.02757
lexr	-1.994678	.2547491	-7.83	0.000	-2.493977	-1.495379
lgbr	-.1311798	.3662353	-0.36	0.366	-.8489878	.5866282
mktl	.0000637	.0002109	0.30	0.263	-.0003497	.0004771
r_{it-1}	.0378447	.0156969	2.41	0.116	.0070794	.0686099
SR						
ec	-.005982	.001365	-4.38	0.000	-.0086573	-.0033066
lop_p						
D1.	-.0027806	.0262499	-0.11	0.264	-.0542294	.0486683
lop_n						
D1.	-.0609126	.028942	-2.10	0.028	-.117638	-.0041873
lexr						
D1.	.0016607	.0140139	0.12	0.140	-.0258061	.0291275
lgbr						
D1.	.0015637	.002584	0.61	0.545	-.0035008	.0066282
mktl						
D1.	2.50e-08	1.70e-07	0.15	0.883	-3.09e-07	3.59e-07
r_{it-1}						
D1.	.2746973	.1545225	1.78	0.175	-.0281612	.5775558
_cons	.075136	.0161052	4.67	0.000	.0435705	.1067015

Service sector

*** mean group symmetric***********************************

D.lstkr	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
ec						
lop	-.3585282	.3469427	-1.03	0.301	-1.038523	.3214669
lexr	-2.520888	.6922044	-3.64	0.000	-3.877584	-1.164192
lgbr	.8967326	.6285307	1.43	0.154	-.3351649	2.12863
mktl	.0001631	.0000231	7.06	0.000	.0001178	.0002084
r_{it-1}	-5.940951	1.646602	-3.61	0.186	-9.168233	-2.71367
SR						
ec	-.0077069	.0023201	-3.32	0.001	-.0122542	-.0031595
lop						
D1.	-.0220655	.0154142	-1.43	0.152	-.0522767	.0081457
lexr						
D1.	-.0077194	.0110149	-0.70	0.483	-.0293081	.0138694
lgbr						
D1.	-.0023998	.0012559	-1.91	0.056	-.0048612	.0000617
mktl						
D1.	-2.50e-07	2.14e-07	-1.16	0.244	-6.70e-07	1.70e-07
r_{it-1}						
D1.	-.639361	.1079697	-5.92	0.209	-.8509777	-.4277442
_cons	.0761378	.0463475	1.64	0.046	-.0147016	.1669773

** pooled mean group symmetric ******************************

D.lstkr	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
ec						
lop	-.1796753	.2092396	-0.86	0.209	-.5897774	.2304267
lexr	-2.530705	.2911445	-8.69	0.000	-3.101338	-1.960073
lgbr	.1886673	.3428535	0.55	0.352	-.4833131	.8606478
mktl	.0001378	.0001982	0.70	0.198	-.0002506	.0005263
r_{it-1}	-.0046384	.0127702	-0.36	0.716	-.0296676	.0203907
SR						
ec	-.0056935	.0018911	-3.01	0.003	-.0094	-.001987
lop						
D1.	-.0225128	.0150582	-1.50	0.135	-.0520262	.0070007
lexr						
D1.	-.0088576	.0113212	-0.78	0.114	-.0310468	.0133315
lgbr						
D1.	-.0015713	.0011585	-1.36	0.175	-.0038419	.0006994
mktl						
D1.	-1.53e-07	2.04e-07	-0.75	0.454	-5.53e-07	2.47e-07
r_{it-1}						
D1.	-.0354101	.0153792	-2.30	0.221	-.0655527	-.0052675
_cons	.0749743	.0251926	2.98	0.003	.0255977	.124351

********** mean group asymmetric************************************

D.lstkr	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
ec						
lop_p	-2.238933	6.055981	-0.37	0.156	-14.10844	9.630571
lop_n	.0583255	7.365931	0.01	0.168	-14.37863	14.49528
lexr	-2.157053	.4709711	-4.58	0.000	-3.08014	-1.233967
lgbr	.6568417	.577309	1.14	0.255	-.4746631	1.788346
mktl	.0001614	.0000199	8.10	0.000	.0001224	.0002005
r_{it-1}	-.0004009	.0008786	-0.46	0.648	-.002123	.0013212
SR						
ec	-.0073937	.0022908	-3.23	0.001	-.0118836	-.0029037
lop_p						
D1.	.0040315	.0621608	0.06	0.162	-.1178015	.1258646
lop_n						
D1.	-.032179	.0293667	-1.10	0.293	-.0897368	.0253787
lexr						
D1.	-.0087505	.0117422	-0.75	0.117	-.0317648	.0142639
lgbr						
D1.	-.0021515	.001361	-1.58	0.114	-.004819	.0005159
mktl						
D1.	-2.44e-07	2.12e-07	-1.15	0.250	-6.60e-07	1.72e-07
r_{it-1}						
D1.	-.0057625	.0049532	-1.16	0.245	-.0154705	.0039455
_cons	.0726545	.047129	1.54	0.0471	-.0197166	.1650256

*** pooled mean group asymmetric*******************************

D.lstkr	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
ec						
lop_p	.5826678	3.578354	0.16	0.178	-6.430778	7.596114
lop_n	3.724827	3.632231	1.03	0.305	-3.394215	10.84387
lexr	-2.471509	.2386928	-10.35	0.000	-2.939338	-2.003679
lgbr	.0463647	.3366021	0.14	0.197	-.6133633	.7060926
mktl	.0001368	.0001952	0.70	0.483	-.0002457	.0005193
r_{it-1}	-.7949246	.5417453	-1.47	0.142	-1.856726	.2668767
SR						
ec	-.0057655	.0020978	-2.75	0.006	-.0098772	-.0016539
lop_p						
D1.	-.0035697	.0555203	-0.06	0.555	-.1123876	.1052481
lop_n						
D1.	-.0289593	.0290015	-1.00	0.290	-.0858012	.0278826
lexr						
D1.	-.0093719	.0117209	-0.80	0.117	-.0323444	.0136007
lgbr						
D1.	-.0013718	.00107	-1.28	0.200	-.0034689	.0007253
mktl						
D1.	-1.62e-07	2.21e-07	-0.74	0.246	-5.95e-07	2.70e-07
r_{it-1}						
D1.	-.1811373	.2580116	-0.70	0.483	-.6868307	.3245561
_cons	.0763476	.0279141	2.74	0.006	.0216369	.1310583

Firm's size estimation result for the 1st quantile

. Estimation Procedure for symmetric models

. ****************************** mean group ***********************************

D.lstkr	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
ec						
lop	-2.875452	3.669858	-0.78	0.053	-10.06824	4.317337
lexr	1.182342	1.055411	1.12	0.263	-.8862243	3.250909
lgbr	-.9939176	1.216188	-0.82	0.414	-3.377603	1.389768
mktl	.0003286	.0002624	1.25	0.210	-.0001856	.0008428
r_{it-1}	0.550274	.0076022	0.42	0.133	-2.335013	1.635330
SR						
ec	-.0069781	.0008809	-7.92	0.000	-.0087045	-.005251
lop						
D1.	.0379419	.0136922	2.77	0.006	.0111058	.06477
lexr						
D1.	-.0335472	.0066555	-5.04	0.000	-.0465917	-.0205027
lgbr						
D1.	.0084304	.010434	0.81	0.419	-.0120198	.0288807
mktl						
D1.	-6.52e-09	1.70e-07	-0.04	0.969	-3.40e-07	3.27e-07
r_{it-1}						
D1.	4.2251	0.021872	-1.89	0.262	-.003319	.200873
_cons	-.0476724	.0148524	-3.21	0.001	-.0767825	-.0185623

```
. ***************************** pooled mean group ******************************

Pooled Mean Group Regression

Panel Variable (i): crossid                       Number of obs      =    64200

Time Variable (t): periodid                       Number of groups   =       25

                                                  Obs per group: min =     2568

                                                  Log Likelihood     =  46229.3

------------------------------------------------------------------------------

     D.lstkr |      Coef.  Std. Err.      z    P>|z|     [95% Conf. Interval]

-------------+----------------------------------------------------------------

ec           |

         lop |    1.0958  .1833527    5.98  0.000    .7364352   1.455165

        lexr |  1.487739  .2504581    5.94  0.000    .9968497   1.978628

        lgbr |   .256209  .2772169    0.92  0.277  -.2871261   .7995441

        mktl |  .0000406  .0001041    0.39  0.696  -.0001634   .0002446

     r_it-1  |  3.707328  .0051911   -0.12  0.088  -.0107868   .0095618

-------------+----------------------------------------------------------------

SR           |

          ec |  -.0048148 .0005887   -8.18  0.000  -.0059687   -.003661

         lop |

         D1. |  .0386318  .0134833    2.87  0.004   .0122051   .0650586

        lexr |

         D1. |  -.0346111 .0066483   -5.21  0.000  -.0476416  -.0215807

        lgbr |

         D1. |   .008541  .0106163    0.80  0.421  -.0122665   .0293485

        mktl |

         D1. |  9.77e-08  1.41e-07    0.69  0.490  -1.79e-07   3.75e-07

     r_it-1  |

         D1. |   3.0919   .0071938   -1.48  0.140  -.0247283   .0034708


       _cons |  -.0536265  .0065057   -8.24  0.000   -.0663775  -.0408756

------------------------------------------------------------------------------
```

```
. ************************* choosing between mg & pmg **************************

. hausman mg_symmetric pmg_symmetric, sigmamore

                ---- Coefficients ----
             |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
             |  mg_symmetric pmg_symmet~c    Difference          S.E.
-------------+----------------------------------------------------------------
         lop |   -2.875452     1.0958      -3.971252       3.675979
        lexr |   1.182342     1.487739     -.3053962       1.028427
        lgbr |   -.9939176    .256209      -1.250127       1.187811
        mktl |   .0003286     .0000406       .000288       .0002417
      r_it-1 |   .6535032    .8855894      -.2320862       .2642825
------------------------------------------------------------------------------
                          b = consistent under Ho and Ha; obtained from xtpmg
           B = inconsistent under Ha, efficient under Ho; obtained from xtpmg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(3) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =       25.54
                Prob>chi2 =      0.0000
                (V_b-V_B is not positive definite)
```

Mean Group Estimation: asymmetric

D.lstkr	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
ec						
lop_p	9.273095	7.651903	1.21	0.226	-5.724359	24.27055
lop_n	-15.30819	63.08139	-0.24	0.808	-138.9454	108.3291
lexr	-3.149141	3.13203	-1.01	0.315	-9.287806	2.989525
lgbr	4.63927	3.975373	1.17	0.243	-3.152317	12.43086
mktl	-.0006337	.000688	-0.92	0.357	-.0019822	.0007148
r_{it-1}	2.6663228	.0401711	1.26	0.228	-.0281602	.1293077
SR						
ec	-.0064811	.0006694	-9.68	0.000	-.0077932	-.005169
lop_p						
D1.	-.0988471	.0260926	-3.79	0.026	-.1499877	-.0477064
lop_n						
D1.	-.1023277	.0189038	-5.41	0.018	-.1393785	-.0652769
lexr						
D1.	-.0266812	.0064849	-4.11	0.006	-.0393914	-.0139711
lgbr						
D1.	.0078644	.0109433	0.72	0.412	-.0135841	.0293129
mktl						
D1.	5.52e-08	1.56e-07	0.35	0.724	-2.51e-07	3.61e-07
r_{it-1}						
D1.	1.8705	.4524261	0.35	0.729	-.7302714	1.043207
_cons	.0001838	.0126346	0.01	0.988	-.0245795	.0249471

. ***************************** pooled mean group ******************************

Panel Variable (i): crossid   Number of obs   =   64190

Log Likelihood   = 46274.08

D.lstkr	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
ec						
lop_p	1.231964	4.697231	0.26	0.053	-7.974439	10.43837
lop_n	-54.87583	8.423383	6.51	0.040	38.3663	71.38536
lexr	.4701975	.2510814	1.87	0.0251	-.021913	.962308
lgbr	.0473899	.3638821	0.13	0.366	-.6658058	.7605857
mktl	.000124	.0001342	0.92	0.356	-.0001391	.0003872
r_{it-1}	3.888028	.0401711	1.26	0.208	-.0281602	.1293077
SR						
ec	-.0044043	.0003311	-13.30	0.000	-.0050531	-.0037554
lop_p						
D1.	-.1019699	.0216785	-4.70	0.020	-.144459	-.0594809
lop_n						
D1.	-.0917705	.0168765	-5.44	0.002	-.1248479	-.0586931
lexr						
D1.	-.0274403	.0064857	-4.23	0.000	-.040152	-.0147286
lgbr						
D1.	.0091919	.0110262	0.83	0.404	-.012419	.0308028
mktl						
D1.	4.08e-08	1.34e-07	0.31	0.760	-2.21e-07	3.03e-07
r_{it-1}						
D1.	0.2088	.0071741	-1.46	0.5455	-.0245054	.0036165
_cons	.0040118	.00136	2.95	0.003	.0013463	.0066774

```
. ************************* choosing between mg & pmg **************************

. hausman mg_asymmetric pmg_asymmetric, sigmamore
```

	---- Coefficients ----			
	(b)	(B)	(b-B)	sqrt(diag(V_b-V_B))
	mg_asymmet~c	pmg_asymme~c	Difference	S.E.
lop_p	9.273095	1.231964	8.041131	6.073393
lop_n	-15.30819	54.87583	-70.18403	62.73267
lexr	-3.149141	.4701975	-3.619338	3.132623
lgbr	4.63927	.0473899	4.59188	3.972245
mktl	-.0006337	.000124	-.0007577	.0006772
r_{it-1}	.1564676	.4567747	-.3003071	.4321274

```
                b = consistent under Ho and Ha; obtained from xtpmg
    B = inconsistent under Ha, efficient under Ho; obtained from xtpmg

 Test:  Ho:  difference in coefficients not systematic

          chi2(4)  =  (b-B)'[(V_b-V_B)^(-1)](b-B)
                   =        1.37
        Prob>chi2 =      0.8486
```

Mean Group Estimation: most capitalized firms

Mean Group Estimation:

D.lstkr	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
ec						
lop	-2.875452	3.669858	-0.78	0.433	-10.06824	4.317337
lexr	1.182342	1.055411	1.12	0.263	-.8862243	3.250909
lgbr	-.9939176	1.216188	-0.82	0.414	-3.377603	1.389768
mktl	.0003286	.0002624	1.25	0.210	-.0001856	.0008428
r_{it-1}	1.0958	.1833527	5.98	0.000	.7364352	1.455165
SR						
ec	-.0069781	.0008809	-7.92	0.000	-.0087045	-.0052516
lop						
D1.	.0379419	.0136922	2.77	0.006	.0111058	.064778
lexr						
D1.	-.0335472	.0066555	-5.04	0.000	-.0465917	-.0205027
lgbr						
D1.	.0084304	.010434	0.81	0.419	-.0120198	.0288807
mktl						
D1.	-6.52e-09	1.70e-07	-0.04	0.969	-3.40e-07	3.27e-07
r_{it-1}						
D1.	1.487739	.2504581	5.94	0.000	.9968497	1.978628
_cons	-.0476724	.0148524	-3.21	0.001	-.0767825	-.0185623