THE EFFECTS OF SYSTEMATIC RISKS ON BANK ASSET QUALITY: EVIDENCE FROM ORGANISATION OF THE PETROLEUM EXPORTING COUNTRIES (OPEC)

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By

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ABSTRACT

The global position of Non-Performing Loans (NPLs) is persistent and on the rise which indicates a global deterioration of bank asset quality. The problem is more pronounced among the Organisation of the Petroleum Exporting Countries (OPEC) whose ratio of NPLs is on the verge of the banking crisis. The objective of this study is to investigate the effects of the prevalence of systematic risk factors in the OPEC countries on the deterioration of their bank asset quality. In achieving this objective, the study employed the panel data set of the entire OPEC countries spanning 1996-2015. Further, to account for NPL persistence, the study employed Pooled Mean Group (PMG) model in its estimations. The findings reveal that an increase in oil price improves bank asset quality which signifies that a rise in oil price inversely affects NPLs. On the other hand, a rise in the level of corruption increases the level of NPLs which indicates that corruption positively affects NPLs. Further, an increase in the level of political instability deteriorates the level of bank asset quality which means that an increase in the level of political instability positively affects NPLs. Additionally, the result reveals that an increase in environmental risks raises the level of NPLs which denotes that an increase in the occurrence of environmental risk positively affects NPLs. Overall, the findings imply that the prevalence of systematic risks in OPEC countries adversely affect bank asset quality and are key to financial stability. Consequently, the results imply that policymakers should design appropriate prudential policies that will curtail the impact of these systematic risks on bank asset quality and diversification of their economies which will ensure sustainable financial stability amongst OPEC countries.

Keywords: bank asset quality, OPEC, panel data, PMG, systematic risks

ABSTRAK

Kedudukan berterusan dan semakin meningkatnya Pinjaman Tidak Berbayar (NPL) di peringkat antarabangsa menunjukkan kemerosotan *global* kualiti aset bank. Masalah ini lebih menekan dalam kalangan Pertubuhan Negara Pengeksport Petroleum (OPEC) yang nisbah NPL berada di ambang krisis perbankan. Objektif kajian ini adalah untuk meneliti kesan-kesan faktor risiko sistematik di negara-negara OPEC terhadap kemerosotan kualiti aset bank mereka. Dalam mencapai matlamat ini, kajian ini menggunakan set data panel bagi keseluruhan negara-negara OPEC sepanjang tempoh 1996-2015. Tambahan pula, bagi menjelaskan keberterusan NPL, kajian ini menggunakan model *Pooled Mean Group* (PMG) untuk membuat anggaran. Keputusan menunjukkan bahawa kenaikan harga minyak meningkatkan kualiti aset bank yang menandakan bahawa kenaikan harga minyak menyumbang kepada NPL. Sebaliknya, peningkatan tahap rasuah meningkatkan tahap NPL yang menunjukkan bahawa rasuah mempengaruhi NPL secara positif. Selanjutnya, peningkatan tahap ketidakstabilan politik melemahkan tahap kualiti aset bank yang bermaksud bahawa peningkatan ketidakstabilan politik mempengaruhi NPL secara positif. Selain itu, kajian turut mempamerkan bahawa peningkatan risiko alam sekitar meningkatkan tahap NPL yang menunjukkan bahawa peningkatan risiko alam sekitar memberi kesan positif kepada NPL. Keseluruhannya, penemuan ini menyimpulkan bahawa kelaziman risiko sistematik di negara-negara OPEC menjejaskan kualiti aset bank dan merupakan kunci kepada kestabilan kewangan. Hasil kajian ini turut menyimpulkan bahawa pembuat dasar perlu merangka dasar berhemah yang sesuai yang akan mengurangkan kesan risiko sistematik terhadap kualiti aset bank dan kepelbagaian ekonomi mereka demi memastikan kestabilan kewangan yang mapan dalam kalangan negara-negara OPEC.

Kata kunci: kualiti aset bank, OPEC, data panel, PMG, risiko sistematik

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LIST OF ABBREVIATIONS

Abbreviation	Full Meaning
ADF	Augmented Dickey-Fuller
AIC	Akaike Information Criterion
AR	Autoregressive
ARDL	Autoregressive Distributed Lag
BA	Banque D'Algeria
BRICS	Brazil, Russia, India, China and South Africa
BACP	Business Anti-Corruption Portal
BBC	British Broadcasting Corporation
BE	Banco del Ecuador
BNA	Banco Nacional de Angola
BOS	Brent Oil Spot
CBI	Central Bank of Iran
CBIQ	Central Bank of Iraq
CBK	Central Bank of Kuwait
CBL	Central Bank of Libya
CBN	Central Bank of Nigeria
CBUAE	Central Bank of United Arab Emirate
CI	Corruption Index
CIA	Central Intelligence Agency
CORR	Corruption
CPI	Corruption Perception Index
CRED	Centre for Research on Epidemiology of Disasters
DL	Doubtful Loan
ECOWAS	Economic Community of West African States
EDF	Expected Default Frequency
ER	Environmental Risks
EU	European Union
EFCC	Economic and Financial Crimes Commission
FAVAR	Factor Augmented Vector Autoregressive
FDI	Foreign Direct Investment
FE	Fixed Effect
FER	Flexible Exchange Rate
FSI	Financial Soundness Indicators
GARCH	Generalised Autoregressive Conditional Heteroskedasticity
GCC	Gulf Cooperation Council
GDFS	Global Development Finance System
GDP	Gross Domestic Product
GFC	Global Financial Crisis
GFSR	Global Financial Stability Report
GIPSI	Greece, Ireland, Portugal, Spain and Italy
GMM	Generalised Method of Moments
GVAR	Global Vector Autoregressive
IAGS	Institute for the Analysis of Global Securities
IFRS	International Financial Reporting Standard
IFS	International Financial Statistics
IGO	Intergovernmental Organisation

IMF	International Monetary Funds
IPS	Im, Pesaran and Shin
ISIS	Islamic State of Iraq and al-Sham
LIR	Lending Interest Rate
LL	Loss Loan
LM	Lagrange Multiplier
LNG	Liquedified Natural Gas
MG	Mean Group
MLL	Maximum Log Likelihood
MS	Markov-switching
MS-ARCH	Markov-switching ARCH
MW	Maddala and Wu
MWALD	Modified WALD Test
NIDS	National Insurance Deposit Schemes
NOC	Net Oil Consuming
NOP	Net Oil Producing
NPL	Non-Performing Loan
OBS	OPEC Basket Price
OECD	Organisation of Economic Cooperation and Development
OLS	Ordinary Least Squares
OP	Oil Price
OPEC	Organisation of Petroleum Exporting Countries
ORB	OPEC Reference Basket
PIP	Polity IV Project
PI	Political Instability
PMG	Pool Mean Group
PII	Political Instability Index
PSAVTI	Political Stability and Absence of Violence /Terrorism Index
PTS	Political Terror Scale
QCB	Qatar Central Bank
RDGP	Real Gross Domestic Products
RE	Random Effect
RER	Real Exchange Rate
RVF	Residual Value Fitted
SAMA	Saudi Arabian Monetary Agency
SBC	Schwerz Bayesian Criteria
SL	Substandard Loan
TGARCH	Threshold GARCH
TI	Transparency International
UNEMP	Unemployment
UUM	Universiti Utara Malaysia
USD	United States Dollars
VAR	Vector Autoregression
VECM	Vector Error Correction Model
VIF	Variance Inflation Factor
VS	Versus
WDIs	World Development Indicators
WGI	Worldwide Governance Indicators
WSJ	Wall Street Journal
WTI	West Texas Intermediate

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

The financial system is an integral part of any economy that facilitates economic growth and development of every nation state. Further, financial institutions are the bedrock of economic development of any nation that stimulus the allocation of resources across space and time (Levine, 2005). Economies around the world organise their financial activities on certain parameters that are in consonance with their individual nations' needs or based on certain opportunities or threats which they are confronted with, perhaps because of their internal strengths or weaknesses. In most cases, these financial systems are compositions of financial institutions, financial markets and financial regulators (see, for example, Madura, 2014; Mishkin & Eakins, 2012). Depending on the political-economy of a country the financial institutions may consist of finance companies, banks, insurance companies, mutual fund, pension funds, and stock exchanges.

However, these financial institutions and markets operate in a business environment, which is an interrelationship of many societal factors that shape and determine their activities. This business environment is made up of economic, political, environmental (ecological), technological, social and legal factors that affect and shape the activities of the financial institutions and markets.

According to Madura (2014) and Mishkin and Eakins (2012) financial institutions came into being to facilitate financial intermediations, that is, the flow of funds from those economic units that have surplus funds to those economic units that have a shortage of funds for consumption or investments purposes. Also, Richard (2011) suggests that Financial Institutions (FIs) are very important in any economy because of their ability to mobilise savings for productive investments and facilitate capital flows to various sectors in the economy, thereby stimulating investments and increasing productivity.

Moreover, the existence of banks suggests that they perform critical functions of intermediation between borrowers and savers more efficiently than is available via direct exchange in capital markets (Frankel, Kim, Ma, & Martin, 2011). The banking activity is one of the most important segments of the financial system of economies that provides a safe linkage between surplus economic units and deficit economic agents. Further, banks as important members of financial markets play a significant role in financial stability and economic development. Also, Beck, Demirgüç-Kunt and Levine (2006) maintain that banks provide a substantial proportion of external finance to deficient economic agents around the globe. Hence, the stability of the banking industry in every economy is essential for sustainable economic growth and development (Amuakwa-Mensah, Marbuah, & Ani-Asamoah Marbuah, 2017). Consequently, Weber (2012) raises an important question of 'What is the business of banks?' Weber then opines that banks' businesses are those of accepting deposits and channelling the capital into lending or investment activities. Further, Jain (2007) views banks to be financial institutions

that perform the function of lending and collection of money. Thus, this has made the role of banks in facilitating economic growth imperative. Additionally, Athanasolou, Brissimis and Delis (2008) emphasised that the role of banks remains central in financing economic activity.

Consequently, Breuer (2006) argues that developing countries and emerging markets tend to put much reliance on bank credit which is central for investment. This is typified in the banking systems of Organisation of the Petroleum Exporting Countries (OPEC) member states which are basically made up of developing countries and emerging markets. Figure 1.1, 1.2 and Table 1.1 in Appendix F have demonstrated the extent of growth in total bank asset, total customers deposit, total owner equity and gross loans which is an indication of substantial banks' role in the financial intermediation processes. For example, the total assets of their entire banking systems grew from an approximate of $587 billion USD[1] in 2000 to $3.577 trillion in 2014, that is, by over 609% as indicated in Figure 1.1.

[1] USD means the United States currency dollar

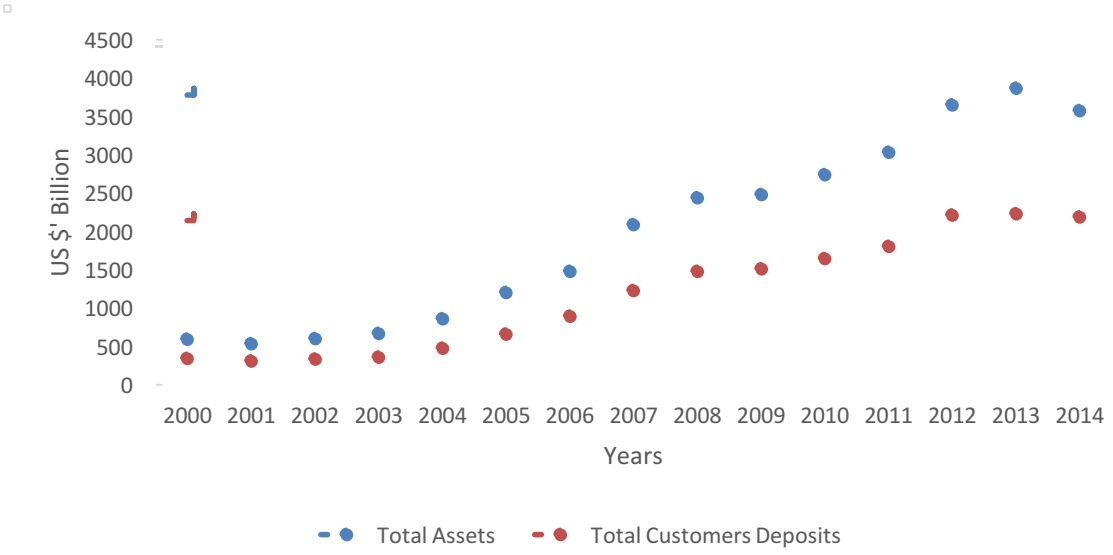

Figure 1.1
Total Assets of Banks and Total Customers' Deposits of OPEC Member Countries
Source: Bankscope (2015)

A critical look at Figure 1.1 and Table 1.1 in Appendix F the total assets which are made up of total loans and investments growth show a somehow steady trend within the period of 2000-2104. This has been the situation until 2012 through 2013 when it became marginal and eventually dropped by $287 billion in 2014 which is approximately a decrease by 7 percent. Also, at the early stage from 2000 to 2004, the growth rate was not as high as that of 2005 to 2007. Furthermore, the changes in the total asset from 2006 to 2007 and 2007 to 2008 indicate a sharp growth in the total assets by $605 billion and $355 billion representing 41 and 17 percent respectively. Nevertheless, the growth rate between the total assets of $2,439 billion in 2008 and $2,480 billion in 2009 was only by $41 billion which was an approximate growth of just 2 percent. Additionally, a sharp increase in the total assets was recorded between 2011 to 2012 where the total assets grew from $3,027 billion to $3,652 billion in 2012 which was approximately by 20 percent over and

above the former year. This trend in the OPEC member states' total bank assets is not totally different from what has been observed in their total customers' deposit as exhibited in Figure 1.1 and Table 1.1 in Appendix F.

The OPEC total banks customers' deposits as shown in Figure 1.1 and Table 1.1 in Appendix F indicate a somehow the same pattern of movement with that of their total assets. The customers' deposits are important components of banks liabilities and play an important role in lending. The deposits from 2000 to 2014 show steady growth in except for contraction from 2000 to 2001 and 2013 to 2014 by $35 billion and $38 representing drops of 10 and 1.5 percent respectively. The years 2007 and 2012 represent important landmarks for the customers' deposits growth where it recorded 37 and 22 percent representing $335 billion and $412 billion respectively which are not too different from the shifts in bank total assets within the same years in terms of magnitude. Furthermore, the OPEC banking systems customers' deposits grew from $336 billion in 2000 to $2.186 trillion in 2014, that is, by over 650 percent as exhibited in Figure 1.1. The banks' balance sheet indicates that loans are largely given out of the customers' deposit to the borrowing customers while some portion of the deposits is invested by the banks.

Furthermore, OPEC banking systems gross loans grew from $214 billion in 2000 to $1.402 trillion in 2014, that is, with over 655 percent increment but with some fluctuations within the period of 2000-2014 as shown in Figure 1.2 and Table 1.2 in Appendix F. There were four contractions in the growth of gross loans as shown in the years 2001, 2009, 2013 and 2014 by $27, $19, $26 and $9 billion representing

12.6, 1.9, 1.8 and 0.7 percent respectively. Conversely, there were increases in the gross loans within the period of data by $242, $194, $69, $156 and $229 billion for the years 2007, 2008, 2010, 2011 and 2012 representing 42.8, 24, 7, 14.8 and 18.9 percent respectively. Additionally, the OPEC banking systems total shareholders equities exhibit similar trends with total assets, total customers' deposit and gross loans as highlighted in Figure 1.1 and 1.2 as well as Table 1.2 in Appendix F.

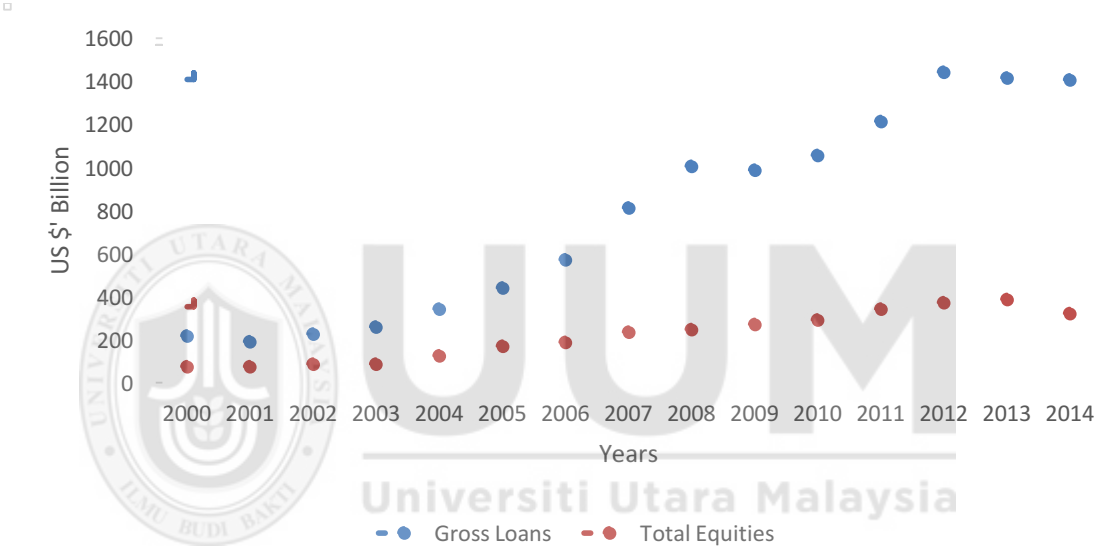

Figure 1.2
Gross Loans and Total Equity of OPEC Member Countries
Source: Bankscope (2015)

Moreover, Figure 1.2 and Table 1.1 in Appendix F indicate the growth of total banks' equities from a mere $70.13 billion 2000 to only $318.27 billion in 2014, that is, 454 percent increment as against the growth of their total assets of $587 billion in 2000 to $3.577 trillion, that is, 609 percent increment in 2014. The total equity has grown steadily but marginally within the period 2000 to 2013 and

crashed down in 2014 by 16 percent. The lowest growth rate was in 2006 by 11 percent while the highest growth rate was in 2006 by 47 percent. The case of the OPEC banking system is a source of concern because the total equity which is an indicator of capital adequacy as at 2014 stood at an approximate of 9 percent. This is far below the amended capital adequacy requirement of 13 percent under Basel III (see, for example, Chincarini, 2012).

These capital adequacies are normally dictated by the Basel accord as the minimum capital in term of owners' equities required for the default risks coverage by the banks (MacDonald, Sogiakas, & Tsopanakis, 2015). The total equity is an important component of bank balance sheet that represents a significant portion of liability to the bank. It usually serves as a bumper to support the banks in terms of liquidity crises and/or bank runs. Furthermore, the capital adequacy is an indicator of general average safety and soundness of the financial institution (see, for example, Azam & Siddiqui, 2012).

The above Figures 1.1 and 1.2, as well as Table 1.1 in Appendix F, have shown the clear role of the banking systems of OPEC member states in terms of growth of their total assets and gross loans. They also indicate their ability to mobilise and significantly grow savings in form of total customers' deposit and loans creations accordingly which is an indication of financial strength. However, the owners' equities did not grow in the same proportion with their assets and customers' deposits, which is an indication of potential banking problem especially when there is a significant proportion of Non-Performing Loans (NPLs). This can create

liquidity crises as the owners' equities will not cover the shortfall that would occur because of the NPLs. Furthermore, there are series of fluctuations in total assets, total customers' deposits, gross loans and shareholders' equities, as well as eventual declines of all the, highlighted banks' balance sheet parameters. These problems coupled with the OPEC member states huge and persistent NPLs indicate the apparent existence financial fragility and a concern for financial stability in the banking systems.

The banks in the process of performing their statutory functions of deposit mobilisation and loan creation are faced with challenges where they end up with credit risks of NPLs which revolve around bank asset qualities (see, for example, Beck, Jakubik, & Piloiu, 2015). This is a situation where the borrowing customers cannot pay back their loans, that is, principal amount and/or interests as at when due for over 90 days. Therefore, NPLs are considered as impaired loans that have been left unpaid, for over 90 days (Akinlo & Emmanuel, 2014; D'Hulster, Salomao-Garcia, & Letelier, 2014; Minton, Stulz, & Williamson, 2009). These NPLs have become important issues of discourse in the literature of banking and finance as they can determine the success or failure of lending banks and other financial institutions hence general financial stability and their multiplier effects on the real sectors of the economy.

These multiplier effects of the distressed banking sector due to NPLs is a serious obstacle to the real sector growth of the economy because it lowers financial activities of intermediation, employment growth and real GDP (Ghosh, 2017). Further, Barseghyan (2010) maintains that the unattended NPLs will lead to a persistent decline in aggregate economic activities. Therefore, the multiplier effects of NPLs on the real sector is akin to financial pollution that is harmful not only to the economy but also has an extended multiplier effect on the social welfare of citizens as banks are constrained from further lending (Zeng, 2012). Moreover, Ghosh (2015) contends that the effects NPLs is not only confined to the deterioration of bank assets quality but can degenerate to economic inefficiencies and impaired welfare of the citizens. Consequently, the credit quality of loan portfolios of banks is an important factor in financial systems that can determine the level of financial stability and economic efficiencies. Additionally, the study of Nkusu (2011) provides a documented evidence on the multiplier effects of NPLs on the real sector of the economy transmitted through micro financial vulnerabilities to macroeconomic vulnerabilities.

Over the past decades, the bank assets quality of most countries across the countries of the world remained relatively stable until Global Financial Crisis (GFC) of 2007 to 2008 (Beck *et al.,* 2015). Despite the significance of loans to economies, the World Development Indicators WDIs (2015) reveal a global persistent and rising level of NPLs as shown in Figure 1.2 and Table 1.2 in Appendix G. As it has been exhibited the Table 1.2 and Figure 1.2 the global position of Non-Performing Ratio (NPLR) stood at 3.10 percent in 2006 but dropped temporally to 2.70 percent in 2007. Nonetheless, in 2008 the ratio increased to 3 percent and persistently grew

through 2013 until it reached 4.2 percent in 2014. Although, there were fluctuations within the period of 2006 to 2014 the situation is persistent and is an indication of global deterioration of bank assets quality that can lead to financial fragility.

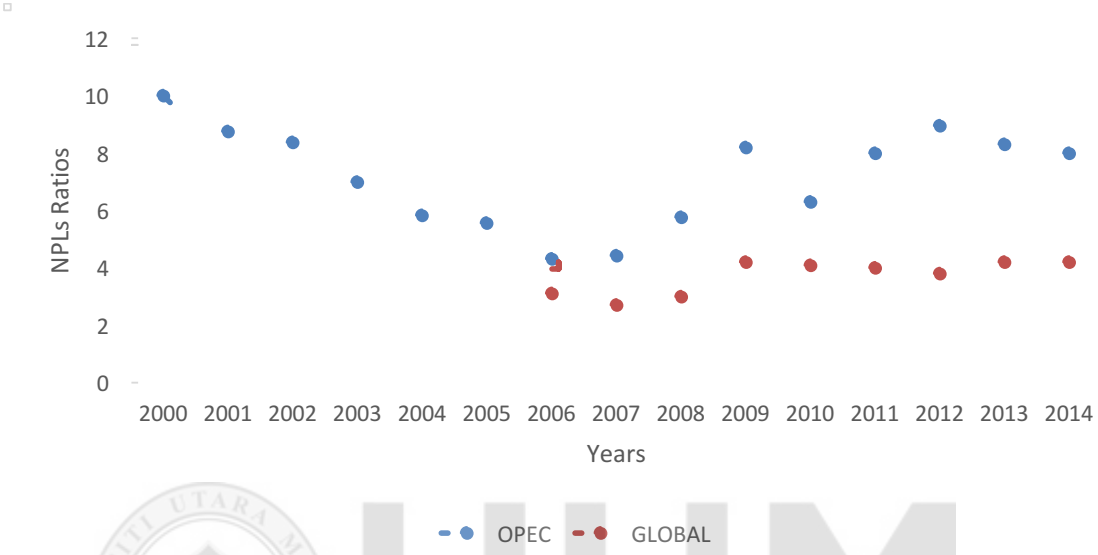

Figure 1.3
Global NPL Ratios and Average NPL Ratios of OPEC member states
Source: Bankscope and WDI (2015)

The problem is indeed highly pronounced amongst OPEC members as shown in the same Figure 1.3 and Table 1.2 in Appendix G. A comparative analysis between global and OPEC's average NPLs shows that the level of loan quality deterioration was higher in the latter than the former. For example, in 2006 while the global position was just 3.10 percent the position in OPEC was 4.3 percent. Although there some levels of fluctuations observed within the period of 2006 to 2008 in the case of OPEC and the situation got worsened in 2009 through 2014 where it virtually doubled those of the global NPLs except in 2010. Finally, in 2014 the global ratio of NPLs was 4.2 but that of the OPEC was 8 percent respectively.

Furthermore, Figure 1.4 and Table 1.2 in Appendix G show the levels of NPLs amongst the various economic groupings[2] of nations. A comprehensive NPLs data from Bankscope[3](2015) spanning 2000-2014 reveals a very high and persistent level of NPLs among OPEC member states compared to other major global economic groupings of seven major advanced economies (G7)[4], the group of eight highly industrialised nations (G8)[5] and the association of five major emerging national economies (BRICS)[6]. Also, the Figure and Table show the detailed statistics of economic groupings and the global positions of NPLs.

[2] These are organisations and/or associations of countries based on economic interests and not physical proximities

[3] A private data stream firm that keeps global banks data across countries of the world

[4] G7 means seven major advanced economies of Canada, France, Germany, Italy, Japan, United Kingdom and United States.

[5] G8 means eight highly industrialised nations of Canada, France, Germany, Italy, Japan, Russia, United Kingdom and United States.

[6] BRICS means five major emerging national economies of Brazil, Russia, India, China and South Africa.

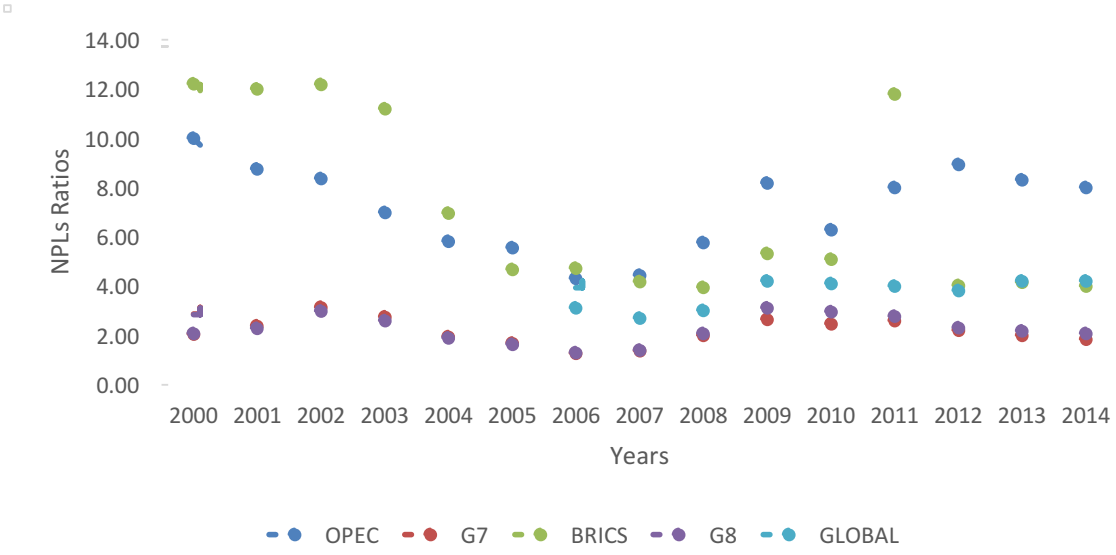

Figure 1.4
Average NPL Ratios of OPEC, G7, G8, BRICS and Global NPLs
Source: Bankscope and WDI (2015)

As stated earlier Figure 1.4 shows the combined trends of NPLs among the comparator groupings of OPEC, G7, G8 and BRICS from 2000-2014. The average ratio of G7 countries represents the lowest NPLs ratio with a record highest of 3.14 in 2002 and lowest of 1.26 in 2006 but closed with 1.84 in 2014. It was followed by G8, BRICS and OPEC groupings in terms of magnitude respectively. In 2014 OPEC recorded the highest NPLR of 8.00 followed by BRICS, G8 and G7 with 4, 2.07 and 1.84 respectively.

Additionally, Figure 1.4 and Table 1.2 in Appendix G show a comparison between the global average of NPLRs and those of the different economic groupings. The statistics indicate that the OPEC ‘s average was in multiple of those of G7 and G8 in all the years under study. The OPEC’s average ratio of NPLs is higher virtually to all BRICS’ average for the year 2005 through 2014 except 2006 and 2011.

More importantly, the position of OPEC's NPLR of 4.31, 4.43, 5.75, 8.19, 6.29, 8.00 8.94, 8.31 and 8.00 was by far greater than the World's global average of 3.1, 2.7, 3, 4.2, 4.1, 4, 3.8, 4.2 and 4.2 for the period of 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013 and 2014 respectively. Additionally, a critical look at the statistics of NPLs reveals that the levels of OPEC member states' NPLRs were averagely higher than those of other economic groupings from 2007-2014 except 2011 in the case of BRICS.

The presence of a huge and persistent ratio of global NPLs and among the OPEC member states over the years indicate the intensity of the loan quality deterioration and level of financial fragility. This can influence the general financial stability of the global economy and OPEC financial systems. Therefore, there is an urgent need for all stakeholders and researchers to investigate the root causes of the problem with a view to resolving it and protecting not only the OPEC financial systems but also preserving the global financial stability that is yet to recover from the 2007-2008 GFC.

Several attempts have been made by researchers to understand the causes of NPLs but much emphasis has been placed on bank-specific, industry-specific and macroeconomic variables. The most researched variables in relation to NPLs are those of bank lending rate, bank management, bank size, credit growth, as well as central bank autonomy, exchange rates, Gross Domestic Product, (GDP), interest rate, inflation rate and unemployment rate (see, for example, Anastasiou, Louri, & Tsionas, 2016a; Konstantakis, Michaelides, & Vouldis, 2016; Beck, Jakubik, &

Piloiu, 2015; Ghosh, 2015; Makri, Tsagkanos, & Bellas, 2014; Castro, 2013; Louzis, Vouldis & Metaxas, 2012; Mileris, 2012; Pesola, 2011; Vogiazas & Nikolaidou, 2011).

Consequently, the problem of global bank assets quality has remained unresolved while the problem among the OPEC member states poses a threat to their financial systems and to global financial stability. Further, the studies of the determinants of NPLs is inconclusive because there are mixed results in the findings, some of the results show a significant positive relationship, others exhibit significant negative relationships while others reveal insignificant relationships. Therefore, these twin problems of unresolved deteriorated assets quality and inconclusiveness of previous studies necessitate further researches in NPLs with a view of better understanding of its root causes and proffering solutions. This requires more investigations of possible new factors that can affect NPLs especially the role of systematic risks otherwise also in this study referred to as systemic risks variables.

The term systematic risks which in this study is interchangeably used with the concept of systemic risks refers to the undesirable and contagious occurrence of events in the larger business environment that adversely affect the financial system. The Systemic Risk Centre (CSR) of the London School of Economics and Political Sciences opines that systemic risk refers to the risk of a breakdown of an entire system rather than simply the failure of individual parts (CSR, 2017). Further, Bollen, Skully, Tripe and Wei (2015) opine that systematic risk is a measure of bank's sensitivity to changes in the wider economy. Also, De Bandt and Hartmann (2000) argue that systemic risk is now being widely accepted as the fundamental

underlying concept for the study of financial instability and possible policy responses. Additionally, May, Levin and Sugihara (2008) suggest that the increasingly and globally interlinked financial markets are no less immune to such system-wide (systemic) threats. Therefore, financial markets are vulnerable to triggers from outside the system such as natural disasters or outbreak of war hence most of the current financial models are based on the assumptions that risk is created by the said triggers which economists call outside factors (CSR).

Collier and Skees (2013) stipulate the elements of systemic risks to include triggers such as price instability, political instability and natural disasters (environmental risks). This does not exclude other systemic risk factors such as the 2007-2008 global financial crisis and other contagious triggers such as prevalent corrupt practices (see, for example, Beck *et al.*, 2015; Castro, 2013; Park, 2012). Additionally, Berger and DeYoung (1997) contend that uncontrollable external 'bad luck' events along with other factors such as 'bad management' cause bank failures. Therefore, Kambhu, Weidman and Krishnan (2007) maintain that the stability of the financial system and the potential of for systemic events to alter its functioning have for long been critical issues for central banks and researchers. Thus, the study of financial stability has become a major force in the modern macroeconomic policy (Nikolaidou & Vogiazas, 2017).

Consequently, based on available statistics in Appendix A, B and C, the prevalence of these systematic risk factors of oil price instability, corruption, political instability and environmental risks in the OPEC member states is a major source of

concern to the stability of their financial systems. For example, the effect of ongoing oil price instability among the OPEC members and their persistent NPLs have shown very clearly that a continuous monitoring of the banking systems and credit risks to which banks are exposed is of utmost importance to policymakers, researchers, practitioners and investors.

Further, the OPEC member states are Net Oil Exporting (NOE) countries that are oil-price sensitive[7] hence coming together to guard against oil price volatility through price settings and/or quota system of productions (OPEC, 2015). Thus, the effect of oil price fluctuations and its attendant consequences can affect their banking systems and loan performance (Al-Khazali & Mirzaei, 2017; Miyajima, 2016). Unfortunately, most of these states have been experiencing the effect of price changes, especially the recent downward slope of oil price. The oil price changes can influence the economic units' cash flows and net worth of OPEC member states thereby affecting loan repayment abilities of economic units in either negative or positive direction as it has been documented in studies such as Al-Khazali and Mirzaei and Miyajima. Therefore, investigating the effect of oil price changes on NPLs may provide a better understanding of the phenomena and give insights into bank management and banking policy directions among OPEC member states and other countries of the world at large.

[7] Price sensitivity is a major reason that led to the formation of OPEC. The organization was basically formed as a cartel to guard against falls in the price of crude oil.

The countries under study have witnessed tremendous oil price[8] fluctuations as represented in Figure 1.5, ranging from $24.36, $94.45, $61.06, $109.45, $105.87, and $53.78 for the years 2002, 2008, 2009, 2012, 2013 and 2014 respectively. These price fluctuations may have an impact on the performance of various loans extended in the OPEC member states (Al-Khazali & Mirzaei, 2017; Miyajima, 2016).

The factor of oil price changes has been a major source of concern to many economies around the world due to its influence on economic growth and development. The effect of the oil price factor on economic activities can be dated back as far as 1946 (Aguiar-Conraria & Soares, 2011) and also some of the earliest studies in the area can be traced to the pioneer works of Mork (1989), Hamilton (1983) and Darby (1982). Furthermore, in the recent time the importance of the oil price changes has drawn the attention of so many researchers on its effect on loan performance and other economic activities (Al-Khazali & Mirzaei,; Miyajima,; Breunig & Chia, 2015; Sotoudeh & Worthington, 2014; Ng, 2012; Masih, Peters, & De Mello, 2011; Poghosyan & Hesse, 2009; Rafiq, Salim, & Bloch, 2009). Therefore, the severity of oil price changes and its importance to OPEC member states' economies has made it an interesting factor and considered as one of the variables of interest for this study.

[8] This is the annual oil basket price per barrel provided by OPEC (in US dollars).

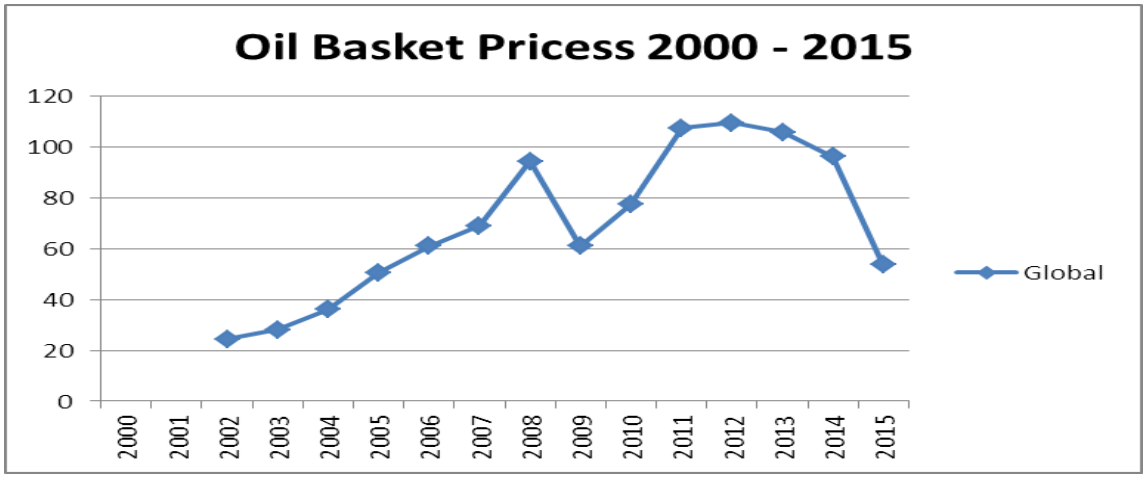

Figure 1.5
OPEC Basket prices spanning 2002-2015
Source: OPEC (2015)

Additionally, the high level of corruption amongst the member states of OPEC as documented in Corruption Perception Index (CPI) provided by Transparency-International (TI) (2015) over the years has portrayed most of the OPEC member countries as highly corrupt amongst a community of nations states. Corruption is the taking advantage of person's or other persons' official position (s) to influence the situation for personal gains (Nye, 1967). This is an important issue in loan administration because a country-wide corruption can determine the quality loan portfolio of a nation (Goel & Hasan, 2011).

The issue of the role of corruption on economic activities also has a very long history and has drawn the attention of early scholars (see, for example, Becker & Stigler, 1974; Nye, 1967). Furthermore, the variable of corruption has received a very wide attention of researchers concerning its effects on economic activities (see, for example, Abu, Karim, & Aziz, 2015; Okada & Samreth, 2014; D'Agostino, Dunne, & Pieroni, 2012; Craigwell & Wright, 2011).

The entire loan process can be affected by the country-wide corruption of a given country. The loan processes of application, appraisal, pricing, approval, disbursement, collateralisation, administration and recoveries can be corrupted. A more challenging scenario will be the corruption in the wider society among regulatory authorities, law enforcement agencies and the judiciary which can compound the problem of realisation of customers' collateral securities or loan recovery efforts (see, for example, Goel & Hasan, 2011). It is widely believed that country-wide corruption can easily influence individuals and firms' corruption tendencies hence the logical assumption that it can have an influence on the banking system in general and loans performance in particular (see, for example, Park, 2012).

The corruption perception indexes of OPEC member states as provided by TI is indeed an alarming scenario where virtually all the countries except Qatar and UAE are below the world average ranking of 5 out of 10 (2000-2011) and 50 out of 100 (2012-2014) as indicated by Table 1.3 under Appendix A. It depicts the intensity of country-wide corrupt practice among the OPEC member states which can have serious implications on NPLs hence the need to investigate the relationship between corruption and NPLs in the member states as it has been found in other studies, such as; Park (2012) and Goel and Hasan (2011). Therefore, this makes corruption an interesting factor considered as a variable of interest for this study.

Similarly, the effect of political instability on the economy and financial system has been a subject of discussion as far back as 1971 (Citron & Nickelsburg, 1987) and some

of the early studies are those of Balkan (1992), Edwards and Tabellini (1991) and Citron and Nickelsburg. Extensive studies were conducted on the effects of political instability on economic activities, sovereign debt risks/country credit-worthiness, country risks and savings (see, for example, Abu, Karim, & Aziz, 2013; Busse & Hefeker, 2007; Svensson, 1998; Rivoli & Brewer, 1997; Edwards, 1996; Balkan,; Citron & Nickelsburg). Political instability in form of terrorism, armed internal conflicts and external wars, violation of fundamental human rights, political intimidations and assassinations, unstable governments, cold-wars and/or social unrest can easily interrupt the financial processes and banking systems (see, for example, Busse & Hefeker, 2007; Le, 2004). Therefore, any of the above mentioned conditions can affect the business environment which can further affect production or consumption of goods and services, as well as government revenues or spending which are the major sources of cash flows to all economic units in developing and emerging markets like those of OPEC member.

The political instabilities situation[9] in most OPEC member states such as Algeria, Iraq, Libya, Nigeria, Saudi Arabia, and by extension in countries such Iran, Kuwait, Qatar, and UAE are good examples of the OPEC countries' exposures to political instabilities which can affect loan performance. The effect of Democratic Republic of Congo's conflicts on the political economy of Angola can affect the latter's banking system hence vulnerable to NPLs problems. Also, the cold war[10] between US and Venezuela as well as between Iran and US is a clear testimony of how political instability can hamper economic activities. The statistics of Political

[9] Terrorism, rebellion, and armed conflict in amongst most OPEC member states
[10] This was typified in the post-election demonstrations that followed the election of President Madura

Stability Index[11] of the OPEC member states from 2000-2014 as indicated by Table 1.4 under Appendix B shows that all the countries except Kuwait, Qatar and UAE are among the worst ranked countries of the world. The rest of the countries are quite below the global average of the said index. The most affected countries are those of Iraq, Libya, Nigeria and Venezuela for all the years under study. Presumably, these high levels of political instabilities of the member states can have a relationship with the economic and banking activities hence can interfere with the loans repayment ability of the borrowing customers as documented by studies, such as; Rehman, Zhang and Ahmad (2016) and Dinç (2005). The index reveals the intensity of political instability amongst OPEC countries which could explain the high level NPLs among them hence taken as a variable of interest of this present study.

Furthermore, environmental risks factor is an important consideration for global economy giving the current intensity and high frequencies of both natural and technological disasters confronting countries around the world. The impact of environmental risks on economic activities in the modern history began to be felt and traced respectively to the 1960s and 1970s (see, for example, Mcdermott, Barry, & Tol, 2014; Shabnam, 2014; Cavallo, Galiani, Noy, & Pantano, 2013; Loayza, Olaberri, Rigolini, & Christiaensen, 2012). However, most of the studies on environmental risks are restricted to natural disasters and have been found to influence economic activities, financial fragility and bank solvency. For example, this includes the studies of Klomp (2014), Collier and Skees (2013), Sharfman and

[11] This Index is based on the US State Department reports for the periods under consideration

Fernando (2008), Athukorala and Resosudarmo (2006) and Cochrane (2004). Environmental risks in form of environmental degradation, oil spillage, oil extraction accident, environmental pollution, flooding, epidemics/pandemics, earthquakes and desertification are major hazards which if crystallised can affect business formations especially of oil dependent economies like those of OPEC member states (see, for example, Associated-Press, 2014; Tawfiq & Olsen, 1993). The consequences can be devastating to OPEC banking systems.

Moreover, a major disaster in one part of the world can also have contagious effects on the economies of other countries in the world which can also interrupt with bank lending activities. There were many clear examples of environmental emergencies which had global impacts such as the 2010 Eyjafjallajokull[12] volcanic eruption in Iceland which impacted significantly on world travels and trading. The 2013 Fukushima's triple disasters of earthquake, tsunami and nuclear meltdown in Japan brought down the global ranking of Japan economy from its second world best economy position and affected many of its trading partners. Other examples are those of Indian Ocean Tsunami of 2004 that affected many countries in the region and the 2014 Ebola pandemic crises in West Africa and its impact on world travels and trading.

[12] Is one of the smaller ice caps of Iceland and a stratovolcano which erupted in 2010 and impacted aversely on global trading and travels

The EM-DAT[13] database details that OPEC member states are internally confronted with environmental risks of oil spillage, pollution and related environmental damages that can trigger other natural disasters such as human epidemics and pandemics, and plant epidemics. Other common environmental risks that the OPEC member states are vulnerable to are those of oil exploitations accidents, health hazards, flooding, droughts, storms, desertification, earthquakes and erosions. These environmental risks have the capacities of interrupting the banking activities and subsequently can affect the borrowing customers' ability to pay back loans, that is, principal or interest hence the emergence of NPLs (see, for example, Klomp, 2014; Berg & Schrader, 2012; Collier, Katchova, & Skees, 2011).

The Table 1.5 under Appendix C gives statistics of the number of occurrences of both natural and technological disasters that happened amongst OPEC member states within the years of 2000-2014 (EM-DAT, 2015). All varieties of major natural and technological disasters were recorded within the period. The occurrence of disasters does not only affect lives and means of livelihood of the citizenry but also the governments and their spending abilities due to huge recourses that are required in reconstruction and rehabilitation of critical infrastructure (Shabnam, 2014). The frequencies of disasters amongst the OPEC member countries and their apparent vulnerability to external disaster across the world motivated the study to include the environmental risks factor as a variable of interest.

[13] D. Guha-Sapir, R. Below, Ph. Hoyois-EM-DAT: The CRED/OFDA International Disaster Database-www.emdat.be-Université Catholique de Louvain-Brussels-Belgium.

From the above discussions, it can be inferred that banking systems of OPEC member states can be affected by oil price changes, corruption, political instability and environmental risks (see, for example, Al-Khazali & Mirzaei, 2017; Miyajima, 2016 Rehman *et al.*, 2016; Abu, 2015; Klomp, 2014; Park, 2012; Goel & Hasan, 2011; Collier *et al.,* 2011). Therefore, Boudriga, Taktak and Jellouli (2009) conclude that loan portfolio qualities can deteriorate in the event of weak institutions, corrupt environment, and little democracy. Additionally, this study is motivated by the persistent and rising levels of global NPLs and amongst the OPEC member states and the latter's current predicaments of falling oil prices, high levels of corruption, political instabilities as well environmental risks.

1.2 Problem Statement

The global position of NPLs is persistent and on the rise, as indicated by World Bank's WDI (2015) in Figure 1.3 from 2005-2014 which is an alarming scenario that calls for immediate action. The statistics show that in 2005 the level of NPLs stood at 3.9 and dropped to its lowest level of 2.8 in 2007 and rose to its highest level of 4.2 in 2014. The remaining periods reveal a steady and upward rise in NPLs which is an indication of global deterioration of banks assets qualities which can also affect other global economic fundamentals.

The issue of NPLs is a major challenge to banks across the world because it affects the source of their revenue, that is, interest incomes especially in the developing countries and emerging markets (Ahamed, 2017) like those of OPEC. The NPLs are not the only

indication of banks' low banks' assets qualities but also an indisputable measure of banks' performance. It also affects their capacity to honour their deposit customers' obligations of making payment as at when demanded or when due, thereby causing liquidity crises in the banking sector and the economy at large (Ghosh, 2017).

The multiplier effect of these problems caused by bank asset quality and the inability of banks to make further loans to the real sector of economies has serious consequences on economic growth and development of nation-states (see, for example, Ghosh, 2017; Ghosh, 2015; Akinlo & Emmanuel, 2014; Filip, 2013; Zeng, 2012; Berger & DeYoung, 1997). It is believed that huge NPLs can negatively affect the level of private investment, deposit liabilities and constrain the scope of bank loans to the private sector which can affect private consumption and subsequently lead to economic contraction (Akinlo & Emmanuel, 2014). Furthermore, Berger and DeYoung (1997) stressed that virtually all researches conducted on the causes of bank and thrift failures are believed to be due to the presence of large proportions of NPLs. These kinds of phenomena trigger a set of questions as to what might be the root causes of NPLs and call for researches that might provide solutions to banks and policymakers in dealing with the huge bad loans.

The situation of NPLs is more critical among OPEC member states because their global averages of NPLRs are twice those of the global averages as indicated in Figure 1.3. Moreover, a comparative analysis of NPLs ratios exhibited in Figure 1.4 amongst the economic groupings of BRICS, G7, G8 and OPEC indicates that in most of the years between 2000-2014 OPEC's position was greater than the other grouping. This shows an NPLs ratio of almost 10 percent (9.99%) in the year 2000 and eight percent (8%) in

2014 which are just a few points very close to the international benchmark of banking crisis point of anything in excess of 10 percent as stipulated by Demirgüç-Kunt & Detragiache (1998). Therefore, the issue of NPLs has remained a major challenge to global economies and researchers.

More specifically there are quite a number of OPEC member states that have been captured in the systemic banking crises data base of Laeven and Valencia (2012a, 2012b). The data base documents 147 banking crises during the period of 1970-2011. As stated earlier there are OPEC member countries that are documented in the banking crises data base which one of the criteria is NPLs ratio in excess of 10 percent as argued by Demirgüç-Kunt & Detragiache (1998). For example, Ecuador was documented to be involved in banking crises from 1982-1986 and 1998-2002, Kuwait in the period spanning 1982-1985 as well as Algeria from 1990-1994. Other countries are Venezuela during the period of 1994-1998, Indonesia from 1997-2001 and Nigeria from 1991-1995 and 2009-date (see, for example, Laeven & Valencia, 2012b).

Moreover, there was a decrease in the OPEC's total customers deposit from $2.224 to $2.186 billion from 2013-2014 accordingly. Further, the total assets decreased from $3.864 to $3.577 in the year 2013-2014. Additionally, gross loans dropped from $1.411 in 2013 to $1.401in 2014 billion correspondingly. The total shareholder's equity decreased from $382 to $318 billion in 2013-2014. The ratio of total equity in 2014 stood approximately at 9 percent which is far below the minimum ratio of 13 percent capital requirement under the amended Basel III as highlighted by (Chincarini, 2012).

Furthermore, the prolonged prevalence of systematic risks of oil price volatility, corruption, political instability and environmental risks in OPEC is a major area of trepidation. It might have been responsible for the huge and persistent NPLs in the member state. Also, it has high tendencies of escalating the deterioration of bank asset quality. For example, Figure 1.5 depicts oil price in 2013 that stood at $105.87 per barrel collapsed to $53.78 per barrel in 2014 (OPEC, 2016b) which would have had a significant impact on cash flow position of economic units hence constrain their loans repayment abilities (see, for example, Al-Khazali & Mirzaei, 2017; Miyajima, 2016). Additionally, the statistics in Table 1.3 under Appendix A provided by the transparency international on corruption level amongst the OPEC countries is also an alarming scenario. Virtually all the countries are above the average global threshold of corruption level. This also has the capacity of creating inappropriate and risky loans that might eventually become delinquent as well as become very hard to recover (See, for example, Park, 2012; Goel & Hassan, 2011).

Additionally, the vast majority of OPEC countries from Middle-East and North-African (MENA), Indonesia, Nigeria and Venezuela which constitute over 60 percent of its membership are permeated by prolong political instabilities (OPEC, 2016a). The statistics of Political Terror Scale and Rankings provided in Table 1.4 under Appendix B by the US State department confirms that all the OPEC countries except Kuwait, Qatar and UAE over the period spanning 2000-2014 are at the top scale and ranking of political instabilities. This situation has the likelihoods of creating unstable business atmosphere and interruption of cash flow generating abilities of economic units (see, for example, Rehman *et al.*, 2016; Dinç, 2005). Further, the level of environmental risks in

form of disasters occurrences amongst the OPEC member states is really frightening as indicated in EM-DAT data base in Table 1.5 under Appendix C. The statistic provided in the data base within the study period of 2000-2014 depicts the occurrences of officially reported major natural and technological disasters whose consequences were fatalities, disruptions of business activities and critical infrastructure and general loss of economic activities (EM-DAT, 2015). This also has the tendencies of causing adverse effects on cash generating abilities of economic agents and loan repayment abilities (Klomp, 2014; Collier & Skees, 2013; Collier *et al.*, 2011).

Nonetheless, there are number of researches conducted in the area of NPLs but were mainly motivated by the economic, bank-specific and industry-specific variables which have been discussed extensively under literature review chapter (see, for example, Anastasiou *et al.*, 2016a; Anastasiou, Louri, & Tsionas, 2016b; Konstantakis *et al.*, 2016; Beck *et al.*, 2015; Ghosh, 2015; Tanasković & Jandrić, 2015; Abid, Ouertani, & Zouari-Ghorbel, 2014; Akinlo & Emmanuel, 2014; Makri *et al.*, 2014; Zaib, Farid, & Khan, 2014; Castro, 2013; Louzis *et al.*, 2012). Furthermore, most of the previous studies that focused on the relationship between macroeconomic determinants and bank asset quality mainly used the following factors as their independent variables: inflation rate, exchange rate, unemployment rate, GDP, lending interest rate, business cycle, Industrial Production Index (IPI) and money supply (see, for example, Anastasiou *et al.*, 2016a, 2016b; Konstantakis *et al.*, 2016; Beck *et al.*, 2015; Tanasković & Jandrić, 2015; Mileris, 2012). Additionally, those researchers that investigated the relationship between bank-specific, industry-specific variables and NPLs were concerned with factors such as individual bank lending rate, credit growth, policy lending rate and central bank

autonomy (see, for example, Ghosh, 2015; Klein, 2013; Salas & Saurina, 2002; Berger & DeYoung, 1997).

Additionally, there is no consistency among these two categories of researchers on their findings concerning the relationships between macroeconomic, bank-specific and NPLs. For example, Louzis *et al*. (2012) and Salas and Saurina (2002) in their separate studies found compelling evidence that bank-specific variables determine bank credit risk, that is, NPLs. However, Abid *et al.* (2014) and Klein (2013) reported that interestingly, the bank-specific variables do not have much effect on NPLs when added to the baseline of macroeconomic determinants of NPLs.

Besides, the findings of previous studies on the effects of the said macroeconomic variables on NPLs are far from being conclusive due to the apparently mixed results obtained. Except for the variable of GDP and unemployment rate that have consistently been negative and positive relationships with NPLs respectively the other variables have contradictory findings which have been demonstrated in studies of; Anastasiou *et al.* (2016a, 2016b), Konstantakis *et al.* (2016), Beck *et al.* (2015), Chaibi and Ftiti (2015), Ghosh (2015), Tanasković and Jandrić, (2015), Abid *et al.* (2014), Akinlo and Emmanuel (2014) and Alhassan, Kyereboah-Coleman and Andoh (2014). Moreover, other studies include those of by Filip (2014), Yurdakul (2014), Zaib *et al.* (2014), Castro (2013), Endut, Syuhada, Ismail and Mahmood (2013), Messai and Jouini (2013), Louzis *et al.* (2012), Mileris (2012) and Ali and Daly (2010). Despite these efforts by previous researchers in investigating the determinants of NPLs the problem has remained not fully understood, unresolved and inconclusive.

Furthermore, methodologically many of the previous studies did not recognise the dynamism of NPLs. Hence, many of them relied on static panel models of analysis, therefore, ignoring the dynamism in modelling the determinants of NPLs. Additionally, the few studies that incorporated the dynamism of NPLs in their studies used short run methods such as Generalised Method of the Moments (GMM) which might have been partly responsible on why the problem remains unresolved. However, there is the need to investigate the phenomenon by employing efficient long run models such as the PMG methods.

Consequently, there is a need for further investigation into what might have been the causes of the persistent and rising level of global NPLs in general and more particularly among OPEC member states using an efficient long run technique such the PMG model. Also, some of the possible factors that can explain the problem of the NPLs are systematic risks factors of oil price changes, corruption, political instability and environmental risks. These systemic risks factors have been found to have an effect on other economic fundamentals but are not adequately used in relations to NPLs. Thus, this study investigates the effects of systemic risks on NPLs as that might explain the unresolved issue.

Nevertheless, there are other studies in the wider literature of economic and financial which investigated the relationship of the systemic risks (oil price charges, corruption, political instability and environmental risks) and other economic activities. For example, there were researches on the effects of the said systemic risks on economic growth,

Foreign Direct Investment (FDI), inflation, sovereign credit rating, stock prices and quality of property right, loan demand, savings, access to credit, financial fragility and bank profitability among others (see, for example, Abu *et al.*, 2015; Breunig & Chia, 2015; Okada & Samreth, 2014; Sotoudeh & Worthington, 2014; Mottaleb, Mohanty, Hoang, & Rejesus, 2013; Collier, Miranda, & Skees, 2013; Ng, 2012; Collier *et al.*, 2011; Cuadra & Sapriza, 2008).

The very few researches that investigated the relationships between the predicting variables and banking activities are those of Al-Khazali and Mirzaei (2017), Miyajima (2016), Rehman *et al.* (2016) and Klomp (2014). The other studies are those of Park (2012), Goel and Hasan (2011) and Dinç (2005). However, these studies are quite too few as they did not adequately investigate the effect of these independent variables of interest on NPLs. Therefore, there is the need to further investigate the effects of systemic risks on NPLs in OPEC countries.

Overall, these researches are not only inconclusive in terms of their findings and relied on short term techniques while studies on the systematic risk factors are limited and inadequate. Therefore, this has given the present study a further motivation to contribute in filling the important gaps in the literature by using long run methods and focusing on the effects of systemic risks variables which have been most neglected for a better understanding of the phenomenon of NPLs. Hence, this will involve examining the effect of oil price changes, corruption, political instability and environmental risks on NPLs in OPEC member countries by employing the

PMG methods. Consequently, this has given rise to the following research questions and objectives.

1.3 Research Questions

The phenomenon of deteriorated global bank assets quality has remained unresolved while the problem among the OPEC nations poses a threat to their financial systems and to global financial stability. Further, the study of the determinants of NPLs has remained inconclusive. Therefore, these twin problems of unresolved deteriorated bank asset quality and inconclusiveness of previous studies as well as the prevalence of systematic risks raise questions as what might have been responsible for the phenomenon in OPEC countries. This necessitates the need to further investigate the effect of new factors especially the prevalence of systematic risks amongst the OPEC countries as that could explain their problem of huge and persistent NPLs. Therefore, against the backdrop of the preceding sections and in line with the problem statement of this study the following questions are raised:

i. Have the previous studies been able to consider and investigate the appropriate causes of deterioration of bank asset qualities? And to what extent do oil price changes, corruption, political instability and environmental risks affect NPLs in OPEC member countries?
ii. Do the previous studies employed the appropriate methodological approaches in investigating the causes of poor bank asset quality? Would the use of long run and more efficient estimation methods such as Pooled Mean Group (PMG) help in understanding the NPLs phenomenon?

iii. To what extent have the policy recommendations of previous studies being relevant in resolving the problem of NPLs amongst the OPEC member states? Would investigating the causes of loan portfolio quality deterioration specifically amongst the OPEC member states proffer appropriate policy recommendations that will lead to the resolution of the problem?

1.4 Research Objectives

The presence of huge and persistent NPLs among the OPEC countries over the years indicates the intensity of the loan quality deterioration and high level of financial fragility. The main objective of this study is to employ the PMG methods in investigating the extent to which the prevalence of systematic risks factors in the OPEC countries have contributed to the deterioration of bank asset quality as well as recommend appropriate policy responses of resolving the issue. Therefore, the specific objectives of the study include:

i. To examine the effect of oil price changes on Non-performing loans in OPEC member countries.
ii. To investigate the effect of corruption on Non-performing loans in OPEC member countries.
iii. To examine the effect of political instability on Non-performing loans in OPEC member countries.
iv. To determine the effect of environmental risks on Non-performing loans in OPEC member countries.

1.5 Significance of the Study

The findings of this study theoretically contribute to the literature and provide insights into future researches in the area which were hitherto characterised by inadequate empirical studies on the relationship between systematic risks and bank asset quality. Therefore, the main contributions of this study include investigating the effects of systemic risks factors of oil price changes, corruption, political instability and environmental risks on NPLs amongst OPEC member states. Generally, the study established the existence of the effects of oil price changes, corruption, political instability and environmental risks on non-performing amongst OPEC member states. Specifically, the significance of this study is highlighted below:

Firstly, most of the previous studies on NPLs were mainly restricted to the determinants of NPLs using the GDP, inflation, exchange rates, unemployment rate and interest rate among countries that never shared the same product but rather mostly based on criteria such as geographical proximity and other economic interest groupings. Moreover, previous studies did not adequately investigate the effects of systemic risks on NPLs. Based on the available literature, this study is among the limited studies that investigated such relationships between the dependent variables and the oil price changes, corruption, political instability and environmental risks especially amongst countries that come together based on single product, that is, petroleum product for the OPEC member nations.

Secondly, this study is among the few studies that employed the PMG/ARDL estimator in modelling NPLs. The present study unlike most of those that preceded it employs the

Pooled Mean Group (PMG)/Autoregressive Distributed Lag (ARDL) model as against the conventional traditional methods of Pooled Ordinary Least Square (OLS), Fixed Effect (FE) and Random Effect (RE) model and a few studies that employed Generalised Methods of Moments (GMM). Except, as suggested by Pesaran, Shin and Smith (1999) and Pesaran and Smith (1995) unless the slope of the coefficients is identical the estimates of the average values of the parameters especially in the fixed effect and generalised methods of moments models may be inconsistent. Therefore, the PMG model has made it possible for the study to estimate the long run effects of the independent variables on the NPLs as well as the speed of adjustments over a long period of time.

The third significance is that the findings of this study are generally relevant to policymakers, practitioners, investors, and regulatory authorities who are usually confronted with the responsibility of managing loan failures. Overall, it is also envisaged that the result will be of help to the banking policymakers and regulators in creating a sustainable framework of quality bank loan portfolios. Furthermore, the findings of this study would also guide policy makers in formulating more sound and effective banking policies based on the stipulated policy implications of the study. More specifically the significance of this study to policymakers and practitioners is in the following ways:

First, the findings will help management and banking industry regulators in formulating policies that will deal with the effects of systemic risks factors in the volatile business environment of OPEC member nations that can cause or compound the problem of NPLs. Secondly, the findings of the study will allow for micro-stress and macro-stress

tests against certain macroeconomic variables such as oil prices changes. Therefore, it can serve as an early warning signal to policy makers, practitioners and regulators against any impending loan or banking crisis which is believed to be caused by deteriorated bank asset quality. The third significance of the findings is that they will help management and regulators in strengthening the function of loan monitoring. The fourth significance of the finding of this study to policy makers and management is that it will help in identifying key vulnerabilities and formulation of policies that will strengthen general financial stability and resilience of banks against systemic risks and other macro shocks. Consequently, the findings of the study will be relevant to policymakers in macro prudential policy formulation as the study centres on aggregate loan quality.

Finally, the results of this study have expanded the frontier of knowledge of systematic risks embedded in the banks' business environment and their effects on bank asset quality. It is expected that the study will serve as a point of reference for researchers who might conduct studies in the same or related areas based on the highlighted limitations of this study and its recommendations for further researches made therein. Therefore, the essence of this study is not only to address the problems stated and search for potential solutions but also to contribute to existing literature and add to the body of knowledge of banking and finance.

1.6 Scope of the Study

This study covers the effects of systematic risks of oil price changes, corruption, political instability and environmental risks on bank asset quality. It also uses the

control variables of real GDP, inflation rate, lending interest rate, unemployment rate and exchange rate as control variables which were included in the modelling process of the study.

The entire 13 countries of OPEC have been considered in the study and the time frame of the study was from 1996-2015. This period represents the turning-point of global and OPEC member states' NPLs crises. Additionally, the choice of the year 1996 as the starting point and 2015 as the year end was determined by data availability of OPEC member states.

1.7 Organisation of the Thesis

The study is made up of six chapters. The first chapter is the introductory aspect of the study that discusses the general persistent position of global NPLs as well as comparative discussion of the NPLs positions of BRICS, G7, G8 and OPEC member countries. Furthermore, the position of total assets, customers deposit, loans and shareholders' equity of OPEC member states' banks were discussed. The pervasiveness of oil price fluctuations, corruption, political instability and environment risks amongst OPEC countries were also highlighted. The research problem was stated and research questions were raised, and the general objective, as well as the specific research objectives, were set for the study accordingly. Additionally, the scope of the study was set and its significance underscored accordingly.

Chapter two deals an overview of OPEC member states. The chapter provides the historical background of OPEC countries and discusses their economic outlook. Also, a

comparative analysis of the countries' oil, economic, financial and banking characteristics were provided. Moreover, an overview of their systemic risks of oil price changes, political instability, corruption and environmental risks was also stressed and the relevance of conducting a research among the member states was also justified.

Furthermore, chapter three which is on the review related literature. The chapter explains the concept of NPLs, its classifications and implications to the banks and the economy at large. Also, the underpinning theories of the study have been discussed accordingly. The literature review covers both conceptual and empirical review of the previous related literature on the dependent variable, independent variables, global financial crisis of 2007-2008 and the control variable of the study. The chapter concludes by summarising the gaps in the literature.

In addition, Chapter four discusses the research methodology of the study. The chapter underscores the methodological procedure adopted in achieving the set objectives of the study. The chapter provides the research framework for the study and developed its research hypotheses. Also, it specifies the models used in estimation in order to achieve each of the objectives of the study. Furthermore, the justification for the measurement of each variable is provided in the chapter as well as a clear description of data and source of the data for each variable were spelt out.

Chapter five is concerned with data analysis and discussion of results. The chapter estimates, interprets and discusses the relationship between NPLs and systematic risks namely; oil price changes, corruption, political instability and environmental risks. The

empirical analysis establishes new and additional evidence with regard to the effects of systemic risks on bank asset quality. The study further explains the relationship between control variables such as real gross domestic products, and unemployment in the main model, as well as inflation, lending interest rate and real exchange rate in addition to the earlier mentioned control variables in the sensitivity analysis.

Finally, Chapter six concluded the study by availing the summary of the major findings made by the research, policy implications of the findings and recommendations were made accordingly. The chapter also underlines the contributions and limitations of the study as well as provides suggestions for future research.

CHAPTER TWO

AN OVERVIEW OF OPEC MEMBER STATES

2.1 Introduction

This chapter presents an overview of the OPEC member countries' economic and financial characteristics and banking systems. It also provides an overview of oil price changes, corruption, political instability and environmental risks in OPEC countries. OPEC is a composition of oil producing countries of different geographical regions of the world. Therefore, oil production and its subsequent exportation are a common product among the member nations of OPEC. The countries of OPEC and their banking systems cut across different stages of economic development which give a fair reflection of NPLs across their economies. Hence, the choice of OPEC member states for this study which is due to oil product they share and their role in supplying energy to the global economy as well as the magnitude of NPLs amongst the member states.

Gupta (2008) argued that oil is the fuel that drives economies and its regular supply is vital for sustainable economic and social development of nations because the world depends on oil for meeting about 35 percent of the global energy needs. However, the problem of NPLs amongst OPEC countries is a serious threat to global financial stability. Furthermore, it poses a threat of global risks of banking and subsequent financial crises which if crystallised will certainly aggravate the fragile global economy that is yet to recover from the 2007/2008 global financial crisis.

The OPEC member states economies have evolved from a very long history of over reliance on the oil sector. This has exposed their economies to oil price changes, environmental risks, corruption and in the recent time wide political instabilities.

2.2 Brief History of OPEC Economy

The Organisation of the Petroleum Exporting Countries (OPEC) is a permanent Intergovernmental Organisation (IGO), created on September 10-14, 1960 in the Iraqi Capital Baghdad. OPEC is mostly perceived by scholars to represent political interactions amongst member countries and it is referred to as clusters of economic and political variables (Mingst, 1980). The current members of OPEC as at January 2016 are Algeria, Angola, Ecuador, Indonesia, Iran, Iraq, Kuwait, Libya, Nigeria, Qatar, Saudi Arabia, United Arab Emirate and Venezuela (OPEC, 2016a). The main objective of OPEC is to coordinate and unify member countries petroleum policies so that they could secure stable and fair prices for petroleum producers and maintain an efficient, economic and regular supply of petroleum to consuming nations as well as a fair return on capital to those investing in the industry (OPEC, 2015).

The impact of an ongoing political and social security challenges and slow recovery of economies in many parts of the world affect both supply and demand sides of oil. Hence, the present collapse of oil price which sells below $40[14] US dollars per barrel and its attendant consequences is not only impacting on member states' but also world's economies. This phenomenon has been linked to the slowdown of the economies of emerging markets and the fact that advanced economies are still recovering from the

[14] Oil price per barrel was $38.29 as at August 2, 2016 (OPEC, 2016)

impact of 2007/2008 global financial crises. Lagarde (2016)[15] also stressed that the external environment has changed, oil prices have fallen sharply, global financial conditions have tightened, growth in emerging and developing economies have slowed and geopolitical tensions have increased thereby calling for concerted efforts from governments in protecting their financial systems.

Furthermore, there are political instabilities in most of the members' country of OPEC with the most recent being the full-blown war between Saudi Arabia and Yemen as well as the Saudi/Nigeria-Iran tension over the sectarian conflict between Sunni and Shia followers in their respective countries. This has also dragged their governments into the crises thereby causing diplomatic row amongst them which could have serious consequences on their economies.

2.3 Overview of OPEC Countries' Economic, Financial and Oil Activities

The OPEC member states represent an important economic grouping that holds over 80 percent of world proven oil reserve as at 2015 as reported by OPEC (2017). These countries have certain unique characteristics in terms of their oil reserves, crude oil production, RGDP growth rate, domestic credit to private sector and gross savings as a percentage of GDP. Additionally, these countries exhibit special features in terms of their gross domestic products and income per capita as highlighted in Table 2.1

[15] This assertion was made by the Managing Director of IMF Lagarde on her visit to Nigerian President in January, 2016

Table 2.1

Key Indicators of OPEC Countries' Economic, Financial and Oil Activities

Country	OR	% GOR	% of OOR	COP	RGDP_GR	DCPB (%GDP)	GDPY	GNIY	GS (% GDP)
Algeria	12.20	0.7%	1.0%	1,047	3.4	21.84	4154.12	14300	36.85
Angola	9.52	0.7%	0.8%	1,692	1	27.18	4101.47	6470	-6.30
Ecuador	8.27	0.5%	0.7%	524	-2	26.88	6205.06	11270	24.20
Indonesia	3.23	0.2%	0.3%	835	2.9	33.05	3346.49	10690	32.10
Iran	158.40	9.3%	13.1%	3,759	4.5	na	na	na	na
Iraq	142.50	8.4%	11.7%	4,373	5	9.15	4943.76	15340	37.03
Kuwait	101.50	6.0%	8.4%	2,702	2	98.60	29300.58	84360	32.64
Libya	48.36	2.8%	4.0%	550	-4	na	na	na	na
Nigeria	37.06	2.2%	3.1%	1,508	-1.5	14.19	2671.72	5810	16.35
Qatar	25.24	1.5%	2.1%	618	2.5	69.55	73653.39	138480	46.56
Saudi Arabia	266.46	15.7%	22.0%	9,954	1.4	56.63	20481.75	54840	25.12
United Arab Emirates	97.80	5.8%	8.1%	2,842	2.3	76.48	40438.76	70020	na
Venezuela, RB	300.88	17.7%	24.8%	1,956	-9	na	na	na	na

Note: OR, %GOR, %OOR, COP, RGDP_GR, DCPB (%GDP), GDPY, GNIY and GS (%GDP) represent oil reserve per billion barrels as at 2015, % of global oil reserve as at 2015, % of OPEC's share of oil reserve, crude oil production barrels per day as at April, 2017, growth rate of RGDP (2015-2016), domestic credit to private sector by banks as a % of GDP as at 2015, GDP per capita (current US$) as at 2015, gross national income per capita, purchasing power parity (current US$) as at 2015 and gross saving as a % of GDP.

Sources: OPEC, WDI, IMF, International Energy Agency (IEA) and British Petroleum (BP) 2017

Algeria which is a North African country began production in 1958 and joined OPEC in 1969 (OPEC, 2015). The oil and gas sector of Algeria has been the major corner stone of its economy and accounts for two-thirds of total export (OPEC, 2015). The Central Intelligence Agency, CIA (2015)[16] maintains that Algeria's economy relies strongly on hydrocarbons which account for almost 60% of its budget revenue, 30% of its GDP, and over 95% of export earnings. The agency maintained that Algeria has the 10th-largest reserves of natural gas in the world and is the sixth-largest gas exporter but ranks the 16th in oil reserves (OPEC).

The country of Algeria as shown in Table 2.1 as at 2015 possesses 12.20 billion barrels of world proven oil reserves which represent 0.7 and 1.0 percent of the total share of global and OPEC reserves respectively. Also, Algeria's crude oil reserve is the third in Africa after Libya and Nigeria but has the lowest daily oil production. Furthermore, Algeria recorded the highest RGD growth rate amongst the African countries and followed by Angola. Its total daily oil production as at April 2017 was 1,047 barrels per day. Algeria's RGDP growth rate grew by 3.4% from the year 2015 to 2016. Furthermore, the country's domestic credit to private sector by banks as a percentage of GDP stood at 21.84 while gross savings as a percentage of GDP was 36.85 as at 2015. In the same year of 2015, the Algeria's GDP per capita and Gross National Income (GNI) per capita based purchasing power parity (Current US$) were $4,154.12 and $14,300.00 respectively.

[16] Central Intelligence Agency's factbook 2015

The Algerian banking system is under the control of Banque D'Algerie (BA) which on 4th January 2015 approved a banking structure made up of 20 Commercial banks, 10 Financial institutions (composed of nine general purpose financial institutions and one specific purpose financial institution) and seven Liaison office, that is, branches of foreign financial institutions (BA, 2015).

Furthermore, Angola like Algeria is also an African economy that joined OPEC in 2007 and is located on the Atlantic coast in the Southern part of Africa and it is the second largest oil producer in Africa (OPEC, 2015). The economy of Angola like that of its Algerian counterpart is heavily oil dependent. The oil sector and related activities contribute about 50% of its GDP. Oil represents more than 90% of Angola's export which also accounts for over 70% of its government revenue (CIA, 2015).

The Table 2.1 states that as at 2015 Angola possesses 9.52 billion barrels of world proven oil reserves which also represents barely just 0.7 and 0.8 percent of the total share of global and OPEC reserves respectively which are very close to the figures of Algeria. The country has the highest crude oil production amongst its African counterparts but appears to have the lowest world proven oil reserves compared to Algeria, Libya and Nigeria. As at April 2017, the country's total daily oil production Stood at 1,692 barrels per day. The Angola's RGDP growth rate grew only by 1 percent from the year 2015 to 2016. Moreover, the country's domestic credit to private sector by banks as a percentage of GDP was 27.18 while gross savings as a percentage of GDP was -6.30 as at 2015. In the year 2015, the country's GDP per capita and Gross National Income (GNI) per capita based purchasing power parity (Current US$) were $4,101.47

and $6,470.00 but lower than those of Algeria respectively. The banking system of Angola is under the control and supervision of Banco Nacional de Angola (BNA). On the whole, 29 commercial banks and six branches of foreign banks are allowed to operate (BNA, 2015).

Besides, Ecuador joined OPEC in 1973 and is in Western South America, sharing borders with the Pacific Ocean at the equator between Colombia and Peru. Its major resources are petroleum, hydropower, timber and fish. The country has a very long outstanding history of natural disasters and war. Petroleum is largely depended upon by Ecuador which contributes more than 50% of its foreign earnings (CIA, 2015).

In Table 2.1 it is exhibited the Ecuador's key indicators of oil activities are lower than those of African countries of Algeria and Angola. For example, Ecuador's oil reserve as at 2015 was 8.27 billion barrels of world proven oil reserves which signify just 0.5 and 0.7 percent of the total share of global and OPEC reserves respectively which are also lower than the figures of Algeria and Angola. The Ecuador's total daily production as at April 2017 was only 524 barrels per day which second lowest to Libya. The RGDP growth rate of Ecuador dropped by -2 percent from the year 2015 to 2016. However, the country's domestic credit to private sector by banks as a percentage of GDP was 26.88 while gross savings as a percentage of GDP was 24.20 as at 2015. In the year 2015 the Ecuador's GDP per capita and Gross National Income (GNI) per capita based purchasing power parity (Current US$) were $6,205.06 and $11,270.00 respectively but higher than those of Angola.

However, Ecuador also deals in textiles, wood, chemicals and food processing among others. The country joined OPEC in 1973 but voluntarily suspended its membership in 1992 and resumed in 2007. Ecuador started oil production in 1921 (OPEC, 2015). The Ecuador's banking sector is regulated by its Apex bank which is known as Banco del Ecuador (BE), that is, Central Bank of Ecuador (BE, 2015).

Indonesia is an OPEC that belongs to Asian Region and is one of the oldest members of OPEC which joined the organisation in 1962. The country suspended its membership in January 2009 but applied for reactivation of its membership in September 2015 (OPEC, 2016a). Indonesian's major economic activities are in the areas of petroleum, tin, natural gas silver and gold among others (CIA, 2015).

The country of Indonesia is the only OPEC member state from Southeast Asia and its key indicators of oil activities as stipulated in Table 2.1 are lower compared to those of Algeria, Angola and Ecuador. Indonesia's oil reserve as at 2015 stood at 3.23 billion barrels of world proven oil reserves which is just 0.2 and 0.3 percent share of the total share of global and OPEC reserves respectively which are also lower than those of Algeria, Angola and Ecuador. Table 2.1 also exhibits Indonesian's total daily production based on data obtained from alternative source as at December 2016 to be 835 barrels per day which are only higher than those of Ecuador, Libya and Qatar. Nonetheless, its RGDP growth rate increase by 2.9 percent from the year 2015 to 2016. Additionally, the country's domestic credit to private sector by banks as a percentage of GDP was 33.05 percent while gross savings as a percentage of GDP stood at 32.10 as at 2015. Indonesia in the year 2015 recorded GDP per capita and Gross National Income (GNI) per capita

based purchasing power parity (Current US$) $3,346.49 and $10,690.00 respectively which are higher than those of Nigeria.

The banking system of Indonesia provides for the coexistence of commercial banks and the people's credit institution. The central bank of Indonesia (Bank Sentral Republik/Bank Indonesia) permits 120 commercial banks which are divided into four government bank and 116 private commercial bank and 1837 people's credit outfits (BSRI, 2015). The commercial banks are further subdivided into 79 private commercial banks, 11 private Islamic commercial banks and 26 local government commercial banks. Additionally, the credit bureau outfits are further subdivided into 1,683 conventional and 154 Islamic credit bureau outfits (BSRI).

The Islamic Republic of Iran is a founding member of OPEC since September 1960. The country's major resources are petroleum, natural gas, coal, chromium, copper, iron ore, lead and sulphur (CIA, 2015). The economy relies heavily on oil and gas exportation but it also taps from its agricultural, industrial and services industries. There is a great direct state involvement in the country's economy by owning and operating enterprises. However, the sanctions imposed on the country have significantly affected Iranian economy causing hardship to its people and financial system.

Additionally, Table 2.1 shows that the Iranian's key oil activities indicators are third to Venezuela and Saudi Arabia except for crude oil production which is third to Iraq and Saudi Arabia. For example, Iran's oil reserve as at 2015 was 158.40 billion barrels of world proven oil reserves which signifies just 9.3 and 13.1 percent of the total share of

global and OPEC reserves respectively. The country's total daily production as at April 2017 was 3,759 barrels per day which third highest to Iraq and Saudi Arabia. The RGDP growth rate of Iran grew by 4.5 percent from the year 2015 to 2016. However, the country's other key economic indicators' data on domestic credit to private sector by banks as a percentage of GDP, gross savings as a percentage of GDP, GDP per capita and Gross National Income (GNI) per capita based purchasing power parity (Current US$) are not available.

The Iranian banking system is a composition of both governments and privately owned banks and non-bank credit institutions. There is a total of three commercial and five specialised government owned banks and a total of 19 non-government owned banks as well as two Islamic Banks in Iran-Central Bank of Iran (CBI, 2015).

Iraq is a Middle East country bordering the Persian Gulf, between Iran and Kuwait and a former colony of Britain. In recent history, the country has been in a state of severe and series of conflicts ranging from Iran-Iraq war, the first and second Gulf wars and the current state of worsening insecurity which is affecting its economy. The country's economy basically depends on petroleum, fertiliser, chemicals, metal fabrications and textiles. Furthermore, Iraq's economy is highly oil dependent because it provides more than 90% of government's budget and also accounts for 80% of its export revenue (CIA, 2015). The founder of OPEC was Iraqi's President Fuad Masum and the country started oil drilling in 1927 hence Iraq is a founding member of OPEC since 1960 (OPEC, 2015).

The same Table 2.1 indicates that Iraq's key indicators of oil activities are the fourth after Iran, Venezuela and Saudi Arabia except for crude oil production is only lower than Saudi Arabia. The Iraq's oil reserve as at 2015 was 142.50 billion barrels of world proven oil reserves which signifies just 8.40 and 11.70 percent of the total share of global and OPEC reserves respectively. Also, the country's total daily production as at April 2017 was 4,373 barrels per day which only second lower to Saudi Arabia. The RGDP growth rate of Iraq increased by 5 percent from the year 2015 to 2016. However, the country's domestic credit to private sector by banks as a percentage of GDP was only 9.15 while gross savings as a percentage of GDP was 37.03 as at 2015. Furthermore, in the year 2015, the Iraqi's GDP per capita and Gross National Income (GNI) per capita based purchasing power parity (Current US$) were $4,943.76 and $15,340.00 respectively.

The current average oil export of the country at early 2016 was 2.4 million barrels per day (b/d)[17] which can be associated with its current state of insecurities and uncertainties, especially the repeated attacks on its Iraq-Turkey border. Their banking activities are under the control of Central Bank of Iraq (CBIQ). The structure of banking in Iraq is multifaceted where there is the existence of seven fully registered state-owned banks, 24 private banks, 10 Islamic banks and 23 foreign banks (CBIQ, 2015).

Kuwait is also a founding member of OPEC and the country started export of crude oil in 1946 (OPEC, 2015). The country has a relatively open economy compared to most Middle East countries and it has crude oil reserves of about 102 billion barrels which

[17] Barrel per day

constitute more than 6% of total world reserve. Petroleum accounts for 94% of its export revenues, and 89% of government income (CIA, 2015). However, the country's industries are basically in the areas of petroleum, petrochemicals, cement, construction materials, food processing, shipbuilding and repairs and water desalination.

Table 2.1 shows that Kuwait has high key indicators of oil activities amongst the OPEC member states are the fifth after Iran, Iraq, Venezuela and Saudi Arabia except that it also has lower crude oil production than UAE. The Kuwait's oil reserve as at 2015 was 101.50 billion barrels of world proven oil reserves which signifies just 6.00 and 8.40 percent of the total share of global and OPEC reserves respectively. Also, the country's total daily production as at April 2017 was 2,702 barrels per day. The Kuwaiti's RGDP growth rate of increased by 2 percent from the year 2015 to 2016. However, the country's domestic credit to private sector by banks as a percentage of GDP was only 98.60 while gross savings as a percentage of GDP was 32.64 as at 2015. Additionally, in the year 2015, the Iraqi's GDP per capita and Gross National Income (GNI) per capita based purchasing power parity (Current US$) were $29,300.58 and $84,360.00 respectively.

The country's banking system is under the supervision of the Central Bank of Kuwait (CBK) and it is made up of 11 Kuwaiti's domestic banks with eight of them focusing on the conventional banking system and three Islamic banks. Additionally, there is also the existence of 12 foreign banks (CBK, 2015).

Libya's first oil well was struck in 1959 but started exporting in 1961 and it joined OPEC in 1962 (OPEC, 2015). The Libyan economy is almost entirely dependent on the energy sector which constitutes about 96% of government revenue (CIA, 2015). It had the highest nominal per capita GDP in Africa due to its small population and excessive income from sales of crude oil and natural gas. The major industries in Libya are petroleum, petrochemicals, cement, Aluminium, Iron and steel and textiles.

As indicated in Table 2.1 Libya has the key indicators of oil activities than all other African countries of Algeria, Angola and Nigeria except the index of crude oil production which Nigeria is ahead of it by almost 300 percent. The Libya's oil reserve as at 2015 stood at 48.36 billion barrels of world proven oil reserves which are 2.80 and 4.00 percent share of the total share of global and OPEC reserves respectively. The Table 2.1 also exhibits Libya's total daily production based on April 2017 was 550 barrels per day which are only higher than that of Ecuador. Nonetheless, Libya's RGDP growth rate decreased by -4 percent from the year 2015 to 2016. However, Libya's data on domestic credit to private sector by banks as a percentage of GDP, gross savings as a percentage of GDP, GDP per capita and Gross National Income (GNI) per capita based purchasing power parity (Current US$) were not made available.

The Central Bank of Libya (CBL) is the apex bank controlling the affairs of banks and other related financial institution in the country. The Libya's banking system is made up of two major classifications. There are 16 domestic commercial banks and 22 foreign banks operating the Libya's banking system (CBL, 2015).

Oil has been the largest contributor to Nigeria's economy since the 1970s. The country's major industries are crude oil, natural gas, rubber products, hides and skins and cement. The country has emerged the Africa's largest economy, with an estimated GDP of US$ 479 billion in 2014 (CIA, 2015). Its oil and gas sector revenue represents over 90% of total export revenue. Oil was first discovered in Nigeria in 1956 and joined OPEC in 1971 (OPEC, 2015).

The Nigeria indicators as indicated in Table 2.1 shows that country has the eighth highest global crude oil reserve amongst the OPEC member states after Libya, Kuwait, Iran, Iraq, Saudi Arabia, UAE and Venezuela. Nigeria's oil reserve as at 2015 was 37.06 billion barrels of world proven oil reserves which signifies just 2.2 and 3.1 percent of the total share of global and OPEC reserves respectively. Moreover, the country's total daily production as at April 2017 was 1,508 barrels per day. Also, Nigeria's RGDP growth rate of decreased by -1.5 percent from the year 2015 to 2016. Although, the country's domestic credit to private sector by banks as a percentage of GDP was only 14.19 while gross savings as a percentage of GDP was 16.35 as at 2015. Furthermore, in the year 2015, the Nigeria's GDP per capita and Gross National Income (GNI) per capita based purchasing power parity (Current US$) were $2,671.72 and $5,810.00 correspondingly.

The Nigerian financial system is made up of critical financial institutions which include banks, insurance companies, investment companies, pension funds, and mutual funds. The banking system, on the other hand, is regulated by the Central Bank of Nigeria (CBN) which includes 22 deposit Money Banks, two merchant banks, one non-interest bank, five development banks, 792 microfinance banks and 40 primary mortgage banks (CBN, 2015).

The exploration of oil in Qatar began in 1935 but commercial exportation started between 1939 and 1940. The country joined OPEC in 1961 (OPEC, 2015). Qatar's economy is driven largely by oil and gas sector but fully supported by growth in the manufacturing, construction and services sectors of the economy. However, the oil and gas sector accounts for 92% of its export earnings and 62% of government revenue. The industrial sector is composed of petroleum, Liquefied Natural Gas (LNG), and cement (CIA, 2015).

Furthermore, Table 2.1 exhibits that Qatar country has the ninth highest global crude oil reserve amongst the OPEC member states after Libya, Kuwait, Iran, Iraq, Nigeria, Saudi Arabia, UAE and Venezuela. The Qatari's oil reserve as at 2015 was 25.24 billion barrels of world proven oil reserves which signifies just 1.50 and 2.10 percent of the total share of global and OPEC reserves respectively. Moreover, the country's total daily production as at April 2017 was 618 barrels per day. The Qatar's RGDP growth rate of grew by 2.5 percent from the year 2015 to 2016. Though, the country's domestic credit to private sector by banks as a percentage of GDP was only 69.55 while gross savings as a percentage of GDP was 46.56 as at 2015. Additionally, in the year 2015 the country's GDP per capita and Gross National Income (GNI) per capita based purchasing power parity (Current US$) were $73,653.39 and $138,480 accordingly.

The Qatari financial system is also under the control of Qatar Central Bank (QCB) and it is made up of three major segments, which are banks, financial institutions (finance companies, investment companies and exchange houses) and investment funds. The

QCB more specifically supervises the activities of the above mentioned arrangement where there are 19 banks which include; seven national banks, four Islamic national banks, seven foreign banks, and one representative office. The financial institutions are made up of three finance companies, two investment companies and 20 exchange houses. However, there are only 13 mutual funds operating in the Qatari financial system (QCB, 2015).

The Saudi Arabian economy has for some time has remained a major producer of oil and gas and holds about 16% of the world's proven oil reserves. This might explain why the economy of Saudi Arabia depends largely on petroleum and how easily any shock in global oil prices can affect the country. Apart from petroleum Saudi Arabia's other natural resources are natural gas, gold, copper and iron ore (OPEC, 2015).

Table 2.1 shows that Saudi Arabia has the highest key indicator of oil activities in terms of crude oil production than any other OPEC member states and the second after Venezuela in terms of oil reserves as well as percentages of a share of global and OPEC oil reserves. The Saudi Arabia's oil reserve as at 2015 was as high as 266.46 billion barrels of world proven oil reserves which signifies just 15.70 and 22.00 percent of the total share of global and OPEC reserves respectively. Also, the country's total daily production as at April 2017 was the highest with 9,954 barrels per day. Also, the Saudi Arabia's RGDP growth rate of increased by only 1.4 percent from the year 2015 to 2016. Nonetheless, the country's domestic credit to private sector by banks as a percentage of GDP was only 56.63 while gross savings as a percentage of GDP was 25.12 as at 2015. Additionally, in the year 2015, the Saudi Arabia's GDP per capita and

Gross National Income (GNI) per capita based purchasing power parity (Current US$) were $20,481.75 and $54,840.00 respectively.

The oil sector accounts for about 80% of its budget revenue and 90% of export earnings. Its first oil well was done in 1938 and joined OPEC as a founding member in 1960 (CIA, 2015; OPEC, 2015). The entire banking activities are under the control of Saudi Arabian Monetary Agency (SAMA). The banks are broadly classified into local and foreign banks. There is a total of 24 banks in Saudi Arabia which is divided into 12 local banks and 12 foreign banks (SAMA, 2015).

The United Arab Emirate has an open economy that encourages foreign investments. The country has been able to encourage private participation and a lot of effort has been exerted in jobs creation and infrastructural development. The free trade zones offer 100% foreign ownership of businesses and zero taxes. The country discovered commercial oil in 1958 and joined OPEC in 1967 (CIA, 2015; OPEC, 2015).

The position of UAE as shown in Table 2.1 reveals that the country has the sixth highest share of the OPEC member states oil reserves. The country's oil reserve as at 2015 stood at 97.80 billion barrels of world proven oil reserves which signifies 5.80 and 8.10 percent of the total share of global and OPEC reserves respectively. Also, the UAE's total daily production as at April 2017 was 2,842 barrels per day. Similarly, the country's RGDP growth rate of increased by only 2.3 percent from the year 2015 to 2016. Nonetheless, the country's domestic credit to private sector by banks as a percentage of GDP was only 76.48 while no data on gross savings as a percentage of

GDP as at 2015 respectively. Additionally, in the year 2015, the UAE's GDP per capita and Gross National Income (GNI) per capita based purchasing power parity (Current US$) were $40,438.76 and $70,020.00 respectively.

The financial system in UAE is made up of 46 commercial banks, 23 national commercial banks, 28 foreign commercial banks, eight investment banks, 25 financial investment companies, 26 finance companies, 140 money changers and 12 financial and monetary intermediaries-Central Bank of United Arab Emirates (CBUAE, 2015).

Venezuela is a North American country bordering the Caribbean Sea and the North Atlantic Ocean, between Colombia and Guyana. It is a non-permanent member of the UN Security Council for the 2015-2016 terms. The country is highly dependent on the petroleum industry which accounts for about 40% of government revenue and almost 96% of its export (CIA, 2015). The country has been in oil production since 1914 and becomes one of the founding members of OPEC in 1960 (OPEC, 2015).

As indicated in Table 2.1 Venezuela has the highest key indicators of oil activities than all other countries of OPEC except the figure of crude oil production which Saudi Arabia records the highest. The country's oil reserve as at 2015 stood at 300.88 billion barrels of world proven oil reserves which is 17.70 and 24.80 percent of the total share of global and OPEC reserves respectively. Table 2.1 also exhibits Venezuela's total daily production as at April 2017 was only 1,956 barrels per day. Moreover, Venezuela's RGDP growth rate has the highest decreased by -9 percent from the year 2015 to 2016. However, the country's data on domestic credit to private sector by banks as a percentage of GDP, gross savings as a percentage of GDP, GDP per capita and

Gross National Income (GNI) per capita based purchasing power parity (Current US$) were not made available.

2.4 Overview of Systemic Risks in OPEC Member Countries

Most of the OPEC member countries share the same structural problems. As stated earlier at the beginning of this chapter that all the countries are oil dependent and are highly susceptible to oil price fluctuations. Presently, most of the countries are having challenges in financing their budgets which are in deficits due to fall in oil prices.

An understanding of the current oil price predicament calls for a retract of global oil price history as shown in Figure 1.5. The Figure is based on data obtained from OPEC's crude oil basket price which shows the levels of fluctuations from 1960-2015. Stevens and Hulbert (2012) maintain that whatever the outcome of uncertainties among OPEC member states and prices volatility, producers need relatively high prices to survive politically.

The Wall Street Journal (WSJ) observed that the current oil price drop has made the world's biggest oil companies struggling to generate sufficient cash to cover their expenses and pay dividends hence cutting billions of dollars from their budget in the face of tumbling oil prices (WSJ, 2015). This has posed future challenges to oil supermajors such as Exxon, Chevron, Shell and British Petroleum where they slashed their spending by more than $30 billion US dollars in the recent time (WSJ).

The recent drop in oil price has adversely affected major oil exporting countries such as Saudi Arabia, Iran, Iraq, Qatar, Algeria, UAE, Libya and Nigeria who are all members of OPEC. Their governments are experiencing a decrease in revenues because of a decline in oil prices. Additionally, other countries with weak balance sheets such as Nigeria, Ecuador and Iraq must struggle to meet their budget targets. Furthermore, Venezuela's situation is not different from the rest of the other OPEC member states.

According to the 2002 Global Corruption Report of Transparency International, three OPEC member countries have the highest corruption rating in the world. These three countries were Venezuela, Indonesia and Nigeria and who ranked 81, 96 and 101 respectively. The issue of corruption among the OPEC members is persistent. For example, Lahcen (2013) maintained that despite its wealth of natural resources, Algeria continues to experience slow economic growth due to endemic corruption and lack of coordinated planning.

Angola is currently facing widespread corruption at all levels of society. Corruption in Angola manifests itself through various forms such as embezzlements of public resources, bureaucratic and grand corruption (De Morais, 2015). Furthermore, a country-wide corruption in Ecuador has compelled the country to prosecute its three former presidents for corruption: Abdala Bucaram, Jamil Mahuad and Gustavo Noboa (Conaghan, 2012).

Additionally, the Business Anti-Corruption Portal (BACP) has listed virtually all the OPEC member countries among those with very high level of corruption affecting

economic businesses (BACP, 2015). BACP cited lack of checks and balances, insufficient institutional capacity and a culture of impunity as the main factors causing corruption in their economies. For example, BACP also maintained that corruption is a significant obstacle to business activities in Nigeria as companies are very likely to encounter bribery and other corrupt practices. Corruption risks are pervasive throughout all institutions but are most prevalent in the police and judiciary arm of government that recently come under the scrutiny of Economic and Financial Crime Commission (EFCC). Despite a strong legal framework, Nigeria is unable to prevent corruption as gifts, bribery and facilitation payments are the norms (EFCC, 2016).

This position was supported by the report of British Broadcasting Corporation (BBC) News Africa which claimed that Nigerian President Muhammadu Buhari took power promising to tackle the "mind-boggling" level of corruption in his country's oil industry (BBC, 2015). The President maintains that although oil is said to account for 75% of the Nigerian economy, no-one knows how much the country produces or refines because hundreds of thousands of barrels of oil are stolen every day, at each level of the supply chain.

It has been observed that the current situation of oil producing states is that of double tragedy of a falling oil price and immense political instability that confronts Middle-East, North Africa and Nigeria oil dependent countries. According to Institute for the Analysis of Global Security (IAGS), many of the world's leading oil producing states are either politically unstable or at odds with the US (IAGS, 2015). Most of these

countries are members of OPEC who hold about 80 percent of proven global reserves and produce about 40 percent of the world oil (OPEC, 2016a).

Cohen (2015) argues that the political instability in oil rich countries of Middle-East and North Africa (MENA) is discouraging capital investment in local oil and gas project. Stevens and Hulbert (2012) insinuates that the impending political turmoil that might follow any armed conflict between any forces and Iran over its nuclear programme. They also presume that it is hard to identify any major oil producing states that are not sitting on a powder keg of political risk. Cohen supported this position by citing the geopolitical concerns in the context of the Iranian nuclear programme or fanning Shia flames in its neighbourhood. Other cases of political challenges are the battles of the Islamic State of Iraq and al-Sham (ISIS). The Nigerian situation is more disturbing given its multifaceted political problems of Boko Haram, the resurrection of Biafra separatists and the militants' activities of oil region of Niger-Delta.

Furthermore, the OPEC countries are faced with the basic challenges associated with oil drilling and transportation. Oil drilling has many harmful ecological and environmental effects. The process of drilling and extracting oil is complex and leaves many opportunities for error or accidents. Additionally, the piping used in transport and extract oil is made of metals, which can corrode. These can pose challenges not only to the borrowing firm but also to the lending banks that have made a loan on activity that is subject to potential environmental liability. For example, if the borrower is forced to pay for clean-up costs, he may not have enough money left over to pay off the debt.

Tawfiq and Olsen (1993) enumerated the causes of 1991 Gulf oil spill to have included intentional discharges from oil terminals in Kuwait and Iraq as well as from many of Iraqi tankers and war-time related activities of the Iraqi military. Their study reveals that Saudi Arabia nearly spent $340 million US dollars on the damages caused by oil spill. The Associated Press reported that the decades of the oil spill in Nigeria's Niger Delta region will take up to 30 years to clean up Ogoniland oil spills, which Shell oil has been accused of being responsible for the damage. The cost of the exercise has been put to almost Fourteen billion ($14) US dollars (Associated-Press, 2014). Other sources of concern have been the intensity and effect of both natural and technological disasters amongst member countries of OPEC as exhibited in Table 1.3 under appendix C.

2.5 Justification for the Choice of OPEC for the Study

The importance of this study stems from the desire for the OPEC countries to have a stable and resilient banking system against adverse changes in systemic risks factors. The choice of this group of countries is motivated by the following factors. First, developing countries and emerging markets such as those of OPEC member states place much reliance on bank mobilisation of savings and credits for investment, that is, they are bank-based economies. This is based on the role of banks which remains central in the supply of credit and financing economic activities (Athanasolou *et al.*, 2008).

The second reason is that OPEC countries over the years have been having persistent and large ratios of NPLs higher than the world average as indicated in Figure 1.3. Therefore, their persistent and growing NPLs needs to be investigated with a view to protecting the real sector of the economies and preventing global banking crisis by

maintaining quality loan portfolios. The third reason is the over dependence of the OPEC countries on oil as their major source of foreign reserves, therefore, they have a common product which also serves as a significant source of financing governments spending. This has exposed the member states to persistent oil price changes which will affect their banking performances depending on the direction of the oil price changes. Therefore, it is more appropriate to carry out a research amongst the OPEC member countries on the effects of oil prices changes on NPLs.

Another justification is the global position of OPEC member states in terms of possession of the world's proven oil reverse which is over 80% and its huge NPLs ratios which call for a concern over a fear of global banking crisis. A collapse of credits in these oil rich countries can degenerate into global financial crisis as did the burst of mortgage bubbles of Japan in 1997-1998, Eastern Asia in 1997-1998 and US in late 2006 to 2009 which led to the 2007-2008 GFC. Furthermore, these countries share other features in common such as poor ratings in terms of corruption and political instability as well as vulnerability to environmental risks such as pollution and other environmental damages caused by oil production or oil spills. These can be subjected to costly legal litigations that can affect bank borrowers' ability to pay back loans as at when due. The environmental risks if crystallised into national or international disasters can cripple the liquidity positions of borrowing customers thereby leading to deterioration of loans.

Finally, the choice of this group of countries is also motivated by the fact that researches on NPLs in OPEC member states are very limited. This means that there is a dearth of studies on NPLs in OPEC countries thereby creating a contextual gap and the need for

this study to be conducted. To the best of knowledge this study will be among the first set of studies to investigate the problem of NPLs among this group of countries, that is, OPEC member states.

CHAPTER THREE

LITERATURE REVIEW

3.1 Introduction

This chapter critically reviews both theoretical and empirical related literature on bank asset quality and factors affecting it. Specifically, it contains the various underpinning theories of the study, the concept of NPLs and its various classifications in the banking system. Furthermore, it discusses the implications of huge NPLs to banks in the process of discharging their banking business activities and the economy at large. In addition, the theoretical and empirical literature of systematic risks, that is, the variables of interest of oil price changes, corruption, political instability and environmental risks, as well as GFC GDP, inflation rate, interest rate, exchange rate and unemployment rate are being addressed.

3.2 Review of the related literature

This section deals with the existing related theoretical and empirical study areas of the study. Furthermore, the section is divided into two sub-sections. Sub-section 3.2.1 discusses the conceptual and theoretical review. The next sub-section which is 3.2.2 discusses the empirical review of the study.

3.2.1 Conceptual and Theoretical Review

This subsection is also subdivided into four sub-sections. Subsection 3.2.1.1 presents the concept of NPLs. The review of the classifications of NPLs is done in sub-section

3.2.1.2. Sub-section 3.2.1.3 discusses the effects of NPLs. The last sub-section, which is subsection 3.2.1.4 explains the underpinning theories of the study.

3.2.1.1 Concept of Non-Performing Loans in Banking

The concept of NPLs is crucial to lending banks because it represents an amount of funds which the borrowing customer has not made a scheduled payment for over 90 days. They are risky assets to the lending banks because they can affect their abilities to make further lending. In addition, the NPLs can also affect the capacities of banks in discharging their obligations to deposit customers.

According to Klein (2013), an NPL is a loan on which principal repayment or interest payment or both have not been made for a period of over 90 days. Akinlo and Emmanuel (2014) define NPLs as loans which for a very long duration of time (over 90 days) stop generating interest income to the banks. More so Beck *et al.* (2015) view NPL as a loan that is past due for more than 90 days. They further stress that NPL is a loan that is unlikely to be repaid without recourse to recovery actions such as the sale of obligors held collateral security if any.

D'Hulster *et al.* (2014) suggest that a most accepted definition of NPLs is when obligation related to loans and advances become over 90 days past due, and when the banks consider the borrower unlikely to pay or when another sort of obligation is past due by more than 90 days. This is indeed consistent with the definition of Financial Soundness Indicators (FSIs) of International Monetary Funds (IMF) that puts NPLs as

positions of non-performing past due of principal or interest over 90 days (Krueger, 2002).

However, Jain (2007) suggests an elaborated definition of NPL by giving five instances of NPLs. The first category of the definition is that of an advance where interest or instalment payment of principal remains overdue for a period of more than 90 days in respect of a term loan. However, the second instance of the definition is that of a loan account that remains "out of order" for a period of more than 90 days, in respect of an overdraft or cash credit.

Furthermore, the third category of the definition is that of a bill which remains overdue for a period of more than 90 days, that is, in the case of bills purchased and discounted. Also, it refers to an interest or instalment of principal or both that remain (s) overdue for two harvest seasons for short-term and one harvest for long-term crop loans, that is, in the case of an advance granted for agriculture purpose. The last definition is that of any amount to be received which remains overdue for a period of more than 90 days in respect of other accounts.

Going by these definitions it can be concluded that NPLs which are sometimes referred to as the Non-Performing Assets (NPAs) are all those categories of bank loans that have been left unpaid in terms of interest or principal or both amount of a loan for over 90 days. However, this excludes loans that have been realised through recovery efforts such as sales of obligors' securities as well as those loans that have been restructured (D'Hulster *et al.*, 2014).

Additionally, the literature did not exhibit differences of opinion on the measurement of NPLs. For example, Park (2012) and Makri *et al.* (2014) have agreed on the measurement to be a ratio of Non-Performing Loans to Gross/Total loans. Also, Castro, (2013) measured credit risks (NPLs) as the ratio between the (aggregate) banks' nonperforming loans in their balance sheets and the total gross loans.

3.2.1.2 Classifications of Non-Performing Loans

The concept has been perceived differently in terms of classifications and treatments. This divergence of opinions may possibly be due to differences in prudential guidelines requirements and risks-tolerance amongst countries. The NPLs include not just the principal amount involved in the loan but also all the accrued interests and other bank charges. These classifications are necessary because the longer the loans remain non-performing above the 90 days the riskier their credit risks characteristics.

According to Laurin and Majnoni (2003), the approaches used in classifying loans are perceived as either management responsibility or regulatory matter. In a survey, they conducted amongst G-10 banking regulators, it was found that the US and, to some extent Germany use a detailed regulatory classification approach. However, they maintained that in such countries that perceive it as management responsibility, that is, countries with no detailed regulatory classification regime, the role of external parties including supervisors and external auditors will be limited to providing opinion on whether the banks' policies are adequate or if they are implemented in a satisfactory and consistent manner.

Depending on who is charged with the responsibility of loans classification, that is, a management responsibility or a regulatory matter or a combination of them; loans can be classified as Standard/Normal Loans (SLs/NLs), Watch-list Loans (WLs), Substandard Loans (SLs), Doubtful Loans (DLs) or Loss Loans (LLs). Therefore, NPLs assume the last three classes of loan classification of SLs, DLs and LLs accordingly (see, for example, Beck *et al.* 2015).

However, D'Hulster *et al.* (2014) reported two approaches of NPLs classifications thus; 90 days past due or the unlikeness of the borrower to pay back loans and significant financial difficulty of the borrower, bankruptcy and breach of contract. They also stressed that prudential guidelines in most cases provide for loans classification systems that require the banks to classify loans and advances into buckets (categories). These categories are usually defined by days of past due and creditworthiness. Their view is essential because the main driving force of loan classification is credit risk as well as its two components of default and losses.

There is no single fit for all method of loan classification among countries. Loan classification is a country-specific issue where each country tends to choose a given periodicity for its classes of loans, hence different provisioning methods (Laurin & Majnoni, 2003). However, they are normally influenced by country prudential guidelines requirement and/or accounting standards or International Financial Reporting Standards (IFRS), hence NPLs are classified as, substandard loans, doubtful loans and loss loans. Therefore, each of these classes of loans is associated

with time frames and perceived credit risks and then certain percentages are also attached to them for provisioning purposes (see, for example, D'Hulster *et al.*, 2014).

The presence of huge NPLs on banks' balance sheets has serious consequences that affect not only their liquidity, lending abilities and performances but also their impacts on the economies, in terms of investment and productivity (see, for example, Ghosh, 2015; Klein, 2013; Nkusu, 2011; Berger & DeYoung, 1997).

3.2.1.3 Effects of Non-Performing Loans

Zeng (2012) in his study argues that NPLs are "financial pollution" which if present in a financial system of a country can be harmful to its economy and social welfare of its citizens. This means that banking system is expected to maintain clean loan books with little or no NPLs but in reality, banks do not have absolute clean loan books. However, the level of NPLs should not be significant otherwise they will contaminate the banking system and that might negatively affect economies and well-being of citizens. Therefore, NPLs can lead to inefficiency in the banking sector.

Barseghyan (2010) maintains that the existence of NPLs and if combined with a delay in government bailouts can lead to a persistent decline in aggregate economic activity. It should be noted that in most cases if governments around the world do come to the rescues of the bank through bailouts, do so but usually at the expense of taxpayers' funds. However, this should not be encouraged except where it becomes necessary because governments are expected through their central banks and other related

regulatory bodies to provide close banking supervision of all banks. This should not be limited to mere banks periodic and unscheduled examinations but also through regulatory functions such as adequate prudential guidelines and transparent reporting procedures. In other words, NPLs are not only expression of low or non-quality of loans but also as a measure of the qualitative level of the entire loan portfolio of banks (Filip, 2013). The adverse effect of bank bad asset quality is not only confined to the banking sector but also leads to economic inefficiency and impaired social welfare of the citizenry (Ghosh, 2017; Ghosh, 2015).

Therefore, the lending banks should be held responsible for all NPLs because statutorily they are debtors to all economic units that make deposits with them. It is expected that the banks will be efficient in the management of their assets to the extent that loans are not allowed to deteriorate in term of their qualities nonetheless banks have different categories of NPLs.

These effects of NPLs on banks' balance sheets, performance and the economy has for long drew the attention of practitioners, supervisory authorities, policymakers and researchers to investigate the determinants of NPLs. However, any concerted effort by these practitioners, researchers, banks regulatory authorities and policymakers in resolving the NPLs problem requires an understanding of its determinants.

There are strands of literature that attempted to investigate the relationship between bank-specific, macroeconomic factors, other macro variables and NPLs. Furthermore,

there are various empirical studies that analysed the effects of the said mentioned explanatory variables on NPLs. For example, the bank-specific variables are the micro factors, that is, the individual bank level variables within the banks that affect the relationship with bank asset quality. Some of these bank-specific factors are; credit growth, bank profitability, bad management and operating efficiency (Ghosh, 2015; Abid *et al.,* 2014; Louzis *et al*., 2012; Salas & Saurina, 2002; Berger & DeYoung, 1997). The macroeconomic factors are those variables external to the banks (Berger & DeYoung). The commonly used macroeconomic variables are those of GDP, inflation rate, interest rate, foreign exchange rate, unemployment rate, industrial production rate (Idris & Nayan, 2016; Beck *et al.,* 2015; Makri *et al.,* 2014; Zaib *et al.,* 2014; Castro, 2013). However, the other macro factors involve those of global financial crisis, oil prices changes, corruption, political instability, environmental risks and stock prices (Al-Khazali & Mirzaei, 2017; Kjosevski & Petkovski, 2016; Park, 2012; Collier *et al.,* 2011; Dinç, 2005).

However, the literature has not provided depth empirical evidence linking the systematic risks variables of oil price changes, corruption, political instability, environmental risks to NPLs. For example, according to Goel and Hasan (2011) and Park (2012), there is limited literature on the effect of corruption on the performance of the financial market. Additionally, Mcdermott *et al.* (2014) noted the scarcity of literature relating the effect of environmental risks on economic development.

3.2.1.4 Underpinning Theories

There are various theories that can explain the relationship between systemic risks variables of oil price, corruption, political instability, environmental risk and bank asset quality but most of them do not have the comprehensive explanatory power of incorporating the entire variables in a single model. Some of these theories are the game theory approach for corruption of Macrae (1982), the complex system theory by Casti (1992) and the theory of financial risk management for natural disasters by Batabyal and Beladi (2001). However, the financial intermediation theory of banking (see, for example, Werner, 2015), the theory of systemic risks initially developed as system theory by Bertalanffy (1968) and the credit-default theory of Sy, (2007) have the comprehensive explanatory power of the entire variables of interest of this study into a common whole, that is, into a single model.

Consequently, this study adopts the financial intermediation theory of banking, the theory of systemic risk and credit-default theory as the underpinning theories of explaining its model. These theories link the very foundations of financial intermediation role of banks, the systematic risks factors affecting borrowing customers' ability to generate cash flow and pay back loans in terms of principal or interest and loan quality deterioration. These theories are not mutually exclusive but complementary in developing and explaining the relationships between systemic risks factors of oil price changes, political instability, corruption, environmental risks and bank asset quality.

i. The Financial Intermediation Theory of Banking

The financial intermediation theory of banking lays the foundation upon which lending contracts are built between the banks and borrowing customers and the position of risks-bearing associated therein (see, for example, Demirgüç-Kunt & Detragiache, 1998; Hester, 1994; Baltensperger, 1980). Therefore, this theory of Banking is adopted in order to explain the role of banks in financial intermediation and complement the explanatory powers of systemic risks and credit-default theories. The origin of the financial intermediation theory of banking can be traced to early works of well-known economists such as Keynes (1936), Gurley and Shaw (1955), Tobin (1963, 1969), Sealey and Lindley (1977) to mention but a few, although not explicitly modelling banks (Werner, 2015). The theory holds that banks like other non-banks financial institutions mobilise deposits (short-term maturities) from surplus economic agents and loan to the borrowing customers who need capital for consumption and investment (long-term maturities).

The banks usually take depositors funds on short term basis and lend on long time basis thereby creating a liquidity in the system (Dewatripont, Rochet, & Tirole, 2010; Demirgüç-Kunt & Detragiache, 1998). Nonetheless, this creates time mismatch between the period when deposits are taken and when loans are paid back. Therefore, the occurrence of any credit default has the chances of degenerating into NPLs and subsequently it can lead to liquidity and banking crisis. Werner (2015) maintains that the financial intermediation theory consequently provides the rationale for capital adequacy-based bank regulation and that should this theory be wrong, then the current economics modelling and policy-making would have been without empirical foundation.

Furthermore, Werner (2015) stipulates a comprehensive chronological list of contributors to the financial intermediary theory of banking, among which include the well-known economists but not explicitly modelling banks. For example, Keynes (1936), Gurley and Shaw (1955), Tobin (1963, 1969), Sealey and Lindley (1977), Bernanke and Gertler (1995), Allen and Santomero (1998, 2001), Kashyap, Rajan and Stein (2002) and Dewatripont *et al.* (2010). However, more specifically some of the authors have significantly contributed to the development of financial intermediation theory of banking in relation to banking activities of deposit and lending (see, for example, Mises, 1912 in Werner, 2015; Admati & Hellwig, 2012; Kashyap *et al.*, 2002; Baltensperger, 1980; Sealey & Lindley, 1977; Tobin, 1969; Domar, 1947; Harrod, 1939; Keynes, 1936).

Accordingly, the theory assumes that banks are financial intermediaries collecting deposit and making loans to economic agents for investments and/or consumption (see, for example, Sealey & Lindeley, 1977; Keynes, 1936). In most cases, deposits are taken at short term maturities and then given out as loans to the borrowing customer on long term maturities (Dewatripont *et al.,* 2010). This mismatch creates room for liquidity issues to the lending banks which have now been compelled to categorise the loans into performing and NPLs usually based periodicity. Therefore, Berger and DeYoung (1997) argued that any loan that over stays beyond 90 days is considered as non-performing hence affecting the ability of the banks to abide by their obligations to the funds depositors and then get constrained in making further loan. This position is much pronounced in the work of Baltensperger (1980) who maintains that banks are financial

intermediaries and they are unable to create money instead only engage in a vague risk transformation process (see, for example, Demirgüç-Kunt & Detragiache, 1998).

The financial intermediation theory of banking maintains that banks are both individually and collectively performing the function of deposit taking and loan making in the financial system (Werner, 2015). Nevertheless, there are many documented literature that establish the causes of why these loans go into non-performing status. For example, Anastasiou *et al.* (2016a, 2016b), Konstantakis *et al.* (2016) and Beck *et al.* (2015) and Ghosh (2015). As stated earlier the banks are not only engaged in the financial intermediation function but they end up in a vague risks transformation process. Therefore, this theory can explain the role of the banks in generating deposits from surplus economic units and then transfer them to deficit economic agents through the process of loan creation. However, there is a mismatch of the short term maturities of deposits and long term maturities of loans which if defaulted can in turn result into problem loans. Furthermore, the financial intermediation theory of banking has been extended by researchers who modelled into it the determinants of loan quality deterioration. Subsequently, researchers have documented so many factors that can influence loans performance which is linked to certain economic fundamentals such as GDP, unemployment rate, interest rate, inflation rate and exchange rate to mention but a few (see, for example, Abid *et al.*, 2014; Castro, 2013; Louzis *et al.*, 2012).

Consequently, the transfer of inherent risks associated with lending from the banks to the borrowers as argued by Demirgüç-Kunt and Detragiache (1998) and Baltensperger (1980) as well as the mismatch between short-term and long-term maturities of deposits and loans respectively have paved way for any credit-default to be the responsibility of

the borrowers and not the banks. Therefore, a crystallisation of any systemic risks which are inherent in any loan contract means the ultimate transfer of responsibility or burden of repayment on the part of the borrower and not the bank who assumes only the role of an intermediary. Therefore, the occurrence of a risk event such as a fall of oil price in oil exporting countries will have an adverse effect on the cash flow and/or net worth of the borrowing customer. Hence, this results in a delay of repayment and mismatch of maturities will lead to deterioration of loan quality.

Similarly, if the loan contract is affected by county-wide corruption it might lead to insider related credits, inappropriate loans or excessive loan interest which will turn out to be add-ups to loan prices. This can diminish the repayment capacity of the borrowers which can lead to delinquencies and/or insolvencies and subsequent credit defaults hence deterioration of bank credit qualities. Similarly, the occurrence of political instability which has been established to be inherent in the banking environment and considered as systemic risk associated loans is normally documented in the bank credit appraisals hence can have an effect on cash generating ability of the borrowers and general loan quality. Additionally, financial intermediation theory of banking presumes the transfer of environmental risks associated with lending to the borrowers. Therefore, the occurrence of a disaster in the lending environment which has an adverse effect on the borrowers' net worth and/or cash generating ability can impact negatively on loan repayments hence affecting bank asset quality.

Overall, the adverse effects of these factors is not ultimately a liability on the part of the banks who are just financial intermediaries but rather constrain the borrowing customer's

cash flow and affect their net worth hence increase the probability of credit default and NPLs (see, for example, Hester, 1994). Therefore, this study adopts the financial intermediation theory of banking as one of the theories underpinning the relationship between the dependent and independent variables.

ii. The Theory of Systemic Risk

The second theory that underpins this study is the systemic risk theory. The systemic risk theory presumes that society works as a human body where a dysfunction in one organ/institution has the capacity of affecting the entire human system. Thus, the assumption that an occurrence of a dislocation in the political, economic, social, ecological (environmental) institution can have an adverse effect on the entire society's functioning mechanisms including financial sector and the banking industry. The origin of systemic risks theory can be traced to general system theory originally proposed by a biologist, Ludwig Von Bertalanffy. In the 1970s, the rise of systems theory forced social scientists to see organisations as open systems that interacted with their environment. A change in the environment can have a profound impact on an open system (see, for example, Walonick, 1993). Therefore, a change in the business environmental factors is expected to generate a change in open systems such as the banking system.

There are two strands literature on the systemic risks theory which is sometimes called the theory of systemic risks therefore interchangeably used in this study. The first strand is concerned with the belief that a challenge such as liquidity or low quality assets in one particular financial institution, more specifically a bank, can affect the entire banking system which might eventually affect other economic fundamentals (see, for example,

Acharya, 2009). However, the second strand of the literature suggests that the problem of banking system such as banking crises can be attributed to macroeconomic conditions such as; price instability, political instability and environmental risks such as natural disasters (see, for example, Love & Turk Ariss, 2014; Collier & Skees, 2013; Collier *et al.*, 2011; Haldane & May, 2011).

The theory relates all external business environment factors such as political, social, economic, legal risk factors and banking activities. Collier and Skees (2013) list the elements of the theory of systemic risks to include price instability (inflation/interest & exchange rate), political instability and natural disaster (environmental risks). Collier and Skees, assert that these systemic risks are important to non-developed countries, that is, developing and emerging economies. Love and Turk Ariss (2014) suggest that there is evidence of transmission of macroeconomic shocks to credit portfolio of banks.

This theory explains the technicalities and responsibilities of banks in taking deposits from savings economics units and making same funds available to those economic units that need such funds for consumption or investment purposes (Acharya, 2009). However, sometimes the loans go bad and become NPLs and eventually the depositors bear the burdens by losing their deposits except those portions covered under the Nation Insurance Deposit Schemes (NIDS), where applicable. This has the potential of affecting the entire banking system as against certain banks thereby affecting the entire economy of the country under consideration.

Haldane and May (2011) supports the views of Acharya (2009) in their study titled 'systemic risk in banking ecosystem' that linked banking crises to macro environmental variables. They argued that banking crises can be linked to certain events that are completely external to the banking system. Haldane and May maintain that events such as recessions, civil unrests, major wars, and environmental catastrophes have the potentials to depress the value of bank's assets so severely that the banking system fails.

In an earlier study, Cochrane (2004) contributes to the theory by emphasising that indirect damages, regardless of triggering mechanism might cause damages to the banking system. He stresses further that such damages will create uncertainties in the system and the subsequent tightening of overall credit conditions (bank crisis) thereby triggering subsequent economic dislocations. Cochrane views systemic risk as the transmission of a problem at the weak institution to healthy ones in a way that threatens the whole system. He further argues that systemic risk is made up of the probability or likelihood that economic contractions might lead financial intermediaries such as banks to ration credit to a far greater extent than warranted by economic fundamentals.

The Berger and DeYoung (1997) study presented four hypotheses of 'bad management', skimping hypothesis', 'moral hazard hypothesis' and 'bad luck hypothesis'. The 'bad luck hypothesis' implications is akin to the systemic risk theory. Likewise, the bad luck hypothesis suggests that the performance of the bank is affected by external environment. Therefore, the government or regulatory authorities should design and implement regulatory and supervisory rules and laws that will reduce the negative effect of external events on banking performance. A banking crisis is the extent to which the

banking system is immune to external shocks (Calmès & Théoret, 2014). In other words, the banking system is vulnerable to external uncertainty thereby affecting banking business, that is, deposit taking and loan making. Therefore, this study also employs the theory of systemic risks in explaining the relationship between the dependent and independent variables of the study.

Thus, the of a systemic risk in form of instability of commodity price such as oil price, political instability, corruption, GFC and/or environmental risks has the capacity of interfering with transfer of economic units' cash flow and or net worth which is the main source of loan repayment hence adversely affecting bank asset quality (see, for example, Collier & Skees, 2013; Collier *et al.,* 2011). Consequently, an occurrence of any systemic risks which are intrinsic in all economies hamper with the ability of the borrowing customers' ability of loan repayment which has an adverse effect on general loan quality of the banks. The systemic risks theory anticipates an instability in the prices of commodities such as fall in oil price in oil exporting countries will have an adverse effect on the cash flow and or net worth of the borrowing customer resulting into bank credit riskiness.

Likewise, the theory presumes that a country-wide corruption will cause creation of inappropriate loans and insider credit abuse as well as loan diversion on the part of the borrowers which have not only predispositions of leading to bad loans but they can cause financial fragility in the system. Thus, adversely influencing loan repayment capacity of the borrower which result into credit defaults hence deterioration of bank credit qualities. Correspondingly, the manifestation of political instability interferes with

the business atmosphere and hinders not only consumption but the production and investment which are the backbone of cash flows.

Additionally, the prevalence of political instability adversely affect the cash flow generating of economics units from both consumption and production perspective. Therefore, the systemic risks theory postulates that political instability in all ramifications affects other segments of the society and curtails cash flow of economic agents to the extent of creating loans impairment and general loan quality. Moreover, the theory postulate that emergency situations in form of disasters has eminent and long term effect on the ability of entities to recover from the impact of such calamities as well as the delay in restorations of affected critical infrastructures that facilitate efficient cash flows. The theory anticipates that environmental risks are adversities that constrain the flow of funds and reduce the net work of economic units which has a serious consequence in loan repayment giving the long period it takes societies to revert normal life at the aftermath disasters occurrence. Therefore, the incident of disaster is not only restricted to the individuals impacted upon by its devastation but also all other segments of the society through its multiplier effects, therefore, having a negative bearing on loan repayments abilities hence affecting bank credit quality.

Generally, the systemic risks theory presumes that unfavourable consequences of oil price changes, political instability, corruption and environmental risks have wide spread effects on all segment of the society including finance and banking activities. This has the high tendencies of interfering with other vital institutions such as the financial system and other economic activities that can affect not only loan quality but also the

financial stability at large. Therefore, this study adopts the systemic risks theory as one of its underpinning theories of the relationship between the dependent and independent variables of bank asset quality and systematic risk factors of oil price fluctuation, corruption, political instability and environmental risks.

iii. The Credit-Default Theory

The third theory underlining this study is the credit-default theory. The theory presumes that events in the environment external to the banking sector have the capacities of negatively impacting of the cash flow of economic units to the point of delinquencies and insolvencies which can result in credit-default hence affecting bank asset quality. The credit-default theory is most propagated by Sy (2007) as a joint model with a dual causal process of delinquency and insolvency. Therefore, Sy proposed a causal framework of credit-default theory as a way of overcoming the shortcomings of the existing credit default theories and integrated both micro and macro factors in a unified financial economic theory for loan default. However, Bernanke and Gertler (1989) had earlier suggested that borrowers net worth are likely to be procyclical, that is, borrowers are more solvent during a good time but a shock to borrowers net worth can have the reverse effect. A borrower's ability to pay back loans can be closely related to chances of credit default hence the probability of increased NPLs.

Sy (2007) argued that the theory relates to the financial failure of entities both persons and companies and that it should explain the systematic understanding of the causes of credit defaults. Furthermore, he opined that "Such a theory is required to provide direct causal connections between macroeconomic causes of changing the financial

environment and their microeconomic effects on changing personal or corporate financial conditions, leading to possible credit defaults. Most existing theories of credit default do not meet this causal requirement". On the other hand Crook and Banasik (2005) suggest that there was growing literature on why borrowers may default in debt and opined that the 'ability to pay' hypothesis maintains that the borrower may default to pay on time when an income and/or expenditure shock happens which was not expected as at the time the loan was made.

However, Pyle (1997) argues that risk may be defined as a reduction in firm value due to changes in the business environment. Pyle identified four major sources of value loss related to bank risks. First, is a market risk which is the change in net asset value due to changes in underlying economic factors such as interest rates, exchange rates, equity and commodity prices. Secondly, is the credit risk, that is, the change in net asset value due to changes in the perceived ability of counter- parties to meet their contractual obligations. The third risk is the operational risk results from costs incurred through mistakes made in carrying out transactions such as settlement failures, failures to meet regulatory requirements, and untimely collections. However, the last risk is the performance risk which encompasses losses resulting from the failure to properly monitor employees or to use appropriate methods.

Also, Davis (1995) argues that default risk refers to the possibility of not collecting interest and principal as promised in the debt contract. The overall default risk on an individual debt instrument varies with the risk position of the borrower and the economic environment. However, the debt–default relation cannot be studied in isolation

but in the context of other factors that may lead to default (arising from illiquidity or insolvency) and changes to costs of default. Additionally, Crook and Banasik (2005) in Bellotti and Crook, (2009) opined that there is accumulating econometric evidence that aggregate delinquency and write-off rates vary with the state of the macroeconomy.

Credit default can be as a little incidence as a late payment of a debt obligation and as a serious problem of bankruptcy or insolvency of the borrower that will necessitate the lender to initiate the recovery process. Additionally, Basel II defined default to basically mean over 90-day delinquency but Moody's[18] opinion on credit default is that which involves delinquency and the anticipated loss to the lender (Sy, 2007).

The concern on NPLs to the banks is their effect on their balance sheet and financial positions because they will eventually bear the consequences of any unrecovered losses that might be sustained thereafter. Therefore, Moody observes that credit default revolves around delinquencies and the notion of the expected losses to the lending banks. In this study, the credit-default theory has been used to explain the causes of credit default which Basel II sees as 90-day delinquency hence in line with this study's definition of NPLs. The theory of credit-default is found to be relevant in this study because bad loans that cannot be resuscitated they then should go through the next stage of risky assets management which is the loan recovery function which usually takes longer time than necessary hence the proliferation of NPLs. In addition, Basel II considers any cash flow problem that is not resolved within 90 days then it will be assumed that the entity is insolvent hence the need for the lenders to initiate the recovery

[18] Moody is an internationally recognised credit rating agency

process. The delay in recovery can be prolonged as the lending bank takes steps in litigations, sales of collateralised assets or sales of other assets by appointing debt collectors.

Therefore, following Sy (2007) models of delinquency and insolvency, this study also adopts credit-default theory in explaining the relationship between the independent variables and dependent variable. The model of delinquency holds that any factor that affects the cash flow of an entity negatively can cause a default in the payment of loans as at when due thereby creating NPLs problem to the lender which if not properly handled will result in losses to the bankers and adversely affect the economy at large. However, the model of insolvency relates to all factors in the business environment that can cause insolvency, that is, the net worth positions of the borrowing entity to default in making a loan repayment. Therefore, the theory is capable of explaining the causal effect of systemic risks and macroeconomic variables that can trigger NPLs or aggravate the NPLs in the banking sector (see, for example, Bellotti & Crook, 2009). Thus, the interplay of systematic risks factors such as commodity price volatility, environmental risks, corruption and political instabilities impact on the cash generating abilities of entities that normally lead to credit-defaults hence deterioration of bank asset quality. These are normally presumed to be the outcome of delinquencies and insolvencies associated with the said credit risks factors.

Consequently, an upshot of any of the systematic risks which are inherent in any banking external environment can cause depreciation of economic units net worth and cash flows which are related to the imminent issues of delinquencies and/or outright

insolvencies that result into credit-defaults (see, for example, Sy, 2007; Pyle, 1997; Davis, 1995; Bernanke & Gertler, 1989). Therefore, the incidence of a fall in commodity price such as oil price in oil exporting countries will have a negating influence on the net worth or cash flow of the borrowers which can result into delinquencies or outright insolvencies hence leading to relapse of loan quality. Besides, country-wide corruption might lead to insider related credits, inappropriate loans or diversion loans into unintended purposes by the borrower can lead to business failures that can affect clients' cash flows and/or net worth. Hence, this can weaken loan repayments abilities to the point of delinquency and/or ultimate insolvency which eventually leads to deterioration of bank credit qualities.

Correspondingly, the happening of political instability which has been established to be inherent in the banking environment and has the tendency of interrupting with the business processes upon which loan repayments are hinged. Consequently, this can have a negative effect on cash generating ability of the borrowers or depreciation of their net worth which lead to credit-defaults hence affecting the overall bank loan quality. Also, credit-default theory presumes that the occurrence of environmental risk is destructively related to the banking activities of deposit taking and lending. Therefore, the emergence of disaster in the lending environment which has an unfavourable effect on the borrowers' net worth and/or cash generating ability can impact negatively on loan repayments and subsequently leading to credit-default thus affecting bank asset quality.

Largely, the adversative consequences of systemic risks factors of oil price fluctuations, environmental risks, corruption and political instability on economic units' cash flow

and net worth are associated with insolvencies and/or delinquencies of the entities which cause credit-defaults hence bank credit quality corrosions. This is in line with the proposition of the credit-default theory that the society is permeated with systematic risks whose occurrences create insolvencies and delinquencies of various entities hence undesirably interrupting their abilities to repay back loans as at when due. Therefore, this underlining theory revolves around macro factors existing outside the banking sector which leads to delinquencies and insolvencies of economic units which up shots into credit-defaults hence creating bank credit riskiness. Thus, this study adopts the credit-default theory as one of the theories underpinning the relationship between the dependent and independent variables.

In consistency with the financial intermediation theory of banking, systemic risks theory and credit-default theory many researchers have found relationship between the systemic risks factors of oil price changes, corruption, political instability, environmental risks and other related economic activities such as economic growth, country creditworthiness and rating, expected default rate, savings, loan demand and access to credit, bank profitability and to some extent NPLs among others. Some of these studies are those of Al-Khazali and Mirzaei (2017), Miyajima (2016), Rehman *et al.* (2016), Abu *et.al.* (2015), Abu, Karim and Aziz (2014) and Abu *et al.* (2013). Moreover, other studies are those of Klomp (2014), Collier and Skees (2013), Collier *et al.* (2013), Mottaleb *et al.* (2013), Collier and Skees (2012), Collier *et al* (2011), Goel and Hasan (2011) and Poghosyan and Hesse (2009). These studies among others have been discussed extensively under the empirical review of the literature particularly the independent variables section.

3.2.2 Empirical Review of Literature

This section deals with the review of related empirical literature. It is broadly sub-divided into two subsections of 3.2.2.1 3.2.2.2 and 3.2.2.3 respectively. The sub-section 3.2.2.1 reviews the related literature on the possible effects of independent variables of systemic risks on NPLs. Further Sub-section 3.2.2.2 deals with the effects of the global financial crisis on NPLs. Lastly, Sub-section 3.2.2.3 is on effects of control variables on NPLs.

3.2.2.1 Independent Variables and Non-Performing Loans

The systematic risks factors of oil price changes, corruption, political instability and environmental risks are sensitive variables that have the capacity of affecting banks' loan qualities. However, the literature has not sufficiently addressed their effects on NPLs thereby leaving an important empirical gap hence the existence of limited literature on the effects of systematic risks and bank asset quality. Nonetheless, the variables received attentions in other related areas of studies and have been found to be relevant in influencing other economic, financial and banking activities. Therefore, to provide theoretical underpinnings for this study, the present study mainly relies and borrows from the broader literature on the systematic risks factors and their effects on general economic activities as used by previous researchers as well as other grounded theoretical models (see, for example, Abu, 2015; Goel & Hasan, 2011).

i. Oil Price Changes and Non-Performing Loans

The relevance of crude oil in the global economy cannot be underplayed given its importance as a source of energy to the world and revenue to oil exporting countries such as those mono-economies of OPEC member states. According to Ji and Guo (2015), crude oil is a single commodity that is most widely traded around the world and its price changes have significant influences on economic activities. This has attracted the attention of not only economists and politicians but also financial analysts and researchers. There are quite a number of studies on the effect of world oil price on economic activities (Miller & Ratti, 2009). For the purpose of this study oil price changes means the changes in world crude oil prices from the point of view of crude oil exporting countries. Researchers have given much of their attention to the effect oil price changes on oil importing economies while little attention has been given to explicit studies on oil exporting countries (Farzanegan & Markwardt, 2009).

The literature on the relationship between oil price and bank asset quality, financial and economic activities are separated into three main categories; for example, the studies that are related to bank asset qualities such as; Al-Khazali and Mirzaei (2017) and Miyajima (2016). Further, there are those studies that are related to finance and other banking activities such are those of Breunig and Chia (2015), Ng (2012), Malik and Ewing (2009), Poghosyan and Hesse (2009), Rafiq, Salim and Bloch (2009) and Castrén, Dées and Zaher (2008). However, there are studies that focused mainly on analysing the relationship between oil price changes and other economic factors such as output growth, employment, wages and inflation such as the studies of Aguiar-Conraria and Soares (2011), Farzanegan and Markwardt (2009), Mork (1989), Hamilton (1983)

and Darby (1982). Thus, overall the literature can be said to have given limited attention to the effects of oil price changes on bank asset quality.

Furthermore, the literature is subdivided into two broad categories of those dealing with of oil exporting countries and oil importing countries. For example, the studies of those on oil exporting countries are such as; Al-Khazali and Mirzaei (2017), Miyajima (2016) and Poghosyan and Hesse (2009). However, the vast majority of the studies are done in oil importing countries some of which are the works of Breunig and Chia, Ng, Aguiar-Conraria and Soares, Farzanegan and Markwardt and Mork. Nonetheless, the study of Farzanegan and Markwardt involves both oil exporting countries and oil importing countries. The essence of this comment is that the overall policy implications of the studies might not apply to all the countries categorizations because a rise in oil price will theoretically be of advantage to oil exporting countries and of disadvantage to oil importing countries and vice versa on in the case of a fall in oil prices.

Therefore, limited attention has been given to the question of whether there is a relationship between oil price changes and loan performance. Although, there is insufficient evidence relating changes in oil price and financial sector (Al-Khazali & Mirzaei, 2017; Sotoudeh & Worthington, 2014). Nonetheless, the studies of Al-Khazali & Mirzaei and Miyajima (2016) have provided compelling evidence on the association of oil price and bank asset quality among others have the present study a strong theoretical and empirical foundation to investigate the effect of oil price changes on bank asset quality.

The studies that demonstrated the influences of oil price and economic activities such as inflation, recession, GDP, investment and general economic growth are those of Ng (2012), Aguiar-Conraria and Soares (2011), Farzanegan and Markwardt (2009), Rafiq *et al.* (2009), Mork (1989), Hamilton (1983) and Darby (1982). For instance, some of the pioneering works on oil price effects were those carried out by Darby (1982) and Hamilton (1983) who focused on the world inflation and recession, and the US economy respectively. The study of Darby was carried out to investigate the effect of oil price changes on inflation and recession. His study provides new evidence on the empirical importance of the oil price effects but was not able to identify a significant relationship between oil prices and the economy.

However, the study of Hamilton (1983) was conducted in the US to investigate the effects of oil price changes on its macroeconomy, that is, GDP from since the world war II in 1948-1972 in order to find out how the changes caused recessions within the period. Hamilton study finds that oil price shocks were important factors in almost all US recessions from 1948 to 1972. The findings reveal evidence of correlation that was statistically significant between the variables for all the recessions prior to 1972. These findings are in line with the theoretical expectations of oil importing countries that increase in oil price changes will adverse consequences of cash generating abilities of their economic units hence leading to inflation and/or recessions in the studies of Darby and Hamilton. However, the policy implications of these studies will not be appropriate for implementation in oil exporting countries such as those of OPEC member state where an increase in oil prices theoretically means fortunes to them. Further, the studies did not relate oil price changes to bank asset qualities.

Additionally, Mork (1989) study is an extension of Hamilton's which establishes a relationship between oil price and GDP. His study suggests that the behaviour of GNP growth is indeed correlated with the state of the oil market. The above studies concentrated on mainly the oil importing countries in whose case increase in oil prices could be adverse against a welcome development that can accelerate economic growth. Also, they are some of the earliest studies on the impact of oil prices changes on economic fundamentals in general and the methodologies were basically descriptive statistic in nature. However, they have provided an insight and theoretical undertone to the present study be revealing the association between oil price changes and economic activities from at least the point of view of net oil importing countries.

Further, the study of Aguiar-Conraria and Soares (2011) was on an investigation of net oil importing but a single country of US economy using a monthly time-series from the begging of 1946 to end of 2007. Although, the study adopted one of the most robust and efficient tools for analysing time-series data of Wavelet methods. Unlike the studies of Mork (1989), Hamilton (1983) and Darby (1982) it employed the widest and latest data (monthly data) spanning from 1946-2007 which is most relevant giving its topical nature and long range. It was conducted using Wavelet analysis to investigate the impact of oil price increases on industrial production and inflation. The results identify a relationship between the increase in oil prices and inflation, which means an increase in oil prices lead to increase in inflation across time and across frequencies. Furthermore, the findings suggest that some interesting relations may exist at different frequencies: oil prices may act like a supply shock at high and medium frequencies, therefore, affecting

industrial production. The finding of this study is in line with the general theory that presumes that at least for the net oil import countries an increase in the oil price will mean a general increase in consumer price index. Also, compared to this present study which expects an increase in oil price will mean more fortune to the net oil exporting countries and an increased net worth of their economic units.

Contrary to the studies of Aguiar-Conraria and Soares (2011), Mork (1989), Hamilton (1983) and Darby (1982), the investigation of Farzanegan and Markwardt (2009) was a major net oil exporting country of Iran which has been a long outstanding member of the OPEC countries. The study is a single country which used quarterly data from 1975q2 to 2006q4 on the effect of oil price shocks on Iran's economy using VAR approach. They employed real oil price as a measure of oil price shock. The study found a strong positive relationship between positive oil price changes and industrial output growth which is in opposite direction with previous studies that report an inverse relationship between the oil price and recessions.

The result also shows that there is a marginal impact of oil price fluctuations on real government expenditures but both positive and negative oil price shocks significantly increase inflation as against the finding of the previous literature which exhibit a positive relationship between oil price and inflation. However, reaching a widely acceptable generalisation from a study country of Iran which single net oil export countries will be difficult compared to OPEC countries that are made up of 13 countries. The present study expects a significant relationship between oil price and loan performance and

predicts that it will be an inverse association because the countries of the study are net oil export countries.

Similarly, the studies of Ng (2012) and Rafiq *et al.* (2009) are on the impact of oil price changes on investments and investment and trade in Singapore and Thailand respectively. These are countries are also net oil import countries where the theory expects that high oil prices to make their economies to contract thereby inversely affecting trade and investment. Their study is similar to those of Aguiar-Conraria and Soares (2011), Castrén *et al.* (2008), Mork (1989), Hamilton (1983) and Darby (1982) in terms of oil position of the countries under study. Their policy implications will, therefore, have a reverse effect on net oil export countries such as those of OPEC countries who depend on oil as a major source of their foreign reserve as indicated in Chapter Two of this present study.

For example, the study of Rafiq *et al.* (2009) which investigates the impact of oil price volatility on economic activities of Thailand which included investment and trade balance. The study on a single like those of Ng (2012), Aguiar-Conraria and Soares (2011) and Farzanegan and Markwardt (2009) spanning the period of 1993q1 to 2006q4 but which applied vector auto-regression (VAR) system on the quarterly time-series data to examine the causal relationship between the oil price volatility and the economic indicators of Thailand. The study collected oil price data from the daily "Arab Gulf Dubai US$/BL". The empirical result from Granger causality test indicates that there was unidirectional causality running from oil price volatility to investment trade balance as well as the unemployment rate and interest rate.

Additionally, Ng (2012) studied the relationship between oil price volatility and the Singapore's macroeconomy by using the data of daily West Texas Intermediate (WTI) oil price and over the period of 1983q2 to 2009q2. Moreover, the study relies on a single country data set like those used in the studies of; Ng (2012), Aguiar-Conraria and Soares (2011) and Farzanegan and Markwardt (2009), Rafiq *et al.* Further, consistent with the work of Rafiq *et al.* the empirical result suggests that a spike in oil price volatility leads to investments decline. The result also establishes the fact that a spike in oil price volatility leads aggregate output decline as well as a rise in inflation over the study period. The study also relied on VECM model.

Overall, the above studies are on the relationship between oil price changes and general economic growth activities such as recession, inflation, investments and industrial output. Also, the countries of studies are largely oil importing countries. Therefore, their findings and policy implications are more relevant to oil importing countries as against oil exporting countries such as OPEC member states where oil price increases are theoretical of an advantage to their economies. However, they have revealed compelling evidence of the explanatory power of oil prices changes on economic activities which logically can impetus to the present study as they have demonstrated in the studies of Al-Khazali and Mirzaei (2017), Miyajima (2016).

Similarly, there are studies that provided evidences of the associations between oil price changes and finance and banking activities of expected default frequencies, sovereign credit ratings, bank profitability, real stock returns and financial markets such as those

of; Breunig and Chia (2015), Sotoudeh and Worthington (2014), Masih *et al.* (2011), Malik and Ewing (2009), Poghosyan and Hesse (2009), and Castrén, Dées and Zaher (2008). For example, Poghosyan and Hesse studied the relationship between oil prices shocks, global financial crises, country-level macro variables, bank-specific variables and bank profitability amongst Middle East North Africa (MENA) oil-exporting countries. This study is similar to those of Breunig and Chia (2015) and Farzanegan and Markwardt (2009) that focus net oil exporting countries. Nonetheless, Poghosyan and Hesse used panel data set of net oil exporting countries of MENA. The study was conducted between 1994 and 2008 using panel data and GMM estimation approach. It is one of the most close studies of the association between oil price changes and loan performance but focuses on bank profitability. The result reveals that oil price shocks have an indirect effect on bank profitability which underscores their importance for macro prudential regulation purposes in MENA countries and policy implications.

The result is found to be indirect because theory presumes the transmission mechanism of bank profitability to be indirect which is mainly through channels such as interest income, interest expense, fees and commission and over well as overhead expenses. Although the relationship between oil price changes and bank profitability is indirect the policy recommendations of the study has implications for general banking activities. Nevertheless, the study deals with the issue of bank profitability while the present study revolves around bank assets quality they are all concerned with general financial stability. The finding is also in line with the systemic risks theory which states that interaction between the occurrence of systematic risks such as commodity price changes and economic activities such as banking. However, the study did not specifically

investigate the relationship between oil price changes and NPLs the finding has relevance to this current study in terms of theoretical foundation and policy implications.

Furthermore, Breunig and Chia (2015) in a study of 115 oil-exporting countries from 2003-2008 using panel dataset investigated the effects of high and rising oil price on the sovereign credit rating of the studied countries. The study also has implications on oil exporting countries like those of Farzanegan and Markwardt (2009) and Poghosyan and Hesse (2009). The study used Ordinary Least Square (OLS) methods and their finding concludes that persistently high oil price changes over the period of 2003–2008 were accompanied by a positive shift in ratings for high oil-exporting countries. The study also finds evidence which suggests that during the latter part of the sample period when oil prices were high, the sovereign ratings of countries increases for whose net oil revenue accounted for more than 20% of GDP. The study is on sovereign credit rating which is similar to bank credit rating of the borrower which suggests that the findings can have comparable implications to the present study. The positive relationship between oil price changes and sovereign credit rating is in line with the theoretical expectations of the underpinning theories of the present study, that is, financial intermediation theory of banking, systemic risks theory and credit-default theory that postulates such relationship.

Castrén *et al.* (2008) used Global Vector Autoregressive (GVAR[19]) approach in studying the effects of global macro-financial shocks of oil prices, exchange rate, GDP, equity

[19] Global Vector Autoregressive

prices on Expected Default Frequencies (EDF). The study was conducted in Euro Area[20] which is also a group of net oil import countries which used a quarterly data of between 1975 and 2005. The study area and the findings are similar to those of Aguiar-Conraria and Soares (2011), Mork (1989), Hamilton (1983) and Darby (1982) whose work were basically from the perspective of net oil importing countries which means the finding will not have the same implication for net oil exporting countries. However, it is similar to the investigations of Breunig and Chia (2015), Farzanegan and Markwardt (2009) and Poghosyan and Hesse (2009) in terms of lending and banking activities respectively. The results showed that at the aggregate level of Euro Area, the corporate EDFs react most to shocks to the GDP, exchange rates, equity prices and oil prices. Although the study was conducted using the panel data set of multi countries not that of net export countries. Their findings and policy responses might not be in consonance with economic settings of net oil export countries such as OPEC member states which the present study focuses on. Nonetheless, the study is not about the relationship between oil price changes and NPLs, the reaction of EDFs to oil price changes is certainly in line with the theoretical expectations of the present study which posits such associations between the variables.

A closely related research that studied the relationship between oil prices changes and banking activity is that of Sotoudeh and Worthington (2014) which investigated the effect of global oil price changes on macroeconomics and financial markets. The study is closely related to the studies of Masih *et al.* (2011) and Malik and Ewing (2009) in term of the focus to the effect of oil price changes on financial markets. It is somewhat

[20] That is the 8 countries of single currency arrangement (Austria, Belgium, Finland, France, Germany, Italy, Netherland and Spain).

different from all the studies in terms of its ability to incorporate the compositions of two categories of countries which are Net Oil Producing (NOP) and Net Oil Consuming (NOC). The study uses two categories of countries, the NOP countries which are made up of Canada, Mexico and Norway, and NOC countries which include Brazil, Denmark, Germany, Italy, Netherland, US and Sweden. The study spans between January 1970 and August 2013. The result of the study reveals that the macroeconomies of NOC countries have long-term co-integrating relationships with oil price as against the macroeconomies of NOP countries that do not. The financial markets of both countries panels exhibited long-term co-integrating relationships with oil price. The study did not investigate the association between oil price changes and NPLs nor banking related activities. Nonetheless, the finding is in consonance with the systemic risks theory which one of the underlining theories of the present study hence used in the current literature review.

Malik and Ewing (2009) used the bivariate Generalised Autoregressive Conditional Heteroscedasticity (GARCH) model to conduct a study of the effects of oil price changes on equity of certain sectors of US spanning January 1, 1992, to April 30, 2008. The study is similar to those of Sotoudeh and Worthington (2014) and Masih *et al.* (2011) on their focus on financial markets. The sectors are those of financial services, technology, consumer services, healthcare and industrials sectors. The result shows evidence of significant transmission of shocks and volatility between oil prices and some of the examined market sectors. The study documents a significant effect of oil price volatility and shocks on the examined sectors. The study also employed oil price data provided by WTI. The finding might not have similar implication for the current study

however it is in line with the theoretical argument of systemic risks theory which posits an association between commodity price fluctuations and economic activities. Therefore, this study provides sufficient evidence to assume a significant relationship between oil price changes and NPLs in OPEC countries.

Moreover, Masih *et al.* (2011) assessed the impact of oil price changes on real stock returns, industrial production and interest rate of the oil importing country taking evidence from South Korea by using the VAR model. The study upholds that of Malik and Ewing (2009) in investigating the effects of oil price on stock markets. The data for the study were collected from international financial statistics of IMF as well as monthly observations of the Korean stock market index the period of May 1988 to January 2005. The result shows that oil price changes have a significant negative effect on the stock market. This finding is related to the assumptions of the current studies postulations and the underpinning theory of systemic risks theory which believe that adverse commodity price volatilities will negatively impact on economic activities such as stock market and banking businesses of deposit taking and lending. Therefore, the practical policy implication of the findings will have a meaningful bearing to the present study.

However, in a global context, oil price changes may have a different impact depending on countries' sectoral compositions, their institutional structures and their economic development. To the best of knowledge and based on available information there are very limited explicit studies on the relationship between oil price changes or oil price shocks and bank asset quality. To the best of knowledge, there are two studies that documented empirical evidence on the relationship between the variables. In much more

recent studies of Al-Khazali and Mirzaei (2017) and Miyajima (2016) new evidence have been discovered on the effects of oil price changes and NPLs.

For instance, the study of Al-Khazali and Mirzaei (2017) which corroborate the study of Miyajima (2016) was on the impact of oil price movement on NPLs using the case of 30 major oil exporting countries spanning 2000-2014. They employed dynamic GMM model in their estimations and used disaggregated data from commercial banks of the said 30 countries. The results of the finding reveal oil price changes have a significant impact on banks NPLs. Further, they contend that a rise in oil price will lead to a decrease in NPLs. This finding is in consonance with all the three underpinning theories of this current study, that is, the financial intermediation theory of banking, credit-default theory and systemic risks theory. Therefore, the study provides the theoretical and empirical underpinning for this study as well as practical policy implication because the countries of study are net oil exporting countries.

Similarly, the study of Miyajima (2016) investigated the oil-macro-financial linkages in Saudi Arabia. The study used both fixed effect and system GMM approaches in estimating the bank level data of banks sourced from Bankscope spanning 1999-2014 and found that lower growth in oil prices lead to a rise in NPLs ratios. Although to the best of knowledge this is a very limited study that investigated the relationship between growth of oil prices and NPLs but it is constrained by bank level data of only 9 Saudi Arabian banks which might not give room for wider generalization as much as the present study which used aggregated data from multiple countries of OPEC. The study is indeed similar to the study of Al-Khazali and Mirzaei (2017) which also investigated

the association between oil price fluctuation and NPLs. The study reported an inverse relationship between the growth of oil price and NPLs. The finding is in conformity with the theoretical expectations of the financial intermediation theory of banking, credit-default theory and systemic risks theory. Although, the study is restricted to Saudi Arabia which is just a one member of OPEC countries nonetheless its finding provides theoretical and empirical footing for this study.

Consequently, as it can be observed from the above reviewed studies that oil price changes influence certain macroeconomic and financial variables as well as banks profitability but only a few studies attempted to investigate the relationship between oil price changes and banks asset quality. Furthermore, there are indisputable evidence in the reviewed empirical literature which suggest that changes in oil price can also affect the quality of loan portfolios. Furthermore, the underlining theories of financial intermediation theory of banking, credit-default theory and systemic risk theory predict a significant negative association between oil price fluctuations and bank risks asset.

Therefore, this current study presumes an increase in oil prices among OPEC member states which are oil dependent can positively improve the cash flow position of borrowing customers and increase their chances of loan repayments as at when due but a decrease in oil prices can have adverse effects on their repayment abilities. Thus, this study added oil price changes as its variable of interest to examine its effect on NPLs owing to its relevance in the economies of OPEC economies and its ability to influence the cash flow position of economic units and their ability to pay back loans as at when due hence affecting bank asset quality.

ii. Corruption and Non-Performing Loans

Country-wide corruption interfaces with virtually all segments of society thereby affecting growth while its negative effect on growth is found to diminish in countries with high degree of regulation otherwise, it creates inefficiencies and misallocation of resources (see, for example, Hodge, Shankar, Rao, & Duhs 2011). The definition of corruption by Nye (1967) has gone beyond the issue of bribery or related offences for the personal benefits of receivers but also the givers. Another very important consideration is the area of coverage of corruption which is being thought to be restricted to public services. The private sector is equally being affected by corrupt practices, which logically extends to the banking sector. Corruption is a global phenomenon that affects not only economic life but also social activities (Podobnik, Shao, Njavro, Ivanov, & Stanley, 2008). Therefore, in this study corruption will mean country-wide corruption that affects the entire economies under investigation which affects the banking sector, the law enforcement agencies, financial regulatory agencies and the judiciary (see, for example, Goel & Hasan, 2011; Hodge *et al.*,).

It is also argued that in general financial sector and banking system, in particular, can be affected by corruption from both aspects of borrowing and lending aspects (Goel & Hasan, 2011). On the borrowing side, corrupt borrowers might bribe their ways to obtain undue loans or on the lending side, the bankers may engage in corrupt practices, for example, by demanding for bribes before they grant loan facilities or refuse to manage loans efficiently. It is also possible those bank owners will engage in insider-credit practices which can easily violate lending procedures and eventually turn out to be bad

debts. The relevance of corruption in the context of the financial sector in general and banking, in particular, can be perceived in relation to the riskiness in a county (Goel & Hasan, 2011). It is much apparent where the punishments are less in monetary value compared to the monetary value involved in the financial or criminal offences (Becker & Stigler, 1974).

Nevertheless, the influence of country-corruption on banking activities and loan performance most of the previous empirical studies concentrated on its influence on economic growth-related activities. However, the studies of Park (2012) and Goel and Hasan (2011) are the most prominent investigations conducted directly on the relationship between corruption and NPLs. Similarly, there is very little literature on the effect of corruption on the performance of the financial sector in general and banking industry in particular. The few researchers that investigated the association between corruption and related banking activities such as those of; Abu *et al.* (2015), Petrou and Thanos (2014)**,** Weill (2011)**,** Bae and Goyal (2009)**,** Beck *et al.* (2006)**.** Therefore, it can be stated that most of the studies rather investigated the relationship between corruption and other economic fundamentals. These studies are those conducted by Okada and Samreth (2014) D'Agostino *et al.* (2012), Pieroni and D'Agostino (2008), Podobnik *et al.* (2008) and Méon and Sekkat (2005)**.** Consequently, this study draws from the study of Park and Goel and Hasan and the said financial and economic related studies its literature reviews.

There are numerous studies that investigated the association of corruption and economic activities such as those of Okada and Samreth (2014) D'Agostino *et al.* (2012), Pieroni

and D'Agostino (2008), Podobnik *et al.* (2008) and Méon and Sekkat (2005). A good example of these few these studies is the work of Pieroni and D'Agostino which suggested that corruption has played a significant role in the history of some specific countries and it was found to be endemic and pervasive, yielding lower growth, hampering private investment as well as productive public investment and inhibiting the efficiency of public services. The study used a cross-countries data of 90 countries covering the period of 1989-1998 by utilising multiple causes multiple indicators model (MIMIC). The result specifically confirms that corruption, as well as a share of military spending to GDP, deteriorate per capita growth rate. This finding is similar to those of Abu *et al.* (2015), Petrou and Thanos (2014), Goel and Hasan (2011) and Beck *et al.* (2006). The finding is in line with the systemic risks theory and the corruption hypothesis of 'sand the wheels'(Méon & Sekkat, 2005; Bardhan, 1997). Although, the study did not investigate the relationship between corruption and NPLs its finding is in support of the present study to the extent that country-wide corruption will adversely affect bank asset quality.

Furthermore, the study of D'Agostino *et al.* (2012) reaffirms the position of Pieroni and D'Agostino (2008) on the relationship between corruption and growth. This study confirms the expectation that corruption and military burden lower the growth rate of GDP per capita hence in agreement with the systemic risks theory and the corruption hypothesis of 'sand the wheels'(Méon & Sekkat, 2005; Bardhan, 1997). The study was conducted amongst African countries where the military role in politics was very significant. A panel data set of 53 African countries ranging from 2003 to 2007 was used

in the study. The dataset was obtained from African Development Indicators, available in World Bank database and estimated using GMM estimator. The outcome of the study is in disagreement with that of Podobnik *et al.* (2008) but similar to those of Abu *et al.* (2015), Petrou and Thanos (2014)**,** D'Agostino *et al.* (2012), Goel and Hasan (2011) and Beck *et al.* (2006)**.**

The results of D'Agostino *et al.* (2012) study indicate a significant and negative impact of corruption and high military spending on growth. The results also confirm the position that high levels of military spending and corruption have both direct and indirect negative effect on economic performance amongst African countries. This investigation is only related to the present study to the extent that examines the relationship between corruption economic activity, not NPLs and the countries of investigation and methods are not the same with the present study. However, it has provided an insight into the expected outcome and direction of what the association between corruption credit risks will be.

On the contrary, a positive relationship between economic growth rate, foreign investment and corruption was found in a global study of all countries of the world between 1999-2004 (Podobnik *et al.*, 2008). Their study reveals a contrary finding that on average that an increase of CPI by one unit leads to an increase of the annual GDP per capita growth rate by 1.7 percent. This finding is in sharp contrast with the corruption hypothesis of corruption hypothesis of 'sand the wheels'(Méon & Sekkat, 2005; Bardhan, 1997). It is contrary the findings of virtually all reported investigations this current study such as; Abu *et al.* (2015), Petrou and Thanos (2014)**,** D'Agostino *et*

al. (2012), Goel and Hasan (2011) and Beck *et al.* (2006)**.** The result can be said to support the notion of the corruption hypothesis of 'grease the wheels' (Méon & Sekkat; Bardhan). More so, it is argued that in the presence of stiff regulations and inefficient bureaucratic settings, corruption may pave way for bureaucratic efficiency by accelerating the process of getting things done (Bardhan).

Similarly, Bardhan maintains that in the context of pervasive and cumbersome regulations in developing countries, corruption may actually improve efficiency and help growth. This finding is not in harmony with the expectation of the systemic risk theory that presumes an adverse effect on economic activities on the occurrence of systemic risks. Therefore, it is not in line with the expectation of the current study that presumes an adverse effect of corruption on bank asset quality because it leads to the creation of inappropriate loans which will leads to NPLs (Goel and Hasan).

Additionally, Okada and Samreth (2014) carried out an investigation of the influence of corruption the effect of FDI on economic growth. This is similar in terms of focus which is economic growth to the studies of D'Agostino *et al.* (2012), Pieroni and D'Agostino (2008), Podobnik *et al.* (2008) and Méon and Sekkat (2005) However, it did not address the effect of corruption on NPLs which is the focus of the present study nor did it address oil exporting countries multi countries regardless of the oil positions. A total of 130 countries were used for the period of 1995-2008. The result of the findings indicates that FDI has a positive impact on economic growth when corruption is severe but a negative if corruption is below a certain threshold. The study used OLS regression in its estimations. Although, the study used Transparency International's corruption

perception index it also conducted robustness checks using the control of corruption of Worldwide Governance Indicators developed by the World Bank which gives an almost identical result with the former measurement.

Further, the study of Méon and Sekkat like the studies of D'Agostino *et al.*, Pieroni and D'Agostino and Podobnik *et al.* was on the impact of corruption on growth and investment. The study covered the period of 1970-1998 on 61-71 countries of the world. The results of the study reveal that the higher the corruption the lower the investment and growth. The confirms the corruption hypothesis of 'sand the wheels' which presumes a negative relationship between corruption and economic growth and investment s against the corruption hypothesis of 'grease the wheels'. The findings of the studies of both Okada and Samreth and Méon and Sekkat indicate significant relationship between corruption, FDI, investment and economic growth which is similar to the works of D'Agostino *et al.,* Pieroni and D'Agostino and Podobnik *et al.* These studies did not investigate the influence of corruption on bank asset quality amongst the net oil export countries nor did they cover same period of study nevertheless they have agreed with the expectations of the present study and in line with the systemic risks theory.

As it has been documented in the above previous studies and elsewhere on the influence of corruption and to the best of knowledge there are limited studies on the association between corruption and NPLs. Although, the most closely related studies that investigated the effects of corruption on banking activities are those of, Abu *et al.* (2015), Petrou and Thanos (2014)**,** Weill (2011)**,** Bae and Goyal (2009)**,** Beck *et al.*

(2006). However, the studies of Park (2012) and Goel and Hasan (2011) specifically investigated the effects of corruption and NPLs.

For example, the work of Abu *et al.* (2015) unlike the focus of foregoing studies of Okada and Samreth (2014), D'Agostino *et al.* (2012), Pieroni and D'Agostino (2008), Podobnik *et al.* (2008) and Méon and Sekkat (2005) provides a closely related evidence to the relationship between the variables of the current study. The study documents the link between corruption and savings. They conducted a study on the determinants of saving using the panel data of Economic Community of West African States (ECOWAS) spanning 1996-2012. The role of corruption in relation to low savings rates among the ECOWAS member countries was investigated and the findings reveal that a lower corruption is associated with higher savings. This was achieved by employing OLS and Two-Stage Least Square instrumental variable technique in estimating the relationship between the variables.

Thus, the study of Abu *et al.* (2015) provides a strong evidence of the explanatory power of systemic risks theory in explaining the effects of country-wide corruption on economic and financial activities, and banking activities such as savings. Although the study does not address the issue of NPLs and it took its evidence from non-oil exporting countries and relies on static model of OLS, still it provides insights on the need to tackle corruption if saving were to be raised amongst ECOWAS countries. Therefore, the finding is in line the theoretical underpinning of the present study which is on the association between country-wide corruption and bank asset quality amongst OPEC member states.

Likewise, the study of Petrou and Thanos (2014) which is related to the study of Abu *et al.* (2015) in terms of its focus on financial activity. They conducted their study in order to investigate the relationship between corruption and bank foreign market commitment measured by capital investment and share equity of banks. This is also a more closely work than the works of studies such as those of Okada and Samreth (2014), Podobnik *et al.* (2008) and Méon and Sekkat (2005)**.** They used evidence from 2004 cross-sectional data of 131 banks of 40 host countries obtained through primary data on the bank-specific variables while corruption data was extracted from CPI. The result shows that share of the equity of the banks and the effects of corruption on FDI hence market-seeking motivates capital invested.

Therefore, in the study of Petrou and Thanos (2014)**,** the role of market-seeking motivation in the capital invested is a clear testimony on the need to reduce corruption if capital investment and share equity of banks are to be improved. The fact that their work did not address the issue of NPLs nor did it use secondary data or took evidence from net oi exporting countries notwithstanding its finding is line with the theoretical expectation of the present study. Thus, it underscores the relevance of the study in providing strong theoretical and empirical direction to this present study that seeks to examine the relationship between corruption and NPLs in OPEC countries.

Nonetheless, the study that more specifically address the association between corruption and lending although not NPLs are those of; Weill (2011)**,** Bae and Goyal (2009) and Beck *et al.* (2006). For example, Weill studied the impact of corruption on bank lending

amongst Russian banks, that is, the causes of financial underdevelopment. The study used quarterly data spanning the period 2002q1-2002q4 covering three types of loans, government, household and firm loans. The results show that corruption hampers bank lending of household and firm loans as against government loans. The implication is that corruption diminishes bank lending to households and firms in Russia. The finding of this study is similar to those of Bae and Goyal and Beck *et al.* as regards to the adverse effects of country-wide corruption on bank lending.

Even though the study of Weill (2011) addresses the activity of financial development in terms of quantum of bank lending and not bank asset quality still it bothers around financial stability. Therefore, finding underscores the explanatory powers of financial intermediation theory of banking and the systemic risk theory which stipulate influence of systematic risks on bank deposit and lending activities. This is also in line with the expectation of the present study on the association between country-wide corruption and credit riskiness amongst the countries of OPEC.

On the other hand, the work of Bae and Goyal (2009) employed RE and FE methods in its research of 48 countries across the world covering 1993-2003. This study is also closely related to the works of Weill (2011) and Beck *et al.* (2006) in terms direction on the banking activity. However, the study is directly on the effect of corruption on bank lending. The aim of the study to find out how poor enforceability of contracts due to corruption reduces loan amount, loan maturities and increases loan spreads, that is, lending interest rates. The results of the study indicate that corruption in the enforcement

of contracts leads reduced loan sizes, lower loan maturities and higher lending interest spread.

Therefore, the study of Bae and Goyal (2009) portrays the adversarial impact of corruption on bank asset and financial stability as it leads loan constraints, shorter loan maturities and higher lending rates which are detrimental consumption, investment and productivity. Although the study is not similar to the studies of Park (2012) and Goel and Hasan (2011) which are on the association of corruption and credit riskiness it findings provide impetus to policy responses which can ensure sustainable financial stability. However, the data set used and the period covered by the study are not recent nor are the countries net oil exporting countries which make the implementation of its recommendations amongst OPEC member states a bit challenging. Nevertheless, the findings are in line with the assumptions of financial intermediation theory of banking, credit-default theory and the systemic risks theory which underscore their ability to explain the present study.

Similarly, Beck *et al.* (2006) study was a survey in 37 countries for the period of 1999 meant to investigate out how banks supervisory policies ease or intensify the degree to which bank corruption serves as an obstacle to firms raising external finances. The study relied on ordered probit and probit procedure and the result reveals that corruption of bank officials impedes efficient allocation of bank credit. There is no that this study similar to the study of Bae and Goyal (2009) in terms of focus on the relationship between corruption and bank asset and financial stability. Although this study is on bank lending it is not similar to the studies of Park (2012) and Goel and Hasan (2011) which

are on the association between corruption and NPLs. Further, the study different in terms of methodology which was on the use of primary data as against secondary data set nor did it centre on oil exporting countries, therefore, making the implementation of its policy recommendations perplexing. Notwithstanding, the findings are in consonance with the underlining theories of this study, therefore, it provides ample evidence to presume a significant relationship between corruption and NPLs in OPEC countries.

To the best of knowledge as stated early in this section there are two most famous studies that directly linked country-wide corruption and NPLs. These are the studies of Park (2012) and Goel and Hasan (2011). For example, the study of Park is one of the very limited researches that examined the relationship between corruption and NPLs. It was conducted among 76 countries of both less and well developed economies from 2002-2004 against the initial total of 86 countries whose data were publicly available. The study used the CPI provided by TI as a measure of corruption. He contends that the study used the national aggregated data of the CPI due to the difficulty of obtaining micro data on corruption.

Park also used a ratio of NPLs (NPLR) obtained from the statistical index of the Global Financial Stability Report (GFSR) released by IMF. The research concludes that corruption deteriorates the assets quality of banking sector, that is, the relationship between Corruption Index (CI) and NPLR was positive and very significant. It is similar to the study of Goel and Hasan but only related to those of Weill (2011)**,** Bae and Goyal (2009) and Beck *et al.* (2006). Even though its data set are not recent nor are they from oil exporting countries the findings are relevant to the current study to the extent of

theoretical arguments of financial intermediation theory of banking systemic risks theory and credit-default theory and policy implications. Therefore, it has contributed significantly to the empirical and theoretical foundation of this current study that anticipates a significant association between the variables of corruption and bank asset quality.

Similarly, the study of Goel and Hasan (2011) is in line with the focus and findings of Park (2012) which investigated the effect of economy-wide corruption on bad loans (NPLs). They all employ multi country data set across the globe and found a positive association between corruption and NPLs. For example, Goel and Hasan's evidence from their study suggests that a greater corruption is associated with higher banks' bad loans. The study used a cross-section data for over 60 countries for only 2007 using OLS method in its analysis. However, the study has attempted to demonstrate how economy-wide corruption can influence loan review and approval processes as well as how the societal corruption of law enforcement agents can propel corruption in banks. However, it varies from this current study and that of Park on the period covered, the former used cross-section data while the latter relied on panel data. This notwithstanding the finding is as expected based on the underpinning theories of the present study which presumes adverse consequences of corruption on loan performance and financial stability. Therefore, the study provides ample compelling evidence to anticipate significant relationship between corruption and NPLs amongst OPEC countries.

Consequently, the abundance of literature on the effect of corruption on economic and financial activities testifies to the fact that corruption in all its ramifications is a serious

challenge to global financial stability. Although, most of the previous studies are dominated by investigation of the association of corruption economic fundamentals other than bank asset quality the findings and policy implications bother on financial stability. Though, there are works which are closely related to the relationship between the variables of corruption and NPLs such as those of Weill (2011)**,** Bae and Goyal (2009) and Beck *et al.* (2006) which have provided a theoretical foundation to this current study.

However, the studies of Park (2012) and Goel and Hasan (2011) are indeed similar to the extent of linking the two variables. Nevertheless, these studies are not adequate for a literature on the relationship between corruption and NPLs. Also, the review of previous related literature of the effect of corruption on other related economic and financial activities, bank lending and NPLs has provided ample and compelling evidence that corruption can significantly affect NPLs. Therefore, there is the need for more studies to improve the existing literature hence the inclusion of corruption as one of its variables of interest. Thus, following the findings of Park (2012) and Goel and Hasan (2011), this present study anticipates that corruption to significantly affect bank asset quality in OPEC member states which are enfolded by the prevalence of high level of country-wide corruption.

iii. Political Instability and Non-Performing Loans

Moreover, it is widely agreed that political conditions, including political instability, in particular, are important factors in countries' creditworthiness (Kennedy, 1988). There are few empirical analyses of the effects of political factors on creditworthiness (see, for

example, Rivoli & Brewer, 1997; Balkan, 1992; Brewer & Rivoli, 1990; Citron & Nickelsburg, 1987). These early studies in most cases tend to relate political instability to country credit risks as against NPLs. In this study, political instability will mean all types of political predicaments such as unstable government, political and social violence, civil and armed conflicts, terror attacks and wars as well as politically motivated policies that might endanger smooth running of all categories business activities (Kaufmann, Kraay, & Mastruzzi, 2011; Kaufmann, 2009).

There are four categories of studies that investigated the effect of political instability on economic and financial activities, country credit risks and bank assets quality. The studies of Busse and Hefeker (2007), Le (2004) and Svensson (1998) were generally on the effect of political risk and political instability on FDI and private investment respectively but never related to banking activity. However, the vast literature centred around the association of political instability and country credit risks and not NPLs such as the works of Cuadra and Sapriza (2008), Svensson (1998), Rivoli and Brewer (1997), Balkan (1992), Brewer and Rivoli (1990) and Citron and Nickelsburg (1987). Although, the studies of Abu *et al.* (2013) and Edwards (1996) concentrated on banking related business of savings at country level but were never related to bank credit riskiness. Nevertheless, there are limited works on the association between political instability and bank credit risks, the studies are those of Rehman *et al.* (2016) and Dinç (2005).

The bulk majority of the earliest studies of economic effects of political instability were in relation to country credit riskiness which is akin to bank credit risks but at the macro level. These studies include those of Cuadra and Sapriza (2008), Svensson (1998),

Rivoli and Brewer (1997), Balkan (1992), Brewer and Rivoli (1990) and Citron and Nickelsburg (1987). For example, Citron and Nickelsburg conducted a research on the relationship between country risk and political instability among five countries of Argentina, Brazil, Mexico, Spain and Sweden spanning 1961-1982. The study claims that political instability tends to be an extremely important component of the probability of default, even when a very 'crude' measure is employed.

Citron and Nickelsburg (1987) contend that country credit defaults are associated with levels of political instability but mainly amongst developing countries. The study used multi country data set with varying degree of political instability as it is in the case of the study of Balkan, Brewer and Rivoli, Rivoli and Brewer and Svensson. Additionally, Balkan (1992) studied the relationship between political instability, country risk and default of foreign loan where he adopted probit model and estimated a panel data of 33 nations for the period spanning 1971-1984. The result shows an inverse relationship between rescheduling probabilities for a given country and its level of democracy. It also finds a direct relationship between the rescheduling probabilities and the level of political instability.

Although the studies of Balkan (1992) and Citron and Nickelsburg (1987) are in different groups of countries and different time frames the influence of political instability was measured against macro credit risks at country level it is indeed in accordance with the systemic risks theory and credit-default theory. The set of countries involved are not necessarily oil exporting countries and the years covered by the studies are not recent compared to those of the present study the findings have policy

implications for countries that are besieged by high political instability such as the OPEC countries. Therefore, their study underscores the relevance of political instability to credit-default thereby laying a strong theoretical foundation to the current study and they are in consonance with systemic risks theory and credit-default theory that underpin the present study.

Furthermore, Cuadra and Sapriza (2008) investigated the influence of political uncertainties, that is, political instability on sovereign debt, country spreads and default rates using Argentinian quarterly data between 1983q3 and 2001q4. This study used single country data as against multi country data sets used by Balkan (1992) and Citron and Nickelsburg (1987) hence the latter's capability of wider generalization. Their quantitative analysis indicates that economies that are more polarised and faced with high political instability are most challenged by higher sovereign default rates and volatile sovereign interest spreads. These findings are not in any way different from the underlining theories of systemic risks theory and credit-default theory.

However, the study of Cuadra and Sapriza (2008) is not similar to those of Rehman *et al.* (2016) and Dinç (2005) that investigated the relationship between political instability and bank asset quality and bank lending respectively. Notwithstanding, the findings of the study of Cuadra and Sapriza and their policy implications require similar policy responses from governments that are troubled by political instability in order to maintain financial stability.

On the contrary, unlike the studies of Cuadra and Sapriza (2008), Balkan (1992) and Citron and Nickelsburg (1987) that reported the adverse effect of political instability on country creditworthiness the study of Brewer and Rivoli (1990) reveals opposing results. Brewer and Rivoli in a study of 30 most heavily indebted developing countries using least squares regressions opined that neither armed conflict nor political illegitimacy was found to have significant effects on country creditworthiness. Additionally, chronic instability in all forms was found not to be related to perceptions of country creditworthiness. The study specifically examines the effects of governmental regime change, political legitimacy, and armed conflict on the perception of country's creditworthiness.

The study of Brewer and Rivoli (1990) relies on economic data from world development report of World Bank and international financial statistic of IMF. The finding of the study is not in line the theoretical expectations of credit-default theory and systemic risks theory that expect the adverse effect of political instability on country creditworthiness. However, it contributes to the theoretical foundation of the present study to the extent that reveals an association between the variable of political instability and credit-default.

Furthermore, Rivoli and Brewer (1997) conducted another research on the effects of political instability, economic variables on country creditworthiness among 80 developing countries using data sets from Global Development Finance System (GDFS) (formally called 'World Bank's Debtor reporting system') for the periods of 1980-1985 and 1986-1990. The study used panel data of the countries but adopted chi-square

approach. The finding reveals the predictive power of exclusively economic models of rescheduling declined from the earlier period to the later period, as did the predictive power of models with political variables. However, the correct prediction rate for rescheduling was 9 to 12 percent greater for the political-economic models than for the exclusive economic models in the earlier period in 1980-1985.

Nevertheless, the later period of the study 1986-1990 had a better prediction rate of rescheduling from 18 to 35 percent which was greater than the former period. The inclusion of political variables thus improved upon the exclusively economic models, especially during the late 1980s. These findings contradict their earlier findings in Brewer and Rivoli (1990) but they are in agreement with the findings of Cuadra and Sapriza (2008), Balkan (1992) and Citron and Nickelsburg (1987). Relatedly, the findings of the study are in course with the presumptions of credit-default and systemic risks theories which predict that high political instability will adversely affect loan portfolio quality. Thus, its findings and policy recommendation will not be far from the expectation of the present study therefore it gives an impetus to both its empirical and theoretical significance.

Apart from the studies that linked political instability to country creditworthiness the studies of Busse and Hefeker (2007), Le (2004) and Svensson (1998) different evidence on the influence of political instability on investment. For example, Svensson in a cross-country study of 101 countries spanning 1960-1985 established a link between property right, investment and political instability. The study which relied on OLS estimator

reveals the extent to which the level of political instability of a country will determine the quality of property rights hence the chance of increased investments.

The study further stresses that unstable government and polarised political systems discourage investment thereby resulting in a lower level of domestic investment. This finding is similar partly to the result of Le which reveals that unconstitutional change of government and changes in government political instability impede private investment. It is also similar to the study of Busse and Hefeker but only to the extent of association between political instability and investment. The study did not address the issue of credit riskiness of the countries nor their banking system but the findings and the policy implications are related to the assumptions of systemic risks and credit-default theories hence underscore their significance to financial stability.

However, Le (2004) studied the panel of 25 developing countries over 21 years ranging from 1975 to 1995 and linked private investment to the rate of return differential, risk aversion, and several sorts of political and economic risk. The result was estimated by employing Feasible Generalised Least Squares (FGLS). The result reveals among other things that non-violent socio-political instability encourages private investment while violent unrests hamper private investment. Also, regime change instability characterised by constitutional government change encourages private investment while the unconstitutional change of government impedes private investment and changes in government political capacity obstructs private investment.

A closely related study is the investigation by Busse and Hefeker (2007) on the linkage of political risk, institution and foreign direct investment inflow amongst 83 developing countries spanning the period of 1984-2003. The GMM estimators was employed in the study while the data on political risk was sourced from the International Country Risk Guide (ICRG) made available by Political Risks Service (PRS) Group. The results show that three indicators of political risk and institution, that is, government stability, religious tension and democratic accountability are closely associated with FDI flows. The study is similar to those of Busse and Hefeker and Svensson (1998) in terms of association of the variables and the fact that all of the works relied on multi country data set however they are not exclusive oil producing countries. Likewise, the findings and policy implications of the study tally with the postulation of the underlining theories of the present study and financial stability.

Furthermore, in the earlier study of Edwards (1996) and that of Abu *et al.* (2013) the literature on the effect of political instability took the direction of banking activity of savings. For example, Edwards in a cross-country study of 36 countries spanning 1970-1992 investigated the effects of both economic and political variables on private savings and public savings. More specifically Edward used three measurements as proxies for political instability. These proxies are the degree of structural political instability in each country, the frequency of politically motivated assassinations and attacks respectively. The result indicates that while private savings respond to demographic variables, social security expenditures, and the depth of the financial sector. But, public (government) savings are affected by an important type of variable, that is, the degree of political

instability of the country in question and that public savings are lower in countries with higher political instability.

Although the study differs from the works of Busse and Hefeker (2007), Le (2004) and Svensson (1998) its finding is similar to that of Abu *et al.* and in line with the theoretical assumption of systemic risks theory which predicts that political instability will have adverse effect on financial and banking activities such as savings. However, it did not address the influence of political instability on NPLs nor did it took evidence from exclusive oil producing states but its findings has relevance for policy implications for countries that are engulfed with political crises such as most of the OPEC countries. Nevertheless, the study lent support to the empirical and theoretical foundation for the present study.

Additionally, Abu *et al.* (2013) investigated the impact of political instability-income interaction on savings of Economic Corporation of West African States (ECOWAS) from 1996-2012. The study employed OLS, Panel Corrected Standard Errors (PCSE) and Two Stage Least Square (TSLS) methods. The result indicates that higher political stability is associated with higher savings and that a higher income tends to reduce the impact of political instability on savings. This finding corroborates the work of Edwards (1996) which reported an inverse effect of political instability on the level of savings. However, it differs from the study of Rehman *et al.* (2016) which investigated the relationship between the political system of a country and NPLs. Further, the study only concentrated on ECOWAS countries, therefore, its findings might not have wider generalization given its regional inclination. Though, the outcome of the study and its

policy implications are in harmony the systemic risks theory, therefore, contributing immensely to the literature of the present study in terms of the association between political instability and credit risks in OPEC member states.

However, the studies of Rehman *et al.* (2016) and Dinç (2005) are the limited works that provide sufficient evidence on the links between political environment and bank asset quality and general bank lending respectively. For example, the study of Dinç investigates the effect of political influences on government-owned banks' lending. The study was in emerging markets and developed economies for the period 1994-2000 using regression multiple analysis. The result indicates that in the year of elections government-owned banks to tend to increase their lending to their supports than the private-owned banks. This portrays that democratic governments influence on government-own banks in their lending process might lead to something similar to insider related credits which is usually associated with poor bank assets qualities. This study is much closer to the studies of Edwards (1996) and Abu *et al.* (2013) and is similar in focus to the present study than the works of Busse and Hefeker (2007), Le (2004) and Svensson (1998).

Nonetheless, the study of Dinç (2005) is not directly similar and on the relationship between political instability and NPLs its findings and policy recommendations are of immense value to the present study because they tally with three underlining theories of this study which are the financial intermediation theory of banking, credit-default theory and the systemic risk theory. Although, the countries of study are not exclusively oil

producing in nature the policy implications can be appropriate OPEC countries that are mostly characterized by high level of political instability.

Further, in a recent study by Rehman *et al.* (2016) the variables of political instability and NPLs are most closely linked based on undisputable empirical evidence from Pakistan. The study which was conducted in Pakistan it spans between 1998-2009 using the static panel model and it employed data of all listed commercial banks in the country. The study strongly argues that democratic political system of a country has a positive effect on its NPLs, that is, the more stable (civilian/democratic government) a political system is the higher the NPLs. To the best of knowledge, it is amongst the pioneer works that established a link between the political instability and NPLs.

The study of Rehman *et al.* (2016) corroborates the findings of Dinç (2005) which was also on the association between the political event of election and bank lending activity. It is also related to the studies of Busse and Hefeker (2007), Le (2004) and Svensson (1998) in term of direction. However, regardless of the differences with this current study in terms of countries of study and span of a period of study, it remains the most related study whose findings are in consonance with the entire three underpinning theories of the study as well as established a relationship between political instability and NPLs. This underscores the relevance of this study in relation to financial stability not only amongst the OPEC member states but also the world at large.

The above literature reviewed on the effect of political instability on economic activities has provided ample evidence to conclude that the variable of political instability

influences country creditworthiness and can predict the expected defaults of countries in repaying their sovereign debts, savings, investments and FDI but did not establish a link with NPLs. However, the studies of Rehman *et al.* (2016) and Dinç (2005) have demonstrated the influence of countries' level of political activities can have on NPLs and banking lending behaviour respectively. Furthermore, they provide sufficient evidence that political instability can affect the abilities of the borrowing customers in generating enough cash flow that can cover their expenses as well as pay back loans. Additionally, the vast majority of member countries of OPEC is challenged with a high level of political instability as indicated in the statistics attached in Appendix C of this study. Therefore, following the works of Rehman *et al.* and Dinç on the effects of political events on NPLs and bank lending respectively as well as the prevalence of political instability in OPEC countries have necessitated the inclusion of political instability as a variable of interest for this study as it could also affect bank asset quality.

iv. Environmental Risks and Non-Performing Loans

Additionally, banks operate in a wider business environment that is characterised by different layers of environmental risks which can affect banking activities of deposits taking and lending. Therefore, loans are made in a highly volatile physical environment that may impact on general loan qualities across the globe. The current global physical environment is more challenged than ever in our recent history given the frequency and intensity of natural and technological disasters in the recent years but very little attention has been given by researchers on their effects on economic development (see, for example, Mcdermott *et al.* 2014). Therefore, in this study environmental risks refer to natural and technological disasters that can impact on general business activities (see, for

example, Loayza *et al.,* 2012). Natural disasters have resulted in significant economic and human loss for the millennia (Noy, 2009) and are considered as systemic risks that have significant influence on banking business (Klomp, 2014; Collier *et al.,* 2013; Collier & Skees, 2013).

Benedick (1990) opined that a serious challenge before government today is the dilemma of whether and how to act when confronted with environmental risks. Environmental risks if crystallised into natural, technological and intentional disasters have the capacities of impacting on economic, political, ecological and social settings. These disasters are expressed in form of oil spillage, flooding, tornados, volcanic eruptions, earthquakes, nuclear meltdowns, environmental pollutions and diseases among others.

The consequences of these disasters transcend borders of economies, industries and sectors. The effects in form of destruction of business and critical infrastructures, limiting income and investments as well as spread of diseases and social problems are felt in oil exploration and exploitation industries of Middle East, the manufacturing and aviation industry in Europe and tourism in Asia, as well as governments' spending and banking businesses across the world (see, for example, Collier & Skees, 2012). Therefore, Sharfman and Fernando (2008) suggest an alternative perspective of environmental-economic relationship which is dominated by the opinion that improvement in economic performance is a function of better environmental performance.

Cochrane (2004) argued that if environmental risk crystallised it might lead to two kinds of losses: direct and indirect. He further argues that direct loss is the direct consequence of an occurrence of a disaster such as physical damages to properties, critical infrastructures and employment losses. However, his perception of an indirect loss relates to second order effects which temper with the smooth running of economic activities in the society thereby affecting production and provision of economic goods and services. This can affect the economic units' cash flows and their ability to pay back loans. Therefore, both direct and indirect losses have the tendencies of impacting on the repayment capabilities of bank borrowing customers hence can cause or aggravate existing NPLs (see, for example, Klomp, 2014; Collier *et al.*, 2013; Collier & Skees, 2013).

According to Klomp (2014), the increasing trends in the frequency and intensity of disasters have the potential to stress and threaten banks to the point of impaired viability or even insolvencies. This might be as a result of expected increasing NPLs, rising leverage and bank runs immediately after the occurrence of a major disaster to finance emergency expenditure and reinvestments. Klomp stressed that these challenges can affect the basic foundation of banking activity and financial intermediation as savings, loans and investments are being destroyed by the aforementioned disasters. The very sources of loan repayment which are cash flow from businesses, government revenues and personal incomes are being threatened and destroyed in the aftermath of disasters thereby making loans repayment extremely difficult hence increasing the chances of having more NPLs. The problem is being aggravated by the inability of governments around the world to handle the situation as well as the lack of adequate insurance cover

to many of the borrowing customers and the lending bankers against losses caused by disasters. The roles of NIDS in some countries cannot be said to be adequate because they do not cover losses that might be sustained by the borrowing customers and the lending banks during and after the disasters. The situation is more pathetic in developing countries and smaller economies with less spending abilities (Noy, 2009).

The variable of environmental risks has received the widest attention compared to the remaining systemic risks factors highlighted by this study. The first category of the literature is on the effects of environmental risks on economic activities which includes studies such as those of; Mcdermott *et al.* (2014), Shabnam (2014), Cavallo *et al.* (2013), Loayza *et al.* (2012) and Athukorala and Resosudarmo (2006). Furthermore, there are also studies that focus on the association between environmental risks and bank related activities which includes those of Collier and Skees (2013), Mottaleb *et al.* (2013), Weber (2012), Aintablian *et al.* (2007), Weber *et al.* (2008), Skidmore and Toya (2002), Skidmore (2001) and Steindl and Weinrobe (1983). However, to the best of knowledge, there are limited attempts to investigate the relationship between environmental risks and bank asset quality amongst which includes the studies of Klomp (2014) and Collier *et al.* (2011).

As stated earlier the studies that related environmental risks and related economic activities include those of Mcdermott *et al.* (2014), Shabnam (2014), Cavallo *et al.* (2013), Loayza *et al.* (2012) and Athukorala and Resosudarmo (2006). For example, the study of Shabnam studied the effect of natural disasters on economic growth using a large panel dataset of 187 countries spanning the period of 1960-2010. The study

employed OLS estimation and collected data on disasters from EM-DAT (CRED 2010). The result indicates the total number of people that have been affected by floods disaster significantly decrease the annual GDP per capita growth rate but the number of the death toll from the same category of disasters has no substantial effect on annual GDP per capita growth rate.

The findings of the study of Shabnam (2014) portrays that environmental risks are associated with the economic growth of countries around the world which is in line with the studies of Mcdermott *et al.*, Cavallo *et al.*, Loayza *et al.* and Athukorala and Resosudarmo. Even though the study did not associate environmental risks and NPLs it has lent support to the present study in terms of theoretical disposition and policy implications. Furthermore, the findings are not constrained to oil exporting nations they are in line the systemic risks theory which underpins argument that adverse impact of environmental risk will negatively affect economic activities

Similarly, the works Mcdermott *et al.* (2014) and Cavallo *et al.* (2013) are related to the studies of Shabnam (2014), Loayza *et al.* (2012) and Athukorala and Resosudarmo (2006) as they all measure the relationship between environmental risks and economic growth. The study of Mcdermott *et al.* investigated the effects of natural or humanitarian disasters at a country-year level on economic growth over the medium to the long term. A dynamic panel data of a sample of 178 countries spanning 1979-2007 was estimated by employing GMM estimator. The natural disaster was equally sourced from EM-DAT from CRED. The result shows that disasters have a significant negative effect on contemporaneous economic growth.

Also, Cavallo *et al.* (2013) carried out their research on the average causal impact of the catastrophic natural disaster on economic growth measured by real GDP. A sample of 196 countries was used for the period of 1970-2008. The study also utilised the EM-DAT (CRED) for obtaining the required data on natural disasters within the period of the study. They argued that their results suggest that only large natural disasters, on average affect the subsequent performance of the economy. The findings of these studies demonstrate the influence of disasters in constraining economic growth which tallies with the assumption of systemic risks there lend support to the theoretical and empirical foundation for the present study.

In a similar manner the studies of Loayza *et al.* (2012) and Athukorala and Resosudarmo (2006) as they investigated not only the issue in relation to economic growth but they both employed multi country data sets. However, their studies are closely related to the works of Mcdermott *et al.* (2014) and Cavallo *et al.* (2013). Loayza *et al.* of conducted their study on the effects of natural disasters on economic growth. Their work employed a cross-country panel dataset sourced from EM-DAT spanning 1961-2005 of 94 both developing and developed countries and estimated the result using GMM technique. A robustness test was also conducted using standard Least-Square methodology. Specifically, the study was on effects of droughts, earthquakes, floods and storms on economic growth and three outcomes were reveal by the result. The first is that disasters effects on economic growth are not always negative as it all depends on the category of the disaster and the sector of the economy. Second, the findings indicate that moderate

disaster does have a positive effect on growth in certain sectors but severe disasters do not. Finally, growth in developing countries is more sensitive to natural disasters.

Correspondingly, in an earlier study conducted by Athukorala and Resosudarmo on the impact of Indian Ocean Tsunami disaster of 2004 on economic activities of the most affected countries of Sri Lanka, Maldives, India, Indonesia and Thailand, result shows that the impact is minimal on the economies of Sri Lanka and Maldives but heavily impacted on the economies of India, Indonesia and Thailand. Athukorala and Resosudarmo assert that the region's financial market remained "Strangely serene" and that their currencies did not collapse, but that there was a significant appreciation of the Sri Lanka's nominal exchange rate. The study presumed the reasons to be because of massive aid commitments and that the Tsunami did not impact on the industrial and commercial areas of the affected countries other than Maldives.

Although, the above studies are far away from investigating the relationship between disasters and NPLs they are neither similar to those works that centre around banking activities like those of Collier and Skees (2013), Mottaleb *et al.* (2013), Skidmore and Toya (2002) and Steindl and Weinrobe (1983). These difference notwithstanding the findings and policy implications are as presumed by the systemic risks theory there serves a good theoretical justification that the environmental risks can also affect bank asset quality.

Additionally, the strand of literature investigates the impact of environmental risks is on its association with general banking related activities which includes the works of

Collier *et al.* (2013), Collier and Skees (2013), Mottaleb *et al.* (2013), Weber (2012), Aintablian *et al.* (2007), Weber *et al.* (2008), Skidmore and Toya (2002), Skidmore (2001) and Steindl and Weinrobe (1983). The studies of Skidmore and Toya, Skidmore, and Steindl and Weinrobe are the early major researches that tried to relate the effect of occurrences of disasters on human capital accumulation, financial fragility and savings respectively. The findings of these three studies are not in line with the systemic risks theory's assumption that savings and human capital accumulation will decrease while financial fragility such as bank runs will have increased.

The study of Steindl and Weinrobe (1983) was conducted with a view of investigating the deposit experience of financial institutions at the aftermath of a major natural disaster. The data employed for the study was based on observation of details supplied by the seven individual savings and loan associations and eight commercial banks in four major natural disasters of United State of America in the 1970s. The results show no evidence of a run on the banks instead there was increased deposit received by financial institutions due to disaster occurrence. The finding of this study negates the expectation of the systematic risks theory which predicts negative consequences of decreased deposits and runs on the banks to cover the losses caused by the impact of disasters.

Further, Skidmore (2001) conducted a study on the influence of natural catastrophe on economic losses among 15 Organisation for Economic Co-operation and Development (OECD) from 1960-1995. The data on net household savings and growth in per capita GDP were sourced from historical statistics of OECD countries while data on natural

disasters were obtained from CRED international disaster database of EM-DAT. The results suggest that higher damages from climatic and ecological disasters are significantly and positively correlated with the rate of savings of household.

Moreover, the study of Skidmore and Toya (2002) investigated the relationship amongst disasters, capital accumulation, total factor productivity and economic growth. The study employed panel data of 89 countries across the world for the period from 1960-1990 and natural disaster data were sourced from CRED, EM-DAT. The result among other things reveals that high frequencies of climatic natural disasters are positively correlated to higher capital accumulation, total productivity and economic growth. Therefore, the findings of the studies of Skidmore and Toya, Skidmore, and Steindl and Weinrobe stand alone in the literature of the relationship between environmental risks and economic, financial and banking activities as they contradict the theory. Thus, as indicated in the studies, it denotes the role that policy makers and management of financial institutions can play in monitoring and handling the impact of environmental risks. Therefore, the studies have contributed to the understanding of the significance of bank monitoring minimising the adverse effects of environmental risks.

However, the studies of Weber (2012) and Weber, Fenchel and Scholz (2008) and Aintablian *et al.* (2007) are related to the internal working of the banks and how they are perceived externally in the banking and stock market environment. For example, Weber (2012) and Weber, Fenchel and Scholz (2008) investigated the relationship between the integration of environmental credit risk management and bank performance while the

study of Aintablian *et al.* (2007) investigated the associations amongst environment risks, bank monitoring and their stock returns.

The study of Aintablian *et al.* (2007) was conducted on the association between bank monitoring and environmental risks where loan announcement effects for 152 Canadian companies were examined to investigate the efficiency of monitoring by banks facing lender environmental liability. They employed standard event study methodology and investigated how bank monitoring controls environmental risk in loans contracts. The finding of the study reveals that announcements of loans to Canadian companies in polluting industries are correlated with unusual positive returns that are more than those arising in the case of loans to other industries. This means that markets regard banks monitoring as an effective screen of environmental risks.

On the other hand, the study of Weber *et al.* (2008) work was based on a survey of 205 banks from eight European countries to test whether the banks take environmental credit risks into account in their credit risk management. The result shows that banks possess instruments to rate environmental risks but there was a need to integrate environmental risk in the credit risk management. Additionally, Weber (2012) conducted a study that involved the six largest Canadian banks that constituted 90% of Canadian assets. He also suggested that one of the key businesses of banks is the loan business, and thus credit risk management is a major activity to guarantee the success of a bank. The study employed two-step mixed method of quantitative and qualitative analysis in investigating whether the banks integrate environmental risks in their credit risk management.

The result of the study of Weber (2012) suggests that the banks incorporate environmental risks in their credit risks management. However, for them to be successful, lenders must rate those factors that influence the borrower's ability to repay the loan. Therefore, he refers to these factors as counterparty credit risks such as those caused by environmental risks. The findings of this study are not far from the theoretical expectations of the systemic risks theory that anticipates the adverse effect of environmental risks on financial and banking activities. These the results of these studies underscore the relevance of integrating environmental risk in credit risk management of bank as it might have an impact on bank performance.

On the contrary, Collier *et al.* (2013), Collier and Skees (2013) and Mottaleb *et al.* (2013) provide contrary evidence from the studies of Skidmore and Toya (2002), Skidmore (2001) and Steindl and Weinrobe (1983) which reveal the negative consequences of environmental risks on household income, customers savings, liquidity financial institutions and lending. For example, Collier and Skees found that disasters can create both asset losses and liquidity shortages for Inclusive Finance Institutions (IFIs). This assertion was revealed in an investigation they carried out on how unmanaged systemic risk continues to limit financial services for the poor in a booming sector of developing and emerging economies by employing data sourced from CRED, EM-DAT. Collier and Skees, further argued that deposit-taking financial institutions will experience liquidity shortages if depositors withdraw their deposits to manage the disaster or borrowers failing to repay loans and that disasters can lead IFI asset loses

where problem loans are written down or off. The study employed the data of 900 IFIs samples.

The study of Collier and Skees (2013) was further strengthened by the work of Collier *et al.* (2013). The study investigated the effect of natural disasters risks of El Nino on Financial Intermediaries (FIs) in Peru. The finding of the study suggested that disasters lead to large loan losses which compel lenders to contract credit. Additionally, the study of Mottaleb *et al.* (2013) focused on the effects of natural disasters on farm household income and expenditure. The study suggests that a crop failure because of a natural disaster is a regular phenomenon among households that engage in rice farming in Africa and Asia that causes volatility in rice income and negative income shocks. They employed Household Income and Expenditure Survey (HIES) data from the national government and applied estimation method in the natural experimental setting for the years 2000, 2005 and 2010. The research work reveals that tropical cyclone that impacted on the coastal region in May 2009 affected rice farmers to spend less on their children education hence affecting capital formation in the long run.

Therefore, the studies of Collier *et al.,* Collier and Skees and Mottaleb *et al.* have provided sufficient evidence on the relationship between disasters and household income, customers savings, financial institutions liquidity and lending. Although, the studies are not done in relation to bank asset quality nor did they employ their data from oil exporting countries still the findings are in consonance with the expectations of systemic risks theory hence provide impetus to the current study.

The most closely related study that links environment risk with Bank asset quality are the studies of Klomp (2014), Mengze and Wei (2013), Berg and Schrader (2012) and Collier *et al.* (2011). These studies unlike the works of Collier *et al.* (2013), Collier and Skees (2013) and Mottaleb *et al.* (2013) they provide a direct relationship with the bank loan credit riskiness which similar to the focus of the present study. For instance, the study of Berg and Schrader is a step closer to effects of disaster on NPLs compared to the works of Collier *et al.*, Collier and Skees and Mottaleb *et al*. The investigation of Berg and Schrader reveals the effects of aggregate volcanic natural disasters' shocks on loan demand and access to credit by employing customer-level data from Ecuadorian microfinance institutions and geophysical data on volcanic eruptions. The study period was from January 2002 to August 2007 and relied on random effect estimations method for analysing all data on loan applications and subsequent approvals.

The result of Berg and Schrader (2012) shows that loan demand increases at the aftermath of volcanic eruptions and that the chances of loan approvals are higher in the aftermath than in the last months before the eruptions. Nevertheless, the study did not directly investigate how disasters cause NPLs it did demonstrate the demand and access to loans increase at the impact of disasters which signifies either delinquency or insolvency of economic units. Thus, the findings are in line with the theoretical expectation of the present study's entire three underpinning theories.

Also, a different evidence was provided by Mengze and Wei (2013) in a comparative study of environmental credit risk performance of a sample of 120 banks of 12 countries from the 19 Asia-Pacific member states. The focus of their environmental risk was on

borrowers that engage in activities that create damages to the environment which may result in financial penalties. They argued that this leads to cost escalation or revenue reduction hence which can affect the borrowers' ability to repay loans, therefore, impacting on the bank's environmental credit risks performance. The data for the study were gathered from Corporate Social responsibility reports, environmental or sustainability reports and/or website information for the period of 2009-2011.

The relevance of Mengze and Wei (2013) study's findings is an indication of the assumption of the present study that the OPEC countries activities of oil dominance in their economies could have adverse effect their banking activities. The oil production function of OPEC economies has an impact on the environment and increases the probability of technological disasters (see, for example, Associated-Press, 2014) whose prevalence has been identified in the EM-DAT data base. Consequently, the outcome of this study is not only in line with the position of credit-default and systemic risks theories but also the has policy implication relevance to the present study which is on OPEC member states.

Similarly, the study of Collier *et al.* (2011) that investigated El Nino events that caused catastrophic flooding on loan portfolio performance in Northern Peru. The study employed intervention analysis in estimating the portfolio-level monthly time-series data collected from January 1994 to October 2008. The dependent variable was in two categories: the proportion of loans in the late category and the proportion of loans in the restructured category. However, for the independent variables, dummy variables were adopted for to identify the months before, during and after the El Nino events. Collier *et*

al. specifically tested for 1997-1998 and the results reveal that El Nino significantly increases the proportion of restructured loans but did not increase the proportion of late loans in the portfolio. This is one of the earliest studies that established the link between environmental risks and bank loan quality. The findings and evidence exhibited by the study have demonstrated the explanatory power of financial intermediation theory of banking, credit-default theory and systemic risks theory in associating the effects of disasters on loan qualities.

Furthermore, Klomp (2014) investigated the relationship between financial fragility and natural disasters and banks performance. The study used OLS to estimate the unbalanced dynamic panel data of 180 large scale natural disasters over 160 countries spanning 1995-2010. The data on natural disasters were documented in 'Emergency Events Database' (EM-DAT, 2013) from Centre for Research on the Epidemiology of Disaster (CRED). The study suggests that disasters will affect assets quality by increasing default rate because of deaths, physical disabilities and loss of sources of income of their borrowing and deposit customers. Additionally, the study suggests that disaster occurrences may also affect operational activities of the banks, that is, their infrastructures that might have been impacted by the disasters hence a serious challenge to their liquidity positions. It also more precisely confirms that wide spread damage caused by geophysical and meteorological disasters reduce distance-to-default. The findings of this study are in harmony with those of Mengze and Wei (2013), Berg and Schrader (2012) and Collier *et al.* (2011) which are all in line with the predictions of the underlining theories of the present study.

Thus, the extant literature which has so many strands on the effect of disasters on general economic, finance and banking activities appear inconclusive. Some of the studies suggest positive effects while other find negative effects (Loayza *et al.*, 2012). Additionally, there is limited evidence that the effects environmental risks on NPLs have been adequately addressed hence leaving a huge gap in the literature. This might not be unconnected with the fact that economic research on natural disasters is only in its infancy with very few studies in the area (see, for example, Mcdermott *et al.*, 2014; Noy, 2009). However, the literature reveals that there is ample evidence to logically suggest that environmental risks influence bank asset quality as demonstrated in the studies of Klomp (2014) and Collier *et al.* (2011).

Consequently, the findings of the studies of Klomp (2014) and Collier *et al.* (2011) on the relationship between environmental risk and bank asset quality confirm that occurrence of a major natural and/or technological disaster can affect the cash flow of economic units hence deterioration of bank asset quality. This relationship is in line with the theoretical assumptions of financial intermediation theory of banking, credit-default and systemic risks theories (see, for example, Collier & Skees, 2013; Sy, 2007). More so, the countries of OPEC are also challenged by different layers of environmental risks which could have contributed to its present position of weak bank asset quality. Therefore, following the theoretical assumption of the three underpinning theories of the present study and the empirical evidence of previous work it is presumed that environmental risk can significantly affect credit riskiness of OPEC countries.

3.2.2.2 Global Financial Crisis and Non-Performing Loans

The issue of the financial crisis is theoretically characterised by large output losses and decline in other economic fundamentals such as consumption, investment and industrial production as well as other financial pillars such as credit and asset prices (see, for example, Amuakwa-Mensah *et al.,* 2017). The recent financial crisis which has its roots in the US in 2007 has exposed the weaknesses of the international banking system (Anastasiou *et al.,* 2016b). According to Beck *et al.* (2015) over the past decade, the credit quality of loan portfolios remains stable until the global financial crisis of 2007-2009. This position was corroborated by Kjosevski and Petkovski (2016) who contend that the credit quality of loan portfolios across most countries in the world remained relatively stable until the GFC of 2007-2008 hits the global economy.

Although, Beltratti and Stulz (2012) opined that overall bank performance in the US from July 2007 to December 2008 was the worst but there is variation in the magnitude of its effects across the world. The GFC has changed the landscape of bank assets qualities of many countries across the world but with different intensities (Kjosevski & Petkovski). This has drew the attention of many researchers to investigate the relationship between GFC and bank assets qualities among which are Amuakwa-Mensah *et al.* (2017), Nikolaidou and Vogiazas (2017), Bollen *et al.*, (2015), Castro (2013), Ree (2011) and Poghosyan and Hesse (2009). Therefore, the GFC has prompted a global call for tougher regulations of the financial institutions and markets alike (Keys, Mukherjee, Seru, & Vig, 2009).

Amuakwa-Mensah *et al.* (2017) investigated the role of financial crisis in the determination of NPLs in Ghana's banking industry within the period of 2007-2009. The study employed system GMM and Fully Modified Ordinary Least Squares (FMOLS) and found that within the period of 2007-2009 the level NPLs was lower. Further, a closely related study to it is that of the study of Ree (2011) was conducted on the impact of GFC on banking sector soundness in Asian low-income countries and the results reveal a positive relationship between GFC and NPLs. Further, Kauko (2012) studied the deterioration of bank credit quality during GFC period and the result shows that both credit growth and current account deficit predict the development of NPLs. Nevertheless, the study of Ivashina and Scharfstein (2010) was in the US and on the relationship between financial crisis and bank lending. The result shows that new loans to large borrowers fell by 47 percent at the peak of GFC, by the fourth quarter of 2008 compared to the 79 percent during the credit boom of 2007.

The study of Anastasiou (2017) based on Italian banks panel data for the period 1995Q1-2015Q1 which estimated its results using both traditional static panel of FE, RE as well as a dynamic panel of GMM. The finding indicates a negative association between the downward phase of the business cycle and NPLs, and that NPLs increase due to the upward phase of the credit cycle. Similarly, the study of Castro (2013) was amongst the GIPSI countries from 1995q1-2011q3 by adopting FE, RE and GMM. The finding indicates credit risks substantially increased during the GFC.

However, the study of Nikolaidou and Vogiazas (2017) was done using the panel data of developing countries of Sub-Saharan African countries in the light of 2008-2009 GFC

by employing ARDL method. The results reveal that the GFC indirectly affected the NPLs of the selected Sub-Saharan African countries. Also, in Malaysia, the effect of GFC on NPLs was investigated by Janvisloo and Muhammad (2013). The study employed GMM in its estimations and the finding shows that the negative impact of the GFC reversed the downward movement of NPLs. The NPLs alongside with the liquidity risks are most weaknesses of banks exposed by the GFC hence the need to consider the effects of GFC in the study of NPLs (Anastasiou *et al.,* 2016). Consequently, Beck *et al.* (2015) contend that bank assets qualities of emerging countries were gradually improving until the onset of the GFC where the NPLs growth rate in 2009 was around 40 percent as against almost 60 percent of the advanced economies.

The above studies have portrayed mixed findings in terms of the influence that global financial crisis of 2007-2009 has on bank asset quality. Most of the studies have conducted are in the most GFC affected regions of Americas, Europe and Asia while few studies are done Middle Eastern and North African (MENA) countries. For example, the above reviewed literature on the relationship between GFC and bank asset quality conducted by Anastasiou (2017), Beck *et al.* (2015), Castro (2013), Janvisloo and Muhammad (2013), Ree (2011) and Ivashina and Scharfstein (2010) were in done within the regions of Americas, Asia and Europe and the results indicated positive relationship between GFC and bank credit quality. However, the studies of Amuakwa-Mensah *et al.* (2017) and Nikolaidou and Vogiazas (2017) were conducted in African regions should inverse relationship between GFC and bank asset quality.

Therefore, these findings have signified the influence of GFC on bank credit riskiness which is in line with the expectation of the underpinning theories of this current study which are the financial intermediation theory of banking systemic risks theory and credit-default theory. Consequently, their practical policy implications are relevant to the OPEC countries as they might have been affected in one way or the order by the GFC of 2007-2009. Nevertheless, the inclusion GFC is outside the scope of the present study.

3.2.2.3 Control Variables and Non-Performing Loans

There are numerous variables have been found to determine the level of country NPLs. The strand of literature on these variables revolved around, GDP, lending interest rate, foreign currency exchange rate, inflation rate, unemployment and stock price index. Other variables are public debt and money supply (see, for example, Beck *et al.*, 2015; Tanasković & Jandrić, 2015; Abid *et al.*, 2014; Louzis *et al.*, 2012; Nkusu, 2011). In this study, the variables of real GDP, inflation rate, lending interest rate, foreign exchange and unemployment rate are considered as the control variables owing to their explanatory power of NPLs and their ability to affect bank soundness.

i. Gross Domestic Product and Non-Performing Loans

The GDP as a determinant of NPLs has received a tremendous attention from researchers who conducted series of studies in both developed countries of Europe, US, Australia, and other developing countries such as Nigeria, Pakistan and Tunisia (see, for example, Makri *et al.*, 2014; Zaib *et al.*, 2014; Castro, 2013; Skarica, 2013; Louzis *et al.*, 2012; Park, 2012). The expectation is that a growing economy will increase the

overall financial stability and borrowers' income hence improved ability to pay back loans (Skarica,). Therefore, GDP is included in this study to control for the overall economic conditions of the OPEC member states. Further, an overall favourable economic condition increases the probability of borrowers to pay back loans while unfavourable economic conditions can have an adverse effect and increase NPLs (Park, 2012). Theoretically, GDP has been found to be the primary determinant of NPLs in the literature of life-cycle consumption model (Konstantakis *et al.*, 2016).

The study of Skarica (2013) was amongst seven Central and Eastern European (CEE) countries between 2007q3-2012q3. The result of the study reveals a statistically significant inverse relationship between GDP and NPLs. It suggests that the cause of high NPLs is the slowdown in the economy. Further, the study of Park (2012) was also on a group of countries as against single country which used a panel data of 76 from all over of the world which gives it wider generalisation ability. The investigation used aggregated data from 2002-2004 because obtaining micro level data on some of his variable like corruption is difficult due to its secrecy. However, the study relayed on multiple regressions and the result is also a negative relationship between GDP and NPLs which is not different from what other researchers contend in their study.

Love and Turk Ariss (2014) investigation was on a single country of Egypt spanning the period 1993-2013 which differ from those of Skarica (2013) and Park (2012) that used multi county data sets. Their study was on the effect of economic shocks and loan portfolio quality of Egyptian banks and sourced its data from Bankscope but used dynamic GMM estimator. The study reports a significant and inverse relationship

between GDP growth rate and loan portfolio quality. Furthermore, Makri *et al.* (2014) in a similar research used two different proxies for measuring GDP, that is, the annual percentage growth rate of GDP and public debt as a percentage of GDP in a study of fourteen Eurozone countries from 2000-2008 using exclusive aggregate data of banks. Their study suggests that an annual percentage growth rate of GDP denotes a significant negative relationship to NPLs and public debt as a percentage of GDP was found to be positively and significantly related to NPLs. The data used did not capture post-financial crises period of 2007/2008 and the situation would have drastically changed after 7 years away from now. It is also desirable to conduct a research that will capture pre-financial crisis, during-financial crisis and post-financial crisis periods so that a balanced view can be obtained but the study has left it out.

Kjosevski and Petkovski (2016) study is similar to the studies of Makri *et al.* (2014), Skarica (2013) and Park (2012) that used the data set of multi county. It is on the determinants of NPLs amongst the Baltic States for the period of 2005-2014. The study used the panel data from 27 banks of the Baltic States and the estimation relayed on OLS and GMM. The results indicate a strong and negative relationship between GDP and NPLs which is also consistent with the findings of previous studies. Additionally, Castro (2013) investigates the relationship between GDP and NPLs amongst Greece, Ireland, Portugal, Spain and Italy (GIPSI) over the period of 1997q1-2011q3. His study suggests that NPLs are significantly increased by a decrease in GDP growth. The study used Arellano-Bond (1991) estimator technique in its analysis and the finding established an indirect relationship between bank credit risks and GDP growth. His

study was restricted to just a segment of European Union (EU) countries that were most affected by the recent financial crisis.

Amuakwa-Mensah *et al.* (2017) study was a revisit to an earlier study conducted in Ghana to investigate the determinants of NPLs with a special focus on the effects of GFC of 2007-2009. This study and those of Abid *et al.* (2014) and Love and Turk Ariss (2014) used country level data although were all aggregated data of banks within their countries of studies. The study covers the period of 1997-2011 and employed two estimation tools of GMM and FMOLS. The finding of the study indicates that GDP has a strong but negative influence on NPLs. Further, Us (2016) investigates the impact of GFC on the NPLs in Turkish between 2002q4-2013q3 which is only a single country level study like that of Amuakwa-Mensah *et al.* The study used FE and RE in its estimations which report a statistically significant negative relationship between GDP and NPLs.

Another study that investigates the relationship of the variable of GDP and NPLs is that of Abid *et al.* (2014) which was done on Tunisia. A total of sixteen banks were considered from 2003-2012 using dynamic panel data. The object of the study was to investigate the potential effect of both macroeconomic and bank-specific variables on the quality of bank loans (NPLs). The result of the study suggests that an increase of 1 percentage point of GDP leads to a decrease of about 0.040297 in the NPL ratio, leading to a negative relationship between the variables. However, this study focused only on household loans as such generalisation cannot be made on other types of loan because

each type of loan has its peculiar risks characteristics. Therefore, an aggregated bank loan data would have provided the true position of banks credit quality.

Moreover, Louzis *et al.* (2012) investigate the effect of GDP on NPLs of 9 largest Greek banks from 2003q1-2009q3. The study was restricted to consumer, business and mortgage loans only. It used panel data and estimated the results using GMM approach due to its consistency and the assumption of serial independence of the residuals. The GDP among other variables was found to mainly affect consumer and business loans than the last category of loan under study, that is, mortgage loans which were less responsive. The use of aggregated loans data would have given their study a more robust result that could have proposed a better policy implication. Another single country but in a developing country study is that of Zaib *et al.* (2014) focuses on GDP growth rate and NPLs of eight Pakistani's banks within the period of 2003-2011. The result suggests an inverse relationship between GDP growth rate and NPLs.

Moreover, Ali and Daly (2010) in a similar research but using comparative evidence from a cross-country study of Australia and US investigates the effect of GDP on bank credit risk. A quarterly time series data for 15 years from 1995Q1 to 2009Q2 was used and the study adopted logit regression technique as an estimation model. Their investigation reveals that the US economy was more susceptible to adverse GDP shocks than the Australian economy ceteris paribus. Therefore, all the studies demonstrated that GDP has an inverse relationship with NPLs hence the rationale for choosing GDP as a control variable in the model of the study. The studies that use of single country data with relatively few banks cannot be said to have provided sufficient evidence that could

allow for generalisation of its finding compared to the multi county studies of Kjosevski and Petkovski (2016), Makri *et al.* (2014), Skarica (2013), Castro (2013) and Park (2012).

Following the proven countercyclical nature of GDP and the results of empirical studies on its effect on NPLs, it is expected that it will also have an effect on the bank asset of OPEC countries. Therefore, given the importance of overall economic condition to financial stability and its relevance to bank asset quality in OPEC countries this study will control for real GDP.

ii. Inflation Rate and Non-Performing Loans

The rate of inflation is assumed to have a significant influence on the general price level of goods and service in a particular economy which might also include the prices of bank loans (Idris & Nayan, 2016). This assumption might be true especially if expected inflation is not factored in the pricing of the loans (Demirgüç-Kunt & Detragiache, 1998). There are several previous studies that have conducted research on the effect of inflation on NPLs. Among the contributors to the relationship between inflation and NPLs variables are; Amuakwa-Mensah *et al.* (2017), Kjosevski and Petkovski (2016), Us (2016), Chaibi and Ftiti (2015), Ghosh (2015) and Tanasković and Jandrić (2015). Others are Makri *et al.* (2014), Endut *et al.*, (2013), Messai and Jouini (2013), Skarica (2013) and Adebola, Wan Yusoff and Dahalan (2011). According to Anastasiou *et al.* (2016a) inflation rate has the capacity of determining the extent of country's NPLs because it improves loan repayment abilities of the borrowing customers because it

makes loans cheaper. Also, Ghosh (2015) argues that theoretically inflation reduces the value of debt and hence makes the debt servicing easier.

Nonetheless, the inflation rate variable has demonstrated mixed results in its findings. For example, some studies reported statistically positive evidence such as those of Amuakwa-Mensah *et al.* (2017), Us (2016), Ghosh (2015), Abid *et al.* (2014), Messai and Jouini (2013), Skarica (2013) and Mileris (2012). On the contrary, others documented a negative relationship between inflation rate and NPLs which includes the studies of Chaibi and Ftiti (2015), Endut *et al.* (2013) and Adebola *et al.* (2011). There are studies that reported the insignificant effect of inflation rate on NPLs such as those of Anastasiou *et al.* (2016a) and Tanasković and Jandrić (2015).

Consequently, most of the studies reported a positive association between inflation rate and NPLs. For example, the study of Us (2016) investigates the impact of GFC on the NPLs in Turkish between 2002q4-2013q3. The study used FE and RE in its estimations which report a statistically significant positive relationship between inflation and NPLs. Further, Ghosh (2015) studies the relationship between state-level banking-industry specific as well as regional economic determinants of NPLs for all commercial banks and savings institutions across 50 US states and the District of Colombia spanning 1984-2013. The study employed both fixed effects and dynamic-GMM estimations and discovers that inflation significantly increases NPLs. As stated earlier Skarica (2013) study was on multi-country level of Central and Eastern European countries which used quarterly data between 2007q3-2012q3. It tests for the relationship between inflation rate and NPLs. It adopts Harmonised Index of Consumer Price (HICP) as a

measurement of inflation. The result indicates that an increase in Inflation causes NPLs to grow amongst seven Central and Eastern European countries.

Amuakwa-Mensah *et al.* (2017) study was a revisit to an earlier study conducted in Ghana to investigate the determinants of NPLs with a special focus on the effects of GFC of 2007-2009. The study covers the period of 1997-2011 and employed two estimation tools of GMM and FMOLS. The finding of the study indicates that inflation has a strong and positive influence on NPLs. Additionally, Messai and Jouini (2013) conducted a study of 135 European banks of Greece, Italy and Spain from 2006 to 2011 with the aim of investigating the determinants of NPLs. The study among other determinant concluded that there is a strong positive relationship between inflation rate and NPLs. This finding has confirmed the position Mileris (2012) on the same issue. Moreover, Abid *et al.* (2014) in a study of the macroeconomic and bank-specific determinants of household's NPLs in Tunisia used a quarterly dynamic panel date of 16 banks from 2003Q1-2012Q4 with 768 banks-quarter observations. The result showed that a decline in the inflation rate has a positive impact on the financial conditions of households and subsequently on the repayment of loans, which further explains the positive relationship between inflation and NPLs.

Moreover, Mileris (2012) used a panel data of 22 EU countries to investigate the effect of inflation on loan portfolio credit risk from 2008-2010. The study also used other variables such as; real GDP growth rate, interest rate, money supply and industrial production index. His finding indicates that it is possible to predict the changes of NPLs in banks according to the changes in a country's macroeconomics. The research has also

confirmed that the amount of NPLs in banks highly depends on macroeconomic changes in a country.

However, negative relationships between inflation and NPLs were reported by some studies such as those of Chaibi and Ftiti (2015), Endut *et al.* (2013) and Adebola *et al.* (2011). For example, the study of Endut *et al.* reveals that inflation has significant negative effect on NPLs. This was stated in the investigation of the implication of macroeconomics on NPLs in 12 countries of Asian Pacific Region ranging 2000-2008 period. The estimation of the results was done by using the random effect method. Also, Chaibi and Ftiti conducted a study of the determinants of credit risk, that is, NPLs in both France and Germany between 2005 to 2011. The dynamic unbalance panel data of the two countries were estimated using GMM estimator. The data on macroeconomic variables were collected from International Financial Statistics (IFS) database of IMF. An inflation rate was one of the macroeconomic variables tested in the study and in the result, there is a compelling evidence to conclude that there is a statistically significant but negative relationship with NPLs for Germany and no effect for France. Furthermore, Adebola *et al.* also investigate the determinants of NPLs in the Islamic banking of Malaysia by employing a monthly data for the period between 2007m1-2009m12. The study used an ARDL approach for the estimation of the results which show that produce price index used as a proxy for inflation was found to have a negative but significant impact on NPLs.

Additionally, there were studies that did not find a significant relationship between inflation and NPLs among which include, Anastasiou *et al.* (2016a) and Tanasković and

Jandrić (2015) while a mixed result was provided by Kjosevski and Petkovski (2016). The study of Tanasković and Jandrić reaffirmed the finding of Chaibi and Ftiti (2015) at least for France, on the effect of inflation on NPLs. This was revealed in an investigation of the determinants of NPLs in Central and Eastern and South-Eastern Europe (CESEE) economies spanning the period of 2006-2013. This was estimated by employing the traditional method of FE and RE tools. The result indicates that inflation rate is statistically insignificant in the sampled countries.

Also, the position of Tanasković and Jandrić (2015) is also reaffirmed in a current study of Anastasiou *et al.* who also found a negative but insignificant coefficient between inflation rate and NPLs. This is the result of a study of the Euro-area banking system over the period of 1990q1-2015q2. The study employed both static and dynamic frameworks. However, the study relied basically on GMM estimation. On the contrary, a mixed result was revealed by Kjosevski and Petkovski who studied the determinants of NPLs amongst the Baltic States for the period 2005-2014. The study used the panel data from 27 banks of the Baltic States and estimation relayed on OLS and GMM. The results indicate a positive relationship between inflation and NPLs on the static model while a negative result was obtained for the dynamic model. This means that in the long run, high inflation reduces the level of NPLs amongst the countries under study.

Although this variable has demonstrated mixed results in its findings were some studies reported statistically positive evidence, others documented negative relationship however others reported insignificant relationships between inflation rate and NPLs. Nevertheless, following the theoretical arguments of the influence of inflation on the

general purchasing power of the all economic units and the mixed results of the prior studies on inflation and NPLs as well as the prevalence of high inflation rate amongst the OPEC member state this study controls for the variable.

iii. Interest Rate and Non-Performing Loans

The interest rate is a major factor in the banking system because it is the driving force of banks deposits and loans hence an important variable in analysing loan performance of banks (Castro, 2013). Additionally, it is a crucial factor in bank lending because it serves as the price of banks' funds paid by consumption or investment economic units that have borrowed such funds. The relationship of interest rate and NPLs has attracted the highest consideration among researchers as well as controversies thereby rendering finding inconclusive (Idris & Nayan, 2016b). However, the findings are inconclusive giving the fact that the studies documented mixed results. Notable among these researchers are Abid *et al.* (2014), Love and Turk Ariss (2014), Zaib *et al.* (2014) and Castro (2013). Others are Louzis *et al.* (2012), Mileris (2012), Adebola *et al.* (2011), Glen & Mondragón-Vélez (2011), Goel and Hasan (2011), Pesola (2011), Vogiazas and Nikolaidou (2011), Ali and Daly (2010) and Bellotti and Crook (2009).

The studies that provided positive significant relationship are those of Beck *et al.* (2015), Abid *et al.* (2014), Love and Turk Ariss (2014), Zaib *et al.* (2014), Castro (2013), Louzis *et al.* (2012) and Adebola *et al.* (2011). For instance, Castro has established a positive relationship between interest rate and credit risks. The result reveals that an increase in 1 unit of interest rate will lead to a higher increase in credit risk (NPLs). His position is consistent with the position of Louzis *et al.* who also established a positive significant

relationship between interest and NPLs but which mostly affects consumer loan and business loan than a mortgage loan. Their position is not different from that Love and Turk Ariss who investigate the effect of economic shocks and loan portfolio quality of Egyptian banks in the period 1993-2013 found a significant and positive relationship between lending rate and loan portfolio quality

Futhermore, Abid *et al.* (2014) observed that household's NPLs are sensitive positively to changes in real lending rate. Pesola (2011) discovered that strong macroeconomic shocks such as interest rate shocks affect loan losses when banks are exposed to such shocks. In addition, Beck *et al.* (2015) reveals that an increase in lending interest rates tends to increase NPLs. Also, Adebola *et al.* (2011) investigated the determinants of NPLs in the Islamic banking of Malaysia by employing a monthly data for the period between 2007m1-2009m12. The study used an ARDL approach for the estimation of the results which show that average lending rate has a significant and positive long run effect on NPLs. Bellotti and Crook (2009) found that a probability of default is affected by variables such as interest rate and unemployment. Their finding signifies a direct relationship between the increase of interest rate and the probability of default because it will affect disposable incomes of borrowing customers.

Zaib *et al.* (2014) content that a nominal lending interest rate has a positive relationship with NPLs because an increase in the interest rate leads to higher costs of borrowing. They argued further that a higher cost of borrowing can only be relevant for loans if you are dealing with new loans not when the issue at stake is loan repayment. However, the

cost of repayment can be said to increase if there is a positive variation of lending interest rate which might create NPLs.

However, there are studies that differed from those studies that reported positive associations between interest rate and NPLs. For example, the study of Vogiazas and Nikolaidou (2011) of the Romanian banking system using a monthly data from December 2001 to November 2010 on the determinants of NPLs show a different result. The variable of interest rate was not found to possess explanatory power when added to the baseline model. The study concludes that NPLs are dependent on macroeconomic variables. The study conducted by Ali and Daly (2010) also found in the short-term an insignificant but negative relationship between interest rate and credit risks (NPLs). Additionally, Goel and Hasan (2011) in consistency with the study of Ali and Daly suggests an inverse relationship between lending (interest) rate and NPLs. Their study reveals that loan defaults are lower in economies with higher lending (interest) rates than in countries with lower interest rates.

There are inconsistencies of the findings of the above studies where all researchers agree that interest/lending rate is directly related to NPLs except the studies of Goel and Hasan (2011) and Ali and Daly (2010) that suggest an insignificant inverse relationship between the variables of interest rate and NPLs. Therefore, this study adopts interest rate as a control variable. The role of lending interest rate in the banking business of deposit taking and lending has made it imperative for modelling the determinants of credit risk. Following the mixed findings of the previous studies and the theoretical opinion that lending interest rate determines the level of bank asset quality, this study

has also controlled for its effect in modelling the relationship between systematic risk and bank asset quality.

iv. Unemployment Rate and Non-Performing Loans

Unemployment rate variable has been used by a significant number of studies probably due to its connection to business activities of economies which impact on demand of goods and services, and any possible rise of unemployment reduces households' disposable income and their ability to repay their debts (Quagliariello, 2007). The assumption here is that gainful employment accords various economic units' opportunities to not only consume but also to save and invest the surplus in banks (Idris & Nayan, 2016). Furthermore, Konstantakis *et al.* (2016), argues that theoretically unemployment has also been found to be the primary determinant of NPLs in the literature of life-cycle consumption model. However, there are quite a few numbers of researches that investigated the relationship between unemployment and NPLs. Some of the few studies are those of Anastasiou *et al.* (2016a), Kjosevski and Petkovski, (2016), Konstantakis *et al.* (2016), Akinlo and Emmanuel (2014), Filip, (2014), Castro (2013), Skarica (2013) and Louzis *et al.* (2012). Unlike the previous control, variables examined the relationship between unemployment and NPLs has been most consistent because earlier studies mainly found a direct relationship between the variables except the studies of Akinlo and Emmanuel (2014) and Filip (2014).

The studies that reported positive relationship are those of Anastasiou *et al.* (2016a), Kjosevski and Petkovski, (2016), Konstantakis *et al.* (2016), Castro (2013), Skarica (2013) and Louzis *et al.* (2012). For instance, the study of Skarica using FE methods

reports that an unemployment rate has a positive relationship with NPLs in the study conducted amongst seven Central and Eastern European (CEE) countries between 2007q3-2012q3. Further, Kjosevski and Petkovski study that was on the determinants of NPLs amongst Baltic states between 2005-2014 supported the work of Skarica by indicating that the relationship between unemployment and NPLs is significantly positive. It should be noted that the two studies share the same characteristics in terms of panel data of several countries specifically the panel data from 27 banks of the Baltic States. However, the latter study used alternative methods of and estimation relayed on OLS and GMM.

Additionally, the result of the findings of Anastasiou *et al.* (2016a) also corroborated those of Kjosevski and Petkovski (2016) and Skarica (2013). They investigated the relationship between unemployment and NPLs amongst Euro-area countries for the period covering between 1990q1 to 2015q2 using the GMM estimation method and found a statistically significant and positive relationship between the dependent and the independent variables. Similarly, Konstantakis *et al.* (2016) used quarterly data and reported a strong positive relationship between unemployment rate and level of the NPLs in a study of Greece economy using an aggregate quarterly data, in the time period 2001q4-2015q1. The data was estimated using real time Vector Autoregressive (VAR)-Vector Error Correction (VEC) model. The same position of is discovered by Anastasiou *et al.* (2016b) in a study of NPLs in Euro-area. It covers 2003q1-2013q3 and the data was collected from Bankscope database provided by bank DataStream professional and was estimated using Fully Modified OLS (FMOLS) and panel cointegrated VAR.

Castro (2013) examined the relationship between unemployment rate and credit risks in GIPSI countries and concluded that credit risk increases when unemployment rate increases, that is a positive relationship. The study concentrated only on those countries that were heavily impacted by the recent financial crisis thereby excluding the remaining EU countries with which the results could have been different. More so, Messai and Jouini (2013) study reveal a positive effect of unemployment on NPLs in an investigation of the determinants amongst Greece, Italy and Spain. The study employed a sample of a total of 135 European banks in the said three countries for the period covering 2006-2011.

In a similar study conducted by Louzis *et al.* (2012) among 9 largest Greece banks where the relationship between unemployment rate and NPLs was investigated from 2003q3-2009q3. They used a dynamic panel data method in their investigations and the result found unemployment rate to have a strong positive effect on NPLs. However, their study did not make use of the total bank loan portfolio but a partial portion of it which includes consumer, business, and mortgage loans. Additionally, the study did not significantly cover the post-financial crisis period that would have allowed for comparative analysis of the relationship for a complete business cycle.

However, the insignificant relationship was reported in the literature by studies such as; Akinlo and Emmanuel (2014) and Filip (2014). For example, the study Akinlo and Emmanuel examined the relationship between unemployment rate and NPLs among Nigerian banks. The result revealed a positive but an insignificant relationship between

unemployment rate and NPLs. Their study used time-series data and VECM. However, the use of dynamic panel data would have accounted for the dynamism of NPLs and probably could have given more robust and better results to their study. Furthermore, Filip study indicates that unemployment is less significant in influencing NPLs. This was found in his study of Romanian banking system the period of 2001-2012. The data of the investigation was estimated using OLS regression.

From the foregoing studies, all have indicated positive effects of the unemployment rate and credit risk. Nonetheless, only the studies of Akinlo and Emmanuel (2014) and Filip (2014) that could not obtain a significant outcome from the relationship between the variables. This notwithstanding the relevance of unemployment rate as a determinant of bank asset quality has been fascinating due to its influence on economic units' cash-flows generating abilities upon which banks lend. Hence, following the findings of the above previous studies that reported the significant impact of the unemployment rate on NPLs and the imperative role of employment in generating cash flow, this study has included it as a control variable.

v. Foreign Exchange Rate and Non-Performing Loans

The relevance of exchange rate on bank loans becomes pronounced in three different ways, that is, foreign currency denominated loans, international trade and a highly import or export dependent economy (Idris & Nayan, 2016). Therefore, the foreign exchange rate becomes relevant to this study because OPEC countries are oil export dependent economies as stated earlier. The major contributors to the literature of this variable are Beck *et al.* (2015), Tanasković and Jandrić (2015), Akinlo and Emmanuel

(2014), Alhassan *et al.* (2014) and Castro (2013). A currency appreciation weakens debt-servicing capacity of oriented firms however it might also increase the debt repayment of abilities of certain thereby influencing the NPLs position (see, for example, Skarica, 2013). However, Amuakwa-Mensah *et al.,* (2017) stress that for loans that are denominated in foreign currencies, a depreciation in the currency will worsen the plight of the as such are likely to default in their loans repayments and vice versa hence affecting the NPLs positions.

The previous literature on the association between exchange rate and NPLs was found to be inconclusive with some reporting inverse relationship. For example, the study of Alhassan *et al.* investigated the assets quality in crisis period of Ghanaian banks between 2005 and 2010. They relied on panel data set and OLS methods of analysis. The findings indicate that exchange rate depreciation negatively impacts bank asset quality. This is consistent with the study of Yurdakul (2014) which suggests that deterioration in the foreign exchange rate increases bank credit risks. This finding is an outcome of a study of Turkish banks spanning 1998-2012. Consistent with this finding, the study of Amuakwa-Mensah *et al.* (2017) which was conducted in Ghana to investigate the determinants of NPLs with a special focus on the effects of GFC of 2007-2009. The study covers the period of 1997-2011 and employed two estimation tools of GMM and FMOLS. The finding of the study indicates that real exchange rate has a strong but negative influence on NPLs.

Additionally, Beck *et al.* (2015) used dynamic panel data of 73 countries global sample to investigate the key determinants of NPLs. The study examined the effects of GDP,

lending interest rate, share prices and foreign exchange rate among other variables on NPLs. Their suggests that a depreciation (appreciation of foreign currency) of the domestic currency would lead to an increase in NPLs ratios. They concluded that direction of the effect of the foreign exchange rate on NPLs depends on the extent of foreign exchange lending to unhedged borrowers particularly in countries with regulated exchange rate policies. The same result was obtained by Skarica (2013) which indicates that exchange rate depreciation leads to growth in NPLs amongst seven Central and Eastern European countries between 2007q3-2012q3.

Nevertheless, Castro (2013) in his study of the determinants of credit risks among GIPSI countries between1997q1-2011q3 found a positive relationship between credit risks and exchange rate. This positive association between the dependent variable and exchange rate is strengthened by Akinlo and Emmanuel (2014) study of the determinants of NPLs in Nigeria using a time-series data set 1980-2011 and Vector Error Correction Model (VECM). Their investigation found that exchange rate exerts a positive influence on NPLs in Nigeria. Moreover, the study of Tanasković and Jandrić (2015) corroborated the finding of Castro on the influence of foreign exchange rate on NPLs. The outcome of their finding suggests that the foreign currency loans ratio and the level of exchange rate are positively related to the increase of NPL ratio and they are statistically significant.

In a contrary study, an insignificant relationship between exchange rate and NPLs was reported by the study of Love and Turk Ariss (2014). Their study investigated the effect of economic shocks and loan portfolio quality of Egyptian banks in the period 1993-2013 found an insignificant relationship between exchange rate and loan portfolio

quality. Nonetheless, this study is amongst the profoundly oil export dependent countries where foreign currency becomes an important issue it, therefore, becomes relevant in influencing the level of NPLs hence the need to control for the foreign exchange rate.

Apart from these afore mentioned control variables in this subsection which are found by several studies to have an influence on NPLs, there are also systemic risk factors such as oil price changes, corruption, political instability and environmental risks that can as well affect bank asset quality. As mentioned earlier there is a dearth of literature on the influence of systemic risks on NPLs. Nevertheless, the variables of interest of this study have been studied in relationships to other economic fundamentals but there are limited researches on how they affect NPLs.

The above reviewed literatures have demonstrated the concentration of previous studies on the effects of variables of GDP, inflation, interest rate, exchange rate and unemployment rate on NPLs. Nonetheless, findings are far from being conclusive as there is sufficient evidence of studies that reveal significant positive relationships while others show significant negative relationships as well as those that indicate no significant relations with NPLs. Most of the previous literature on the systemic risks factors of oil price changes, corruption, political instability and environmental risks are related to their effects on other macroeconomic activities as well as general finance and banking. Furthermore, to the best of knowledge, there are very few studies concerning the effects of systemic risks on NPLs. This has created huge gaps in the literature of determinants of NPLs which this study contributes in filling.

3.3 Gaps in the Literature

This section is created based on the reviewed related literature in the previous sections, therefore, the following gaps have been found in the literature:

The first gap identified is the existence of a practical problem of high level of non-performing in the world. The average global NPLs position reveals that it is persistent and on the rise. The situation is more critical amongst OPEC member countries with an average NPLs ratio at 8% which is also persistent and on the rise reaching the point banking crisis. The international benchmark for NPLs ratio indicating a point banking crisis is any figure in excess of 10 percent (see, for example, Demirgüç-Kunt & Detragiache, 1998).

Second, the literature on the determinants of NPLs concentrated on factors such as GDP, inflation, exchange rate, interest rate and unemployment. Additionally, the findings of these variables are far from being conclusive where contradictions featured significantly in their results. For example, the findings on the impact of interest rate on NPLs is in two categories; the studies of Beck *et al.* (2015), Zaib *et al.* (2014), Castro (2013) and Louzis *et al.* (2012) found a statistically significant positive relationship with NPLs. Whereas negative findings are reported by Goel and Hasan (2011) and Ali and Daly (2010).

This inconclusiveness in findings also applies to the inflation rate. The studies on the effect of inflation rate on NPLs encountered the same setback in terms of inconclusive findings. The first category of the studies reported a significant negative relationship

between the variables as reported by Chaibi and Ftiti (2015) and Endut *et al*. (2013). On the contrary, the findings of those that reported a positive relationship are exemplified by the research work of Ghosh (2015), Abid *et al.* (2014), Messai and Jouini (2013) and Mileris (2012). However, insignificant relationships are revealed by Anastasiou *et al.* (2016a) and Tanasković and Jandrić (2015).

Similarly, a contradictory finding was reported on the influence of exchange rate on NPLs are two categories; the studies of Beck *et al.* (2015), Tanasković and Jandrić, (2015), Akinlo and Emmanuel (2014) and Castro (2013) found a statistically significant positive relationship with NPLs. Whereas negative findings are reported by Alhassan *et al.* (2014) and Yurdakul (2014). Furthermore, the studies on the effect of unemployment on NPLs encountered the same setback in terms of inconclusive findings. The first category of the studies reports the insignificant relationship between the variables, this is reported in Akinlo and Emmanuel (2014) and Filip (2014). However, the findings of those that reported significant positive relationship are exemplified by the research work of Anastasiou *et al.* (2016a, 2016b), Konstantakis *et al.* (2016), Castro (2013) and Louzis *et al.* (2012).

Third, as stated earlier virtually most of the previous literature concentrated on variables such as; GDP, inflation rate, exchange rate, interest rate and unemployment rate leaving out other sensitive factors in their modelling. Apart from these variables, there are other factors which can as well influence NPLs. Although, systemic risks of oil price changes, corruption, political instability and environmental risk factors have been found to be relevant in economics and finance related areas, however, they are not adequately being

used in the field of banking, especially as determinants of NPLs. The most related areas that the effects of systemic risk variables are investigated include economic growth and development, property right, bank performance, bank compliance, savings, bank profitability, country credit rating and sovereign debt expected default frequencies.

The fourth, gap in the literature is the contextual gap. Previous studies especially those that employed data of multi-countries reached their conclusion of the findings irrespective of their heterogeneous characteristics. Moreover, countries were studied based on their geographical proximities, socio-political or economic groupings rather than common products. Therefore, countries that share distinct features of the same product (crude oil) such as the developing countries and emerging economies of OPEC member states are better studied distinctively.

The last identified gap in the literature is the methodological gap. Most of the previous studies were based on static modelling without taking into cognisance of the dynamic nature of NPLs into consideration. Mainly, they employed a traditional static panel of Pooled Ordinary Least Square (OLS), Fixed Effect (FE) and Random Effect (RE) model and a few studies used Generalised Methods of Moments (GMM) in their estimations. Also, the very few studies that incorporated the dynamism in their models relied on GMM estimator without meeting its basic assumptions. Furthermore, the use of GMM estimator is a commendable step in the study of the determinant of NPLs but there is no evidence that Anastasiou *et al.* did observe the conventions of adopting the GMM estimator which requires averaging of the time span of the study into non-overlapping periods (see, for example, Slesman, Baharumshah, & Ra'ees 2015; Slesman,

Baharumshah, & Wohar, 2015; Law & Tan, 2012; Law & Habibullah, 2009). The PMG/ARDL would have been a more robust tool giving its capacity to handle dynamic panel data with t greater than i. Furthermore, most of the previous studies were constrained by outdated data upon which the conclusions of their findings were reached.

In summary, the above identified gaps in the literature have offered this study the motivation to contribute in filling the gaps by examining the effect of oil price changes on NPLs and by investigating the effect of corruption on NPLs in OPEC member states. Additionally, by examining the effect of political instability on NPLs as well as by the determination of the effect of environmental risks on NPLs in OPEC member countries by employing updated data and using alternative methodologies.

3.4 Chapter Summary

The literature review has shown that there are several studies on the determinants of NPLs. The findings of the studies are far from being conclusive and very little attention has been given to the study of the effects systemic risks of oil price changes, corruption, political instability and environmental risks on NPLs thereby creating gaps in the literature. However, the findings of the effects of these systemic risks in related studies of economic activities and general finance suggest that they can help in understanding the behaviour of NPLs. The chapter concludes by summarising the gaps in the literature. The fourth chapter discusses the research design, type of data, population, methods, and techniques of data collection and tool of analysis.

CHAPTER FOUR

RESEARCH METHODOLOGY

4.1 Introduction

This chapter is on the theoretical framework and the methodology adopted in answering the research questions and achieving the objectives of the study. Generally, the chapter presents the research methodology and gives an elaboration on the type and sources of data that were used by the study, the countries of the study, unit of analysis, and the statistical tools employed in the empirical analysis. Furthermore, it discusses the theoretical framework of the study that is used in formulating the model which explains the relationship between NPLs and systemic risks variables of oil price changes, corruption, political instability and environmental risks. In formulating the model the study adopted the ideas of financial intermediation theory of banking, systemic risks theory and credit-default theory and followed the works of Beck *et al.* (2015), Castro (2013) and Ghosh (2015).

Thus, the next section, which is 4.2 of the chapter discusses the theoretical framework. Sections 4.3, 4.4 and 4.5 deal with research framework, model specification and measurement of variables respectively. Additionally, data description, population and sample of the study as well as a unit of analysis are discussed in sections 4.6, 4.7 and 4.8 accordingly. Furthermore, sections 4.9 and 4.10 revolve around research hypotheses and tools of technical analysis respectively. The last section which is 4.11 summarises the chapter.

4.2 Conceptual Framework

The conceptual framework of this study is based on financial intermediation theory of banking, systemic risks theory and credit-default theory which have been discussed under the underpinning theory in chapter three. There are quite a several theories that can be used in underpinning the study but they are limited to a variable or set of variables. (see, for example, Batabyal & Beladi, 2001; Casti, 1992; Macrae, 1982). However, financial intermediation theory of banking, the systemic risks theory and the credit-default theory are most fit because they have more explanatory power and do incorporate the entire variables of interest in the model of this study (see, for example, Werner, 2015; Collier & Skees, 2013; Haldane & May, 2011; Bellotti & Crook, 2009; Sy, 2007; Berger & DeYoung, 1997)

The basic indices of macroeconomic activities such as GDP, inflation, exchange rate, interest rate and unemployment have been identified as primary determinants of NPLs in the theoretical literature. For example, Konstantakis *et al.* (2016), Beck *et al.* (2015) and Ghosh (2015) formulate models in which these factors lead to deterioration of loan qualities as a result of falling GDP, increased unemployment, inflation and interest rate and devaluation of the local currency.

The investigation of the relationship between systemic risks factors of oil price changes, corruption, political instability and environmental risks and NPLs is limited therefore making this study imperative. The inclusion of these variables of interest in the model of determinants of NPLs is guided by the underlining theories of the study as well as the empirical literature. This literature mainly connects the variables of interest and

economic activities other than NPLs. Consequently, this study investigates the effects of oil price, corruption, political instability and environmental risks on NPLs, to capture prevailing deteriorated loan quality situation amongst OPEC member countries within the examined period and how that affects the NPLs. This has led to the development of research framework for this study.

4.3 Research Framework

Based on the of the underpinning theories of financial intermediation theory of banking, systemic risks theory and credit-default theory as well as the review of previous studies a research framework was developed for the study. This research framework in Figure 4.1 below consists of dependent variable and independent variables. There are number of models developed by previous researchers on the relationship between NPLs and its determinants as indicated under literature review chapter (see, for example, Beck *et al.*, 2015; Ghosh, 2015; Tanasković & Jandrić, 2015; Abid *et al.*, 2014; Makri *et al.*, 2014; Castro, 2013; Louzis *et al.*, 2012).

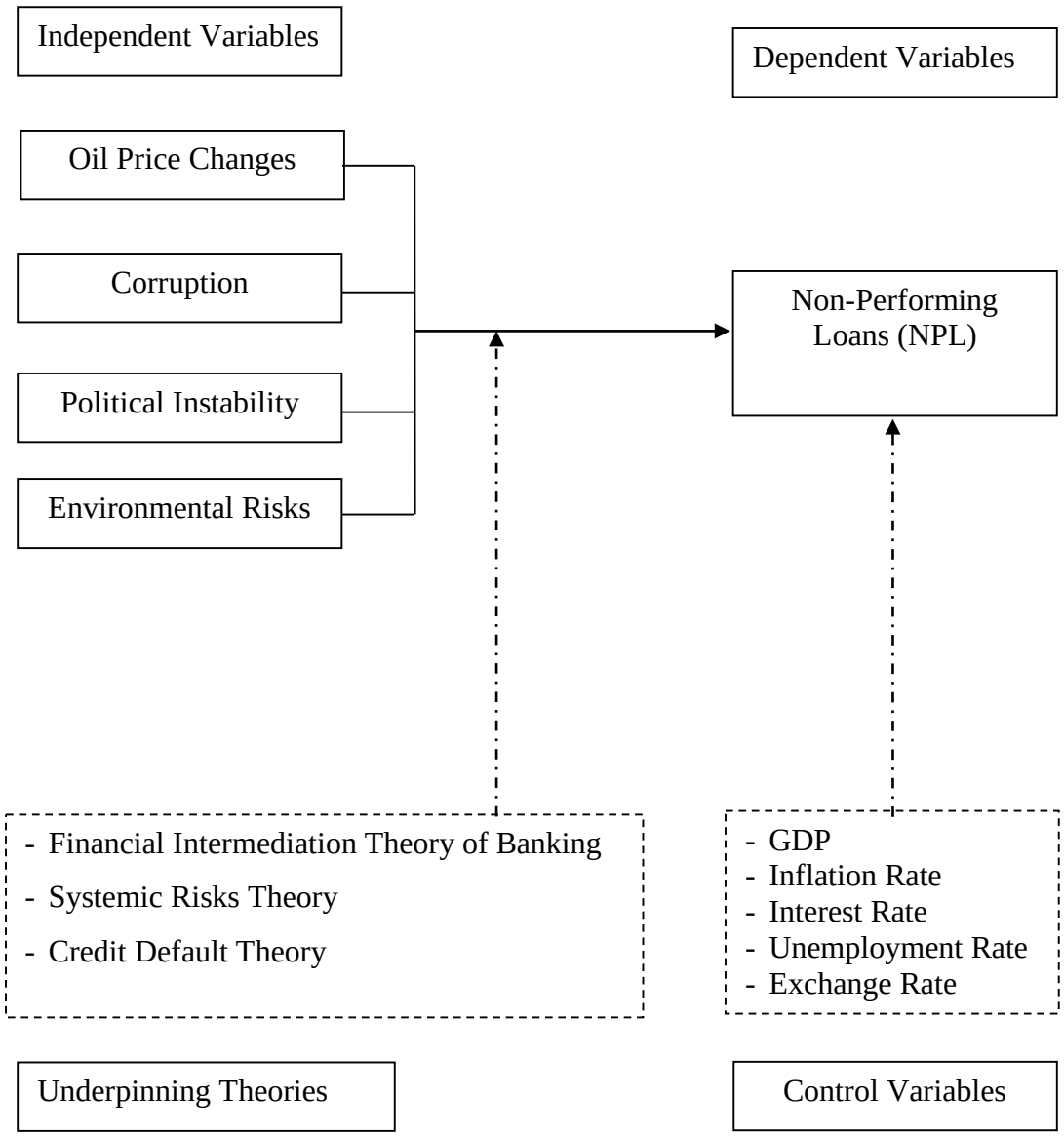

Figure 4.1
Research Framework

However, for the purpose of formulating a model, this study follows the works of Beck *et al.* (2015), Ghosh (2015) and Castro (2013) with modification. The dependent variable is represented by NPLs and the explanatory variables consist of oil price changes, corruption, political instability and environment risks. Additionally, the study included control variables of GDP, inflation rate, interest rate, exchange rate and

unemployment rate. The justification for the inclusion of the control variables is to allow for the model of the study to be well specified.

Previous related studies have demonstrated the abilities of GDP, inflation rate, interest rate, exchange rate and the unemployment rate to determine NPLs. The literature suggests that GDP has an inverse relationship with NPLs while inflation rate and unemployment rate have mixed effects on NPLs as well as divergent result for interest rate in relation to the NPLs (see, for example, Beck *et al.*, 2015; Ghosh, 2015; Tanasković & Jandrić, 2015; Filip, 2014; Castro, 2013; Endut *et al.*, 2013; Goel & Hasan, 2011). Additionally, a favourable exchange rate in relation to foreign currencies can improve loan performance while a negative change in the exchange rate can create loan quality deterioration (see, for example, Beck *et al.,* 2015; Tanasković & Jandrić, 2015; Alhassan *et al.*, 2014; Castro, 2013).

The inclusion of systemic risk factors of oil price changes, corruption, political instability and environmental risks factors as variables affecting NPLs is guided by theoretical arguments and empirical literature on the connection between the former and NPLs as well as finance and economic activities bank performance. Furthermore, this study is based on the underpinning theories of the financial intermediation theory of banking, the theory of systemic risks and credit-default theory as well as compelling empirical evidence that the independent variables have to some extent affected NPLs and other related economic activities in different fields of study. Hence the logical assumption that they have the tendencies of affecting NPLs. Consequently, based on the findings of researchers such as; Al-Khazali and Mirzaei (2017), Rehman *et al.* (2016),

Park (2012) and Collier *et al.* (2011) the study investigates the effect of oil price changes (OP), Corruption (CORR), political instability (PIS) and environmental risks (ER) on NPLs (NPLs), to determine the effects of systemic risks factors on OPEC member states' NPLs over the period of 1996-2015.

4.4 Research Hypotheses Development

The development of hypotheses of this study is basically based on the underlying theories framework and previous empirical literature reviewed under various sections. According to financial intermediation theory of banking the banking environment is characterised by a vague risk transformation process, Baltensperger (1980) and mismatch of maturities Dewatripont *et al.* (2010) which adversely interrupt the cash flow position of economic units and their ability to pay back lends as at when due thereby resulting in credit risks. Further, the systemic risks theory presumes that the banking business environment is made up of systematic risks such as price instability, political instability and environmental risks such as natural disasters (see, for example, Love & Turk Ariss, 2014; Collier & Skees, 2013; Collier, 2011; Haldane & May, 2011; Cochrane, 2004; Berger & DeYoung, 1997). Additionally, the credit-default theory denotes the tendencies of the systematic risks to interrupt with the borrowers' cash flows to the point of delinquencies and/or insolvencies which lead to credit default (Sy, 2007; Crook & Banasik, 2005; Pyle, 1997; Bernanke & Gertler, 1989).

i. Oil Price Changes and Non-Performing Loans

There are few number of previous studies that investigated the relationship between oil price changes and NPLs, such as; Al-Khazali and Mirzaei (2017) and Miyajima (2016).

Nevertheless, this study also relies on the wider finance and economics literature in developing its theoretical and empirical foundations. To that effect, the wider empirical evidence are depended upon in formulation the hypothesis on the relationship between oil price changes and credit risks amongst OPEC member states.

Furthermore, the countries that made up of OPEC are oil dependent economies upon which they rely upon for the external reserves. Oil is central to these economies and various governments depend on it as a source of revenue and it determines their spending. It is a pivotal point upon which other economic activities revolve as highlighted in chapter two of this study. More specifically, the significant negative effect of oil price changes and NPLs are documented by the studies of Al-Khazali and Mirzaei (2017) and Miyajima (2016).

Consequently, based on the foregoing detects of the underlining theories of financial intermediation theory of banking, systemic risks theory and credit-default theory (Haldane & May, 2011; Dewatripont *et al.,* 2010; Sy, 2007; Cochrane, 2004; Berger & DeYoung, 1997) and the empirical findings of previous studies on the associations between oil price changes and NPLs as well as other financial and economic activities this study expects oil price changes to affect NPLs amongst the OPEC countries. This study expects that a positive change in oil price will improve the financial net worth of entities in the OPEC member countries thereby improving the chances of loan repayment and vice versa hence this can cause the negative relationship between the variables.

Therefore, this study assumes that an increase in oil price per barrel will lead to increase in the entities' cash flows and increased net worth as well as the improved capacity of to spend, save and repay back loans. Thus, following the findings of the studies of Al-Khazali and Mirzaei (2017) and Miyajima (2016) on the association between the variables this study predicts an effect of oil price changes on NPLs in OPEC countries, hence the relationship is hypothesised as follows:

H_1*: *Oil price changes significantly affect NPLs in OPEC countries.

ii. Corruption and Non-Performing Loans

Moreover, there are limited studies on the relationship between corruption and NPLs, such as; Park (2012) and Goel and Hasan (2011). The literature on this association of variables is still in its infancy, therefore, this study relies on the underlining theories of financial intermediation theory of banking, systemic risk theory and credit-default theory (Haldane & May, 2011; Dewatripont *et al.,* 2010; Sy, 2007; Cochrane, 2004; Berger & DeYoung, 1997) as well as the wider literature of finance and economics in developing its theoretical foundation and hypotheses. Previous wider literatures have demonstrated the both positive and negative association of corruption and economic fundamentals. Nevertheless, the studies of Park (2012) and Goel and Hasan (2011) reveal positive effects of corruption and NPLs.

Furthermore, based on the presumption of the theories of this study as stipulated under the underpinning theories sub-sections the variable of corruption is expected to lead to the approval of inappropriate loans, insider credits and/or insider related credits. A

significant country-wide corruption will weaken corporate governance on the part of the banks as well as compromised regulatory authorities which will increase the chances of increased NPLs (Goel and Hasan, 2011). Thus, this can make loans recovery exercises extremely difficult as the law enforcement agencies and the judiciary will be part of the problem instead of solutions.

Therefore, consistent with the studies of Park (2012) and Goel and Hasan (2011) expects a significant effect of corruption on NPLs amongst the member countries of OPEC and the underpinning theories postulations on the relationship between the variables of interest and NPLs; the relationship is hypothesised as follows:

H_2*: *Corruption significantly affects NPLs in OPEC countries.

iii. Political Instability and Non-Performing Loans

Additionally, intense political instability ignites interruptions into the society in general and economic activities in particular. Banks do create loans on the premises that the political atmosphere will be conducive throughout the loans periods which will ensure stable cash flows to the borrowing entities and the consumers of final products. As stipulated under the underpinning theories of financial intermediation theory of banking, systemic risk theory and credit-default theory (see, for example, Sy, 2007; Collier et al., 2011; Berger & DeYoung, 1997; Baltensperger, 1980) major and/or prolonged political instabilities in form of civil conflicts, unstable governments, terrorism and similar incidences can interfere with not only the production processes of firms but also the consumptions of the final products hence the cash flow of economic units.

Additionally, as it has been suggested by previous empirical studies that there are evidence of an association between political instability and NPLs such as; the study of Rehman *et al.* (2016). Furthermore, the wider literature indicate relationship between political instability and finance and economics activities. Nonetheless, Rehman *et al.* study's finding reveals that democratic (civilian regime) political system, that is, the stable political system leads to higher NPLs.

Nonetheless, theory and most previous finding indicate a positive association between political instability and economic adversity which can also affect government revenues and spending as well as have devastating consequences on the cash flows of borrowing customers hence adversely affecting their net worth and their ability to pay back loans as at when due. Therefore, following the work of Rehman *et al.* (2016), this study anticipates a significant relationship between political instability and NPLs in OPEC member countries. Thus, the relationships hypothesised as follows:

H_3*: *Political instability significantly affects NPLs in OPEC countries.

iv. Environmental Risks and Non-Performing Loans

Prior empirical literature and established theories have demonstrated a significant relationship between environmental risks and NPLs, as well as wider finance and economics factors (Klomp, 2014; Collier et al., 2011; Berger and DeYoung, 1997). Likewise, a more volatile systemic risk factor is that of the environmental risks which this study has conceived it to be the major natural and technological disasters. Based on theory disaster in form of catastrophe can quickly and easily destroy lives, critical infrastructures, sources of income and/or livelihood and by extension it destroys sources

of revenue and/or income, cripple production and consumptions of not only private entities but also governments (Klomp, 2014; Collier *et al.,* 2011).

The underpinning theories of financial intermediation theory of banking, credit-default theory and systemic risks theory postulate the influence of environmental risks on bank asset quality theory (see, for example, Sy, 2007; Collier et al., 2011; Berger & DeYoung, 1997; Baltensperger, 1980). Also, there are both positive and negative findings that have been documented on the effect of environmental risks on credit riskiness (see, for example, Klomp, 2014; Collier *et al.,* 2013; Collier *et al.,* 2011). The positive associations are reported in the studies of Collier *et al.* (2013) which found a positive association between environmental risks and loan losses which is in consonance with a prior study of Collier *et al.* (2011) who argue that environmental risks lead to increase in the proportion of restructured loans, that is bad loans.

Overall, Klomp (2014) also contends that disasters impact negatively on bank assets quality. Furthermore, on the advent of significant disaster so much resources are diverted to response actions, that is, search and rescue missions as well as recovery actions which are prolonged and painful processes. This can affect production, consumption and savings which are critical in causing not only credit defaults but also adversely affecting the quality of bank loan portfolios (Klomp, 2014).

Therefore, this study postulates a direct influence of environmental risks on NPLs in OPEC member states whose natural and technological hazards profile are high as

stipulated in chapter two of this study. Consequently, the relationship between environmental risks and NPLs is hypothesised as follows:

H_4*: *Environment risks significantly affect NPLs in OPEC countries.

4.5 Model Specification

This section deals with the model employed by the study in achieving its specified objectives. As stated earlier, following the work of Beck *et al.* (2015), Ghosh (2015) and Castro (2013) with modifications, Equation (1) is the initial model specified for this study. It incorporates all sets of variables, that is, the dependent variable represented as NPLs and the variables of interest which are made up of oil price changes, corruption, political instability and environmental risks. For the model to be well specified the study included the control variables of real gross domestic products, unemployment rate, inflation rate, lending interest rate and real exchange rate.

$$NPLs_{it} = \beta_0 + \beta_1 OP_{it} + \beta_2 CORR_{it} + \beta_3 PIS_{it} + \beta_4 ERS_{it} + \beta_5 GDP_{it} + \beta_6 UNEMP_{it} + \beta_7 INF_{it} + \beta_8 LIR_{it} + \beta_9 RER_{it} + \varepsilon_{it} \quad (1)$$

where NPLs represents the ratio of NPLs to total loan; OP means oil price changes; CORR is the corruption, PIS and ER represent political instability and environmental risks respectively. RGDP refers to real GDP and UNEMP is the unemployment rate. Further, INF denotes inflation rate, LIR means the lending interest rate while RER is the real exchange rate. The epsilon, ε means error term, whereas *i* represents country and *t* denotes period of time. Furthermore, Equation 1 is extended to control for the effect of inflation rate, lending interest rate and real exchange rate in addition to real gross

domestic products and unemployment already specified in the said Equation 1. The extension is used in the sensitivity analysis conducted to strengthen the estimates of the initial long run model.

4.6 Measurement of Variables

The following are the various measurements used for both the dependent variable, independent variables as well as the control variables of the study.

4.6.1 Measurement of Dependent Variable

The NPLs is the dependent variable of the study is being measured by NPLR which is the ratio of NPLs of banks for a country. In this study, NPLR is defined as the ratio of NPLs to Total Loans which in conformity with the measurement used by Beck *et al.* (2015), Akinlo and Emmanuel (2014) and Makri *et al.* (2014). Therefore, this study follows their works in defining NPLR as a measure of NPLs.

The study follows the work of Konstantakis *et al.* (2016), Beck *et al.* (2015), Makri *et al.* (2014) and Park (2012), in using the aggregate of NPLs to total gross loans of the banks for the countries under study. This approach is logical and necessary where outliers are anticipated in the data or the tendencies that some of the data might not be complete. This is in conformity with the position Beck *et al.* on the measurement NPLs. However, the study used the aggregate banks' data of each country for the period of the study 1996-2015.

There is no consensus among researchers on the sources of aggregate data of NPLs and/or NPLRs. There are studies that sourced NPLRs data from apex banks of the countries under their studies, International Monetary Funds (IMF) and World Bank (WB) databanks (see, for example, Beck *et al.* 2015; Ghosh, 2015; Castro, 2013; Louzis et *al.*, 2012). These sources are having significant missing values when compared to Bankscope data stream.

However, Anastasiou *et al.* (2016b), Zhu, Wang and Wu (2014), Shehzad, de Haan and Scholtens (2010) and Demirgüç-Kunt and Huizinga (1999) depend on Bankscope data stream for the data of their studies. Therefore, this study follows their works by sourcing its data on NPLRs from Bankscope (2016) data stream.

4.6.2 Measurements of Independent Variables

Independent variables are variables that influence NPLs in either a positive or negative way. They are the predictor variables of NPLs which is our dependent variable and the focus of the study.

i. Oil Price Changes

There is a divergence of opinion on the measurement of oil price amongst researchers that studied the effect of oil price on other economic activities. For example, Aguiar-Conraria and Soares (2011), Farzanegan and Markwardt (2009) and Mork (1989) used oil price growth, real oil price and real oil price changes as a measurement of oil price respectively. Furthermore, Poghosyan and Hesse (2009) argued that in as much as there is no agreement in the literature on a single measure that would constitute an oil price

shock, they opted for using daily Brent Oil Spot (BOS) and 12-month forward rates collected from Bloomberg. However, OPEC relies on OPEC Basket Price (OBP) under the new OPEC Reference Basket (ORB)[21]. For the purpose of this study, we shall adopt the OPEC (2016b) annual OBP as we are dealing with OPEC member countries that share the same pricing method as well as the fact that the study uses annual aggregate data for the rest of the variables.

ii. Corruption

As stated earlier under literature review section there are very few studies that investigated the effects of corruption on banking business and the prominent among them are Park (2012) and Goel and Hasan (2011) and they all used CPI Index of Transparency International. Additionally, Park measured corruption using his modified version of TI corruption perception index (CPI). However, Okada and Samreth (2014) employed Worldwide Governance Indicators (WGIs) of control of corruption for their study. More so, Abu *et al.* (2015) adopted the WGIs as a measure of corruption in the study.

Following the work of Abu (2015), Abu *et al.* (2015), and Okada and Samreth (2014) on the measurement of corruption this study adopts the Worldwide Governance Indicators WGIs (2016) of control of corruption. Furthermore, the adoption of the WGIs measurement is due to its methodology that is clearly devoid of all elements of political

[21] Introduced on 16 June 2005, is currently made up of the following: Saharan Blend (Algeria), Girassol (Angola), Oriente (Ecuador), Minas (Indonesia), Iran Heavy (Islamic Republic of Iran), Basra Light (Iraq), Kuwait Export (Kuwait), Es Sider (Libya), Bonny Light (Nigeria), Qatar Marine (Qatar), Arab Light (Saudi Arabia), Murban (UAE) and Merey (Venezuela)

instability and the data is available and highly accessible for the entire period of the study (see, for example, Kaufmann, Kraay, & Zoido-Lobatón, 1999 in Langbein & Knack, 2010). More so, the WGIs control of corruption has stronger methodology than CPI of Transparency International (see, for example, Langbein & Knack).

iii. Political Instability

There are quite a number of measurements for political instability developed and used around the world by different studies (see, for example, Svensson, 1998; Edwards, 1996; Brewer & Rivoli, 1990; Citron & Nickelsburg, 1987). Additionally, different indices of political instability were used as proxy of political instability by different researchers such as Political Instability Index of (PII), the Polity IV Project (PIP), Political Terror Scale (PTS) and Political Stability and Absence of Violence/Terrorism Index (PSAVTI) (see, for example, Abu, 2015; Hallak, 2013; Simonsohn, 2000; Mauro, 1995). These indexes were developed by The Economist magazine intelligence unit, Center for Systemic Peace, US State Department and World Bank's Worldwide Governance Indicators (WGIs) respectively. This study adopts PSAVTI in as a measure of political instability developed by WGIs.

Following the work of Abu (2015) on the measurement of political instability, this study adopts WGIs of political stability and absence of violence/terrorism of all countries around the world. Furthermore, this study used WGIs (2016) Index as a measurement of political instability due to its methodology which is devoid of corruption perception elements, which is an improvement over the PII of the Economist magazine intelligence unit index, accessibility and availability within the period of this study (see, for example,

Kaufmann, Kraay, & Mastruzzi, 2011, Kaufmann *et al.*, 1999 in Langbein & Knack, 2010;).

iv. Environmental Risk

There are several methods used in literature as measurements for environmental risks variable. For example, the studies of Mcdermott *et al.* (2014), Collier and Skees (2013), Noy (2009) and Skidmore and Toya (2002) used historical data of previous disasters that occurred within the periods of their studies as provided by EM-DAT of the international disaster database of Centre for Research on Epidemiology of Disasters (CRED).

The EM-DAT database contains a chronology of all reported major natural and technological disasters across the world from 1900-2015. It is highly accessible and available within the period of the study which is 1996-2015. Therefore, following the measurement used by Shabnam (2014), Collier and Skees (2013), Noy (2009), and Skidmore and Toya (2002), this study also employs its data from EM-DAT (2016) database.

v. Real Gross Domestic Product

This is an important variable that over the years has played a significant role in determining NPLs. However, there is no consistency among researchers on the measurement of GDP but they tend to use different measurement for it. Castro (2013) used GDP growth as a measure but Louzis *et al.* (2012) adopted real GDP growth rate in their study. In a contrary view, Mileris (2012) use real GDP growth rate percentage in

his study. However, in a different study, Mileris (2015) used GDP growth in his measurement.

This study follows the work of Ghosh (2015) and Castrén *et al.* (2008) in using real GDP as a measure of GDP. However, Real GDP (constant 2005 US$) is used in determining the effect of GDP on NPLs. The use of constant 2005 US$ real GDP is based on the belief that the value of US$ in 2005 gives a fair estimation thereby neutralising its volatility before and after 2005. The data on GDP basically retrieved from WDIs (2016) of World Bank's data bank hence this study collected the data on real GDP from same WDIs developed by World Bank.

vi. Inflation Rate

The variable of inflation is assumed to have a significant influence on the general price level of goods and service in an economy which includes the prices of bank loans. This assumption might be true especially if expected inflation is not factored in the pricing of the loans (Demirgüç-Kunt & Detragiache, 1998).

There is no consensus on a single measurement of inflation among researchers. Demirgüç-Kunt and Detragiache (1998) used rate of inflation as a tool for measuring its relationship with banking crises (NPLs). On the contrary, Bohachova (2008) used an unweighted average of consumer price index as a proxy for the annual rate of inflation. Therefore, following Bohachova, this study adopted consumer price index in measuring inflation, because it gives a fair reflection of purchasing power of the customers and loans repayment abilities of banks borrowing customers. Mostly, data on inflation rate

collected from WDIs of World Bank's data bank, therefore this study sourced its data on inflation rate from same WDIs (2016) developed by World Bank.

vii. Interest Rate

The interest rate is an important factor that influences banks deposits and loans hence an important variable in analysing NPLs of banks. There are quite many researchers that investigated the effect of interest rate and NPLs but used different measurements. Both Demirgüç-Kunt & Detragiache (1998) and Fofack (2005) used real interest rate as a measure of interest.

However, Louzis *et al.* (2012), Glen and Mondragón-Vélez (2011) and Goel and Hasan (2011) adopted real lending rate as a proxy for measuring interest rate. In a different study Castro (2013) used three components for measuring interest rate: the long-term interest rate, the real interest rate and the spread between the long and short-term interest rates. In contrast, Yurdakul (2014) opted for nominal deposit interest rate as a measurement of interest rate. Therefore, this study follows the works of Louzis *et al.* (2012), Glen and Mondragón-Vélez (2011) and Goel and Hasan (2011) in adopting the lending rate as a measure of interest rate. Additionally, this study uses lending interest rate because of its direct link to bank lending which is usually based on country's Monetary Policy Rate (MPR). The data on lending interest rate are basically retrieved from WDIs (2016) of World Bank's data bank except for Saudi Arabia that the study relied on statistics from SAMA (2016) hence this study also mainly collected the data on interest rate from same WDIs developed by World Bank.

viii. Unemployment Rate

Unemployment rate variable has been used by a significant number of studies probably due to its connection to business activities of economies which impact on demand of goods and services. The chances are very high that any possible rise of unemployment reduces households' disposable income and their ability to repay their debts (Quagliariello, 2007).

However, there are divergent views among researchers on how to measure unemployment against NPLs. Mileris (2012) concentrated on the use of long-term unemployment rate percentage as a yard stick of measuring unemployment. His position was strengthened by Castro (2013) who also adopted unemployment rate percentage as a measure of unemployment. Furthermore, Alhassan *et al*., 2014, Yurdakul (2014), Klein (2013) and Louzis *et al.* (2012) adopted the change in the unemployment rate as a measurement. Zaib *et al.* (2014) measured unemployment as the percentage of unemployed people to the total population in a particular year.

In line with the study of Zaib *et al.* (2014), this study adopts the change in the unemployment rate, that is, unemployment, total (% of total labour force) as a means of measuring unemployment rate in relation to NPLs. The data on the unemployment rate is not available on data streams other than that of WDIs (2016) of the World Bank database hence this study extracted its data of unemployment rate from the World Bank data base.

ix. Foreign Exchange Rate

The Foreign exchange rate has been used by several previous studies of NPLs probably due to its influence on borrowing customers' ability to pay back loans especially in import or export dominated economies or loans that are denominated in foreign currency. However different methods have been used in measuring foreign exchange rate (see, for example, Beck *et al.*, 2015; Alhassan *et al.*, 2014; Yurdakul, 2014; Castrén *et al.*, 2008).

Alhassan *et al* (2014) adopted real exchange rate as a measurement in their study of investigating the determinants of assets quality of Ghanaian banks during the financial crisis period. In addition, Nguena and Nanfosso (2014) and Castrén *et al.* (2008) accepted the real exchange rate as a measurement of foreign exchange rate. However, Beck *et al*. (2015) used nominal effective exchange rates in their study of the determinants of NPLs. On the contrary, a straight line exchange rate was chosen by Yurdakul (2014) in his study of macroeconomic modelling of credit risk for banks which also tallies with the measurement adopted by Castrén *et al*.

Therefore, this study adopted real exchange rate as a measure of the foreign exchange rate which is in tandem with the view of Nguena and Nanfosso (2014) and Castrén *et al.* (2008). Although, data on foreign exchange rate can be obtained from apex banks of various countries as well as the bureau of national statistic most studies depended on data from WDIs developed by the World Bank hence this study depended on same WDIs (2016) World Bank data stream.

Based on the above discussion on theoretical and research frameworks, model specification and the variables definitions and measurements, table 4.1 is developed. The table gives a summary of variables, their measurements, sources and expected outcome signs of both the dependent variable and the variables of interest as well as the control variables of the study.

Table 4.1

Summary of the Definition of Variables

Variables	**Measurement**	**Sources**	**Expected Outcome**
NPLR= Non-performing loans ratio	NPL/Total loans	Bankscope data base	N.A
RGDP= Gross domestic product	Real GDP (Constant 2005 US$)	WDl-WorldBank data base	(-)
INF= Rate of inflation	Consumer price index	WDl-World Bank data base	(+)
LIR= Interest rate	Lending interest rate	WDl-World Bank data base	(-)
UNEMP= Unemployment rate	Unemployment, total (% of total labour force)	WDl-World Bank data base	(+)
RER= Foreign exchange rate	Real exchange rate	WDI-World Bank data base	(-)
OP= Oil price Changes	OPEC basket price	OPEC database	(-)
CORR= Corruption	Control of corruption	Worldwide Governance Indicators--World Bank data base	(+)
PIS= Political instability	Political stability and absence of violence/Terrorism	Worldwide Governance Indicators -World Bank data base	(+)
ERS= Environmental risks	Environmental risk	EM-DAT	(+)

Note: N.A represents Not Applicable; EM-DAT is the database of the Centre for Research on the Epidemiology of Disaster

4.7 Data Description

This study used annual secondary data that have already been sourced and made available to the public. As stated earlier under variables measurement the data for the dependent variable were sourced from Bankscope (2016) data stream while the data for explanatory variables were obtained from independent organisations of World Bank data base, EM-DAT CRED and OPEC data bank of oil prices. Following the study of Beck *et al.* (2015) and Boudriga *et al.* (2009), this study uses aggregate NPLR data of the OPEC member states. The reason for this is as stated in the words of Boudriga *et al.* that aggregated data best reflect the level of NPLs of the banks in a country as opposed to individual bank data.

As stated above in this section the NPLRs data of the banks for the countries over the period of the study, that is, 1996-2015 were obtained from Bankscope data stream. The data is unbalanced dynamic panel data set. Furthermore, the data on oil price changes, corruption, political instability, environmental risks, GDP, interest rate, inflation, exchange rate and unemployment variables were obtained from World Bank, EM-DAT CRED and OPEC data bases. Therefore, the study used annual dynamic panel data of the OPEC member states for the period spanning 1996-2015. The essence of using dynamic panel data is to capture the persistence of NPLs among the member states.

4.8 Population and Sample Size

The population of the study is the entire 13 member states of OPEC as at January 2016[22]. The countries under study are presented in Table 4.2. This grouping of

[22] These were the countries on the membership of OPEC as at January, 2016

countries captures virtually all geographic locations of the world from far Africa, Americas, Asia and the Middle East. It gives a fair reflection of the global position of NPLs especially amongst major oil exporting countries as well as the impending risks of contagious effects of any eruption of banking crisis amongst the OPEC member states on the neighbouring countries and the world at large.

Table 4.2

OPEC member states

S/No.	Member state
1	Algeria
2	Angola
3	Ecuador
4	Indonesia
5	Iran
6	Iraq
7	Kuwait
8	Libya
9	Nigeria
10	Qatar
11	Saudi Arabia
12	United Arab Emirate
13	Venezuela

Source: Organisation of Petroleum Exporting Countries (2016)

4.9 Unit of Analysis

The unit of analysis is the individual OPEC member states. The study made use of aggregate data of their individual country's NPLRs in relation to our set of predictor variables on year by year basis for 1996-2015. The population of 13 countries and the 20 years of the study constituted 260 country-year observations for the study.

As stated earlier the choice of aggregate data is in line with the study of Boudriga *et al.* (2009) who opined that data on NPLs for individual banks are accessible only for a very limited number of countries.

4.10 Tool of Technical Analysis

4.10.1 Testing for Integration

Prior to checking for the long run relationship there is need to investigate the order of integration of the variables. Whether they are integrated at level, integrated of order one or a mixture of integration. Since the power of individual unit root tests can be distorted when the data is short (Pierse & Snell, 1995), the study employed panel unit root tests due to Im, Pesaran, and Shin (2003) and Maddala and Wu (1999) denoted by IPS and MW, respectively. The null hypothesis of both the tests is that of a unit root exist. The IPS statistic is based on averaging individual Dickey-Fuller unit root tests.

Nevertheless, Breitung (2000) discovers that IPS suffers a dramatic loss of power when trends of the individual entity are included. Furthermore, the test is sensitive to the specification of deterministic trends in the modelling process. The MW test has the advantage over the IPS that its value does not depend on different lag lengths in the individual ADF regressions. Moreover, MW test is proved to be superior compared to the IPS test (Maddala & Wu, 1999; Maddala, Wu, & Liu, 1999). Thus, this study uses the two tests while paying more emphasis to MW to appropriately check the stationarity of the series.

4.10.2 Test for Long Run Relationship

The study investigates the long run relationship between NPLs and the variables of interest of the study using Pooled Mean Group (PMG). Following Pesaran, Shin and Smith (1999) the advantages of PMG over other heterogeneous cointegration techniques are that PMG constrains the long run estimates to be similar across entities. However, it allows intercepts, short run coefficient and error variances to vary among different entities. It determines both long and short run relationships. Furthermore, the model is appropriate for this study due to the common product of OPEC member states which is expected to influence the long run coefficient in a similar way. This is further augmented by the nature of the countries' solvency constraints.

Moreover, the PMG method of estimation intermediate between the Mean Group which allows both slope and intercepts to vary among groups and fixed effect modelling where only slopes are fixed, the intercept is allowed to differ among groups. The unrestricted ARDL model specification is depicted in Equation 2.

$$y_{it} = \sum_{j=1}^{p} \beta_{ij} y_{i,t-j} + \sum_{j=1}^{q} \alpha'_{ij} x_{i,t-j} + \mu_i + \varepsilon_{it} \quad (2)$$

where y_{it} is the dependent variable, $x_{i,t-j}$ is the vector of explanatory variables for country *i*. The subscript, t = 1, 2, 3, …. T for time *t* and i = 1, 2, 3 … N, for countries in the sample. The symbol, μ_i denotes fixed effect parametisation. Similarly, Equation 2 can be rewritten as VECM Model as shown in Equation 3.

$$\Delta y_{it} = \lambda_i (y_{it} = y_{i,t-1} - \beta_i' x_{i,t-1} + \mu_i + \varepsilon_{it}) + \sum_{j=1}^{p-1} \beta_{ij} \Delta y_{i,t-j} + \sum_{j=1}^{q-1} \alpha_{ij}' \Delta x_{i,t-j} + \mu_i + \varepsilon_{it} \quad (3)$$

where λ_i is the error correction term coefficient and β_i represents long run parameters which are assumed to be common across entities. Empirically, the model for this study is presented in Equation 4.

$$NPLs_{it} = \beta_0 + \beta_1 OP_{it} + \beta_2 CORR_{it} + \beta_3 PIS_{it} + \beta_4 ERS_{it} + \beta_5 RGDP_{it} + \beta_6 UNEMP_{it} + \mu_t + \varepsilon_{it} \quad (4)$$

where $NPLs_{it}$ is the NPLs; OP_{it} represents oil price; $CORR_{it}$ denotes corruption; PIS_{it} is the political instability; ERS_{it} is the environmental risks; $RGDP_{it}$ is the real gross domestic products and $UNEMP_{it}$ is the unemployment rate. i = 1, 2, 3 … 13 for the number of countries in the sample and t = 1, 2, 3… 20 for the number of periods/years. The dynamic panel ARDL (1, 1, 1, 1, 1, 1, 1) specification of Equation 4 is presented in Equation 5.

$$\begin{aligned} NPLs_{it} = {} & \beta_{1i} OP_{it} + \beta_{2i} OP_{it-1} + \beta_{3i} CORR_{it} + \beta_{4i} CORR_{it-1} + \beta_{5i} PIS_{it} + \beta_{6i} PIS_{it-1} \\ & + \beta_{7i} ERS_{it} + \beta_{8i} ERS_{it-1} + \beta_{9i} RGDP_{it} + \beta_{10i} RGDP_{it-1} + \beta_{11i} UNEMP_{it} \\ & + \beta_{12i} UNEMP_{it-1} + \lambda_i NPLs_{i,t-1} \mu_i + \varepsilon_{it} \end{aligned}$$

(5)

The error correction reparameterisation of the long run model in Equation 5 is presented in Equation 6.

$$\begin{aligned} \Delta NPLs_{it} = {} & \lambda_i (NPLs_{i,t-1} - \delta_{0i} - \delta_{1i} OP_{i,t-1} + \delta_{2i} CORR_{i,t-1} + \delta_{3i} PIS_{i,t-1} + \delta_{4i} ERS_{i,t-1} \\ & + \delta_{5i} RGDP_{i,t-1} + \delta_{6i} UNEMP_{i,t-1}) + \alpha_{1i} \Delta OP_{it} + \alpha_{2i} \Delta CORR_{it} + \alpha_{3i} \Delta PIS_{it} \\ & + \alpha_{4i} \Delta ERS_{it} + \alpha_{5i} \Delta RGDP_{it} + \beta_{6i} \Delta UNEMP_{it} + \varepsilon_{it} \end{aligned}$$

(6)

where $\lambda_i = -(1-\lambda_i)$, $\delta_{0i} = \frac{\mu_1}{1-\lambda_i}$, $\delta_i = \frac{\beta_{1i}+\beta_{2i}}{1-\lambda_i}$, $\delta_{2i} = \frac{\beta_{3i}+\beta_{4i}}{1-\lambda_i}$, $\delta_{3i} = \frac{\beta_{5i}+\beta_{6i}}{1-\lambda_i}$

, $\delta_{4i} = \frac{\beta_{7i}+\beta_{8i}}{1-\lambda_i}$, $\delta_{5i} = \frac{\beta_{9i}+\beta_{10i}}{1-\lambda_i}$ and $\delta_{6i} = \frac{\beta_{11i}+\beta_{12i}}{1-\lambda_i}$

The primary interest in the speed of adjustment, λ_i and the coefficient of the long run estimates, $\delta_{1i,}\delta_{2i,}\delta_{3i,}...\delta_{6i}$. The inclusion of δ_{0i} in the model indicates that a nonzero mean of the long run relationship is allowed. The model is estimated using pooled maximum likelihood estimation to compute the common long run estimates and group-specific short run coefficients. This is executed using Newton-Raphson method. The coefficient of λ_i is expected to be negative if the model exhibits a usual return to long run equilibrium. Accordingly, the estimates of the PMG parameters are consistent and asymptotically normally distributed for both stationary and non-stationary regressors (Pesaran *et al.*, 1999).

Furthermore, owing to its advantages over other dynamic panels estimators as highlighted above and elsewhere in the thesis the PMG is being used by researchers. The PMG estimators has been used in researches by authors such as Bangake and Eggoh (2012), Iwata, Okada, and Samreth (2011), Ndambendia and Njoupouognigni (2010) and (Tan, 2009). Moreover, some of the earlier researches that used the PMG estimators are those of Goswami and Junayed (2006), Martínez-Zarzoso and Bengochea-Morancho (2004), Bassanini and Scarpetta (2002) and Pesaran *et al.* (1999). Nevertheless, Nikolaidou and Vogiazas (2017), Yurdakul (2014) and Adebola, Wan Yusoff and Dahalan (2011) used ARDL in estimating the results on the determinants of NPLs.

To further ensure the reliability of the PMG estimate, the relationship between NPLs and the independent variables is also investigated using linear static panel model technique as a sensitivity analysis to the earlier findings. These entail pooled OLS, random effect and fixed effect models. According to Baltagi (2008), the pooled OLS model assumes that the regressors capture all the characteristics of each entity in the sample while dropping all unobserved specific effects. The model treats all variables in the sample with a constant intercepts and slope of the coefficient that varies with time. However, ignoring the specific effect may lead to heterogeneity bias in the model (Cheng, 2003).

In order to account for the possible specific effects in panel data set, fixed effect model will be an alternative. The model allows for time invariant characteristics to be correlated with the predictor variable (Torres-Reyna, 2011; Frees, 2004). Torres-Reyna also argues that under the fixed effect model, each entity is considered distinct without any correlation between constants and error term. However, the fixed effect model is not hypothetically determined, rather it depends on a scientific test conducted to decide the most appropriate model between fixed and random effects.

According to Tauringana and Afrifa (2013), the random effect model assumes that variations across countries are randomly uncorrelated with each variable in the model. This model is usually found to be most appropriate if the panel's data consist of a given sample drawn from a wide population in such a way that individual precise constant terms are randomly distributed across entities. It is further argued that random effect is more appropriate when there is every likelihood that

differences across entities are believed to have influence over the predictor variables (Tauringana & Afrifa, 2013).

4.11 Chapter Summary

The chapter gives a highlight of the methodological procedure adopted in achieving the set goals of the study. In specific terms, the chapter provides a conceptual framework for the study and developed its research framework. Also, the chapter specifies the model used in estimation in order to achieve each of the objectives of the study. The solid justification for the measurement of each variable is provided in the chapter as well as the hypotheses of the study spelt out. Furthermore, a clear description of data and source of the data for each variable is provided.

CHAPTER FIVE

RESULTS AND DISCUSSION

5.1 Introduction

This chapter is on the presentation of the results and discussions of findings of the study. The heterogeneous panel estimation of Pooled Mean Group (PMG) or Autoregressive Distributed Lag Model (ARDL) is employed in analysing the effects of systemic risks on NPLs amongst OPEC member states for the period spanning 1996 to 2015. Furthermore, the averaged data is estimated using the static panel estimations techniques of Pooled OLS, Fixed Effect and Random Effect. This is used as robustness check in order to strengthen the findings of the PMG/ARDL estimation. The efficiency of the estimates is assessed using the necessary diagnostic test. The results are discussed to test the hypotheses of the study.

5.2 Descriptive Analysis

The descriptive analysis is carried out in order to explain the preliminary features of the variables used in the study. This part includes analysis of descriptive statistics and correlation of key variables of the study. The statistics are presented in Tables 5.1 and 5.2 for descriptive and correlation coefficients respectively.

Table 5.1:
Summary of Descriptive Statistics

Statistics	**NPL**	**OP**	**CORR**	**PIS**	**ERS**	**RGDP**	**INF**	**LIR**	**UNEMP**	**RER**
Mean	15.17662	65.48691	-0.282206	-0.429706	7.764706	1.96E+11	16.67324	14.44088	8.677941	96.72853
Median	5.225000	61.00000	-0.475000	-0.735000	4.000000	1.70E+11	12.35000	15.85500	7.600000	99.28000
Maximum	93.98000	109.4500	1.720000	1.210000	54.00000	5.20E+11	99.88000	49.55000	16.80000	272.3700
Minimum	0.400000	12.28000	-1.380000	-1.620000	0.000000	3.30E+10	-1.130000	0.250000	4.600000	40.28000
Std. Dev.	23.00400	32.71051	0.788730	0.894234	9.624468	1.23E+11	18.59578	9.972484	2.844835	32.65716
Skewness	2.267034	-0.048931	0.827243	0.735510	2.567305	0.931330	2.715172	1.164161	0.922028	2.657849
Kurtosis	7.087059	1.570193	2.661750	2.145875	10.70864	3.302075	11.89831	5.563221	3.192366	15.17643
Jarque-Bera	105.5752	5.819456	8.079916	8.198043	243.0644	10.08880	307.8943	33.97502	9.739728	500.1461
Probability	0.000000	0.054491	0.017598	0.016589	0.000000	0.006445	0.000000	0.000000	0.007674	0.000000

Note: NPL, OP, CORR, PIS, ERS, RGDP, INF, LIR, UNEMP, and RER represent Non-performing loans, oil price changes, corruption, political instability, environmental risks, real gross domestic products, inflation, lending interest rate, unemployment and real exchange rate respectively. Std. Dev. = standard deviation; Min. = minimum; Max. = maximum; J B Stat. = Jarque-Bera statistic. The *p*-value is the probability value of the Jarque-Bera statistic. RGDP is expressed in US dollars in billions.

5.2.1 Descriptive Statistics

The descriptive statistics of the main variables of the study is depicted in Tables 5.1. The table reveals that the average NPLs of the sampled countries for the period of 1996 to 2015 is 15.177, with a minimum value of 0.400 and a maximum of 93.980. The statistics indicate that on the average, the NPLs for the entire OPEC member states is about 15 percent. This is a clear indication that there exists evidence of high NPLs ratios compared to G7, G8 and BRICS economic groupings. Venezuela recorded the least percentage of about 0.4, while Ecuador documented the highest NPLs of about 94 percent.

The remaining series in the sample also reveals a similar pattern. The variable that shows an inconsistent growth and thus, most unstable is real gross domestic products followed by oil price and real exchange rate, NPLs and inflation across all the selected countries. One of the anticipated reasons for the instability of most macroeconomic variables in the OPEC member states is the apparent oil price changes. The average oil price of the selected member states is 65.487 USD per barrel. The minimum value is 12.280 and the maximum of 109.450 USD per barrel. The large standard deviation, 32.711 indicates frequent changes in the prices of oil per barrel. This is succeeded by the changes in the real exchange with the second highest standard deviation of 32.657 after oil prices. Moreover, the instability of the real exchange rate is influenced by the frequent changes in the prices of oil which serve as a major source of forex to the OPEC member state. The next most widely dispersed series with a standard deviation of 18.596 is inflation. The minimum inflation rate for the group of countries is -1.130 and the maximum stood at 99.880 with an average inflation rate of 16.673 percent based on consumer price index.

Similarly, the average indices of corruption and political instability for the countries are -0.282 and -0.430 respectively. According to Worldwide Governance Indicators (WGI), the indices show a high level of corruption and political instability. These will also work towards aggravating the menace of NPLs in the countries. This is anticipated to hinder investments into the economies which makes the demand for the domestic currencies lower in the international market thereby a volatile exchange rate (Levy Yeyati, Sturzenegger, & Reggio, 2010). Political instability also leads to volatility in exchange rate due to the inability of investors and policymakers to predict future market occurrence (Kerry, 2000).

The occurrence of environmental risk is reported to be about 8 times with a maximum reported the occurrence of 54 times for Nigeria in the year 2000 and the minimum of zero (0) occurrence for some countries over some years. This is an indication that at least each of the selected countries reported the occurrence of an average of eight (8) major environmental disasters in the countries. The probable implication of these events is that it can lead to the destruction of the clients' cash flows upon which the repayment of loans is based.

The repayment of loans can also be distorted by the lending interest rate. This is shown to be 14.441 percent on the average with up to a maximum of 49.550. This is against the usual single digit lending interest rate of most developed and other developing countries in the World. More so, the average unemployment rate of the OPEC member states is shown to be 8.678 with a minimum of 4.600 and a maximum of 16.800. The average unemployment rate is also higher than the Organization for Economic Cooperation and Development (OECD) benchmark of 4 to 6 percent. This

will equally reduce the repayment ability of the clients, thereby increase the level of NPLs.

The simple descriptive statistics portray various behaviour of the employed series. However, this is only a description of the raw series which may not be easily employed to draw any conclusion on the nature of NPLs of the different countries employed in the sample. Therefore, the study further confirms the possible factors that influence the NPLs based on inferential statistics which can be evidently used to make a reasonable conclusion.

The distribution of the data (normality) is tested using skewness, kurtosis and Jarque-Bera test statistic. The different tests for normality indicate that the data are not normally distributed. From the skewness statistic, all the variables are positively skewed except for oil price changes. The most highly skewed series is seen to be inflation followed by the real exchange rate, environmental risks and NPLs. The least skewed variable is found to be political instability. However, the test is different from the threshold value of zero. Furthermore, the kurtosis statistic similarly shows that the series are non-normality distributed. The variables are found to be platykurtic relative to the benchmark value of three (3) (Bai & Ng, 2005). However, these tests statistics become less efficient when the series of this length are correlated (Bai & Ng).

Moreover, the Jarque-Bera statistic also shows that the observations of the variables are not normally distributed for all the series under study except for oil price changes which is normally distributed at 10 percent significant level. This can be seen from

the probability values of the Jarque-Bera statistic. The normality of the oil price indicates that the price for each year is independent of another year. However, the other variables exhibit a typical feature of panel series data. The test shows the existence of a trend in the data generating process. The non-normality of the data distribution is in line with previous studies such as Diamandis (2009) for stock returns variables and Swift and Janacek (1991) who argue that raw panel/time series data are hardly normally distributed.

Unlike the test of normal distribution conducted on the residuals of estimated models which is expected to be normally distributed, the problem of non-normality in the data generating process is usually observed in the raw panel/time series data. The null hypothesis of raw series normality test is that the observations are independent of one another over years and between entities. In reality, the data are not expected to be independent as a result of seasoning and trending characteristics of most data of this length or time (Brooks, 2008).

5.2.2 Correlation and Multicollinearity Analysis

The correlation analysis is conducted to determine the direction and strength of association between explained and explanatory variables. The analysis further indicates the possibility of the existence of high-order linear correlation (multicollinearity) amongst the explanatory series. Multicollinearity is a problem that leads to size distortion through overestimation of standard errors which leads to smaller *t*-statistic.

Table 5.2
Correlation and Multicollinearity Analysis

SERIES	NPL	OP	UNEMP	CORR	PIS	RER	RGDP	LIR	ERS	INF
NPL	1.000000									

OP	-0.355476	1.000000								
	(0.0029)	-----								
UNEMP	-0.092514	-0.038742	1.000000							
	(0.4530)	(0.7538)	-----							
CORR	-0.000283	0.046599	-0.376701	1.000000						
	(0.9982)	(0.7059)	(0.0015)	-----						
PIS	0.070758	-0.138554	-0.487787	0.191737	1.000000					
	(0.5664)	(0.2598)	(0.0000)	(0.0000)	-----					
RER	0.125085	0.018542	-0.294406	0.229765	0.253833	1.000000				
	(0.3095)	(0.8807)	(0.0148)	(0.0594)	(0.0367)	-----				
RGDP	-0.495449	0.452180	-0.252268	0.027873	-0.114756	0.001647	1.000000			
	(0.0000)	(0.0001)	(0.0380)	(0.8215)	(0.3514)	(0.9894)	-----			
LIR	0.032470	-0.441334	0.394766	-0.117049	0.084349	-0.240747	-0.630734	1.000000		
	(0.7927)	(0.0002)	(0.0009)	(0.3418)	(0.4940)	(0.0480)	(0.0000)	-----		
ERS	0.121646	-0.224009	-0.033281	0.528927	0.583894	-0.155615	-0.290119	0.211758	1.000000	
	(0.3231)	(0.0663)	(0.7876)	(0.0000)	(0.0000)	(0.2051)	(0.0164)	(0.0830)	-----	
INF	0.091308	-0.135276	0.305494	-0.384798	-0.198925	-0.220828	-0.274319	0.552091	-0.088917	1.000000
	(0.4590)	(0.2714)	(0.0113)	(0.0012)	(0.1039)	(0.0704)	(0.0236)	(0.0000)	(0.4709)	-----

Note: NPL, OP, UNEMP, CORR, PIS, RER, RGDP, LIR, ERS and INF represent Non-performing loans, oil price changes, unemployment, corruption, political instability, real exchange rate, real gross domestic products, lending interest rate, environmental risks and inflation respectively. The values in parenthesis are the probability value of the correlation coefficients.

Table 5.2 presents the correlation coefficients and their respective probability values for each pair of the relationship among the variables. The statistics show that all variables are positively related to NPLs except for oil price changes, unemployment, corruption and real gross domestic products. Few variables are found statistically significant. This includes the coefficients of OP, RGDP, RER and ERS. The correlation coefficients are preliminary indication that there would be the possibility of having a significant relationship between the dependent and the independent variables employed in the study. However, the association from correlation coefficient cannot be used for either causality or robust inferential evidence. This is because it only gives the direction and magnitude of pair wise association in a linear case which can change when non-normality and/or non-linearity exist (Cohen & Lea, 2003).

The strength of correlation coefficient among the explanatory variables shows the possibility of having multicollinearity in a model. From Table 5.2, the probability values indicate that the null hypothesis of no correlation among pairs of variables is mostly rejected in all variables. Although there exists a significant correlation among the explanatory variables, the correlation coefficients are found reasonably below the threshold value of multicollinearity. This is emphasised to be 80 percent level of association (Kennedy, 2008 in Sufian & Habibullah, 2010) and even 90 percent (Tabachnick & Fidell, 2013).

The most highly associated variables are 0.631 between RGDP and LIR, 0.584 between PIS and ERS and 0.552 between LIR and INF. However, the analysis further indicates that the least correlated variables are RER and RGDP with 0.002 coefficient followed by

0.018 between OP and RER and 0.028 for CORR and RGDP. This preliminary analysis shows the possible non-existence of multicollinearity among the employed explanatory variables in the model of this study. However, more scientific and statistical tests are conducted to further ensure that multicollinearity does not exist in the data. This includes the variance inflation factor test among others.

5.3 Inferential Statistics

The inferential analysis is conducted in order to draw a valid inference in testing the proposed hypotheses of the study. This is carried out using both panel cointegration techniques, pooled mean group (panel autoregressive distributed lag, ARDL model) and traditional panel techniques of pooled ordinary least squares, random and fixed effect model. The analysis is presented in the following subsections:

5.3.1 Panel Unit Root

To determine an appropriate method to adopt in finding the long run relationship, the test of a unit root is necessary in order to know the order of integration of the series. The panel unit root is presented in Table 5.3. The tests (both IPS and MW), reported in Table 5.3, indicates that all the series are non-stationary at level except for variables of corruption and political instability which are found significant at one percent significance level based on IPS and significant at one and five percent based on MW for corruption and political instability respectively. The other variables support the hypothesis of a unit root in all variables across countries, as well as the hypothesis of zero order integration in first differences. Therefore, it is established that there exists a mixture in the order of integration. However, since the dependent variable is found

stationary at first difference, then the methodology of autoregressive distributed lag model is appropriate for this study.

Table 5.3
Panel Unit Root Test

Variables	**Level**		**First Difference**	
	IPS	**MW**	**IPS**	**MW**
NPLs	-0.243	28.910	-4.622***	62.431***
OP	-0.192	19.891	-4.879***	58.943***
CORR	-5.101***	42.198***	-7.891***	98.418***
PIS	-4.667***	32.413**	-8.160***	82.661***
ERS	1.996	16.742	-7.013***	59.854***
RGDP	-0.401	29.831	-5.189***	72.899***
UNEMP	2.766	25.732	-6.912***	66.110***

The acronym, IPS and MW stand for Im, Pesaran and Shin test and Maddala and Wu test for a unit root in the model respectively. The critical values for MW test are 37.57 and 31.41 at 1% and 5% statistical levels, respectively. Boldface values denote sampling evidence in favour of unit roots. ***, ** Signifies rejection of the unit root hypothesis at the 1% and 5% level.

5.3.2 Pooled Mean Group (PMG)

The basic panel data assumption is that at least some of the parameters are the same across the entities thereby the concepts of static and dynamic panel data. This leads to a serious bias and possible size distortion if the pooling assumption does not hold true (Pesaran & Smith, 1995). It is also emphasised that unless the slope of the coefficients is identical, the estimates of the average values of the parameters especially in the fixed effect, instrumental variable, and generalised methods of moments as well as dynamic models may be inconsistent and misleading (Pesaran *et al.,* 1999; Pesaran & Smith, 1995).

One of the central arguments from the findings of panel analysis with larger time than a number of entities is that the assumption of homogeneity of slope parameters is often

inappropriate. Rather, parameters are heterogeneous across entities. Alternatively, the study employs the heterogeneous panel technique to account for consistency in the coefficients of the long run estimates. The method separate estimates of regressions for every entity in addition to estimates of the average of country-specific coefficients (Evans, 1997; Lee, Pesaran, & Smith, 1997). According to Pesaran *et al*. (1999), the pooled mean group allows the intercept, error variance and short run coefficients to vary across entities. However, it constraints the long run coefficients to be similar for the entire entities. This might be explained by the common product (oil exportation) of the OPEC member states which can influence the long run coefficients of the groups in a similar manner. Finally, the method occupies an intermediate position between the mean group and fixed effect method.

5.3.3 Estimation Results and Discussion

The estimation result of the PMG model is empirically presented in stages; lag length selection, the test for homogeneity of error variance to ensure the appropriateness of employing the PMG model, the long run estimates of the model and finally, the speed of adjustment to measure the return to equilibrium in the long run.

5.3.3.1 Lag Length Selection

The lag length selection is conducted by comparing numerous models estimated with different lag length. This is essential because both the mean group and pooled mean group require selection of appropriate lag length for the equations of an individual country. The various lag lengths estimated to determine the appropriate model is depicted in Table 5.4.

Table 5.4
MG and PMG Lag Length Selection

Model	ARDL Order	AIC	SBC
1	(1,0,0,0,0,0,0)	-778.2757	-808.277
2	(1,1,1,1,1,1,1)	-794.4956	-809.066
3	(1,3,1,1,1,1,1)	-751.2715	-789.701

The appropriate lag length is selected based on the minimum value of the Akaike Information Criteria (AIC) and Schwarz Bayesian Criteria (SBC). The minimum values of the information criteria indicate that the most appropriate model to be estimated is ARDL (1,1,1,1,1,1,1). This is shown from the least values of the selected lag length from Table 5.4. Therefore, the estimable model for this study is chosen to be ARDL of order one. This is true regardless of AIC or SBC which performs better in the least number of time length.

5.3.3.2 Homogeneity of Variance

Although the common products of the OPEC member states make it easily believable that the long run estimates might be the same across the groups, however, we need to choose between the different alternative specifications. In this study, the heterogeneity effect on the mean of coefficients is determined by Hausman (1978) based test. The null hypothesis states that the difference in the coefficients between the mean group and

pooled mean group are not statistically different and that pooled mean group is more appropriate and efficient. The results of the Hausman test is presented beneath Table 5.5.

The test indicates that the difference in the estimated coefficients between MG and PMG are not significantly different and that PMG is more efficient. Therefore, the most appropriate estimates for this study is that of the PMG coefficients.

Table 5.5

Pooled Estimate of ARDL (1,1,1,1,1,1,1): Dependent Variable: NPLs for OPEC Countries

Variables	**Mean Group (MG)**	**Pooled Mean Group (PMG)**	**Dynamic Fixed Effect (DFE)**
OP	1.350	-0.020***	0.117
	(1.387)	(0.006)	(0.228)
CORR	9.959**	4.493***	-22.210
	(4.724)	(0.907)	(21.127)
PIS	5.812*	4.276***	-4.425
	(3.152)	(0.802)	(11.439)
ERS	-0.587	0.174***	0.743
	(1.079)	(0.061)	(1.277)
RGDP	-4.582***	-4.090***	40.020
	(0.582)	(0.973)	(28.379)
UNEMP	25.997	0.249***	-0.322
	(24.765)	(0.086)	(1.809)
Speed of Adjustment	-0.652**	-0.468**	-0.201***
	(0.295)	(0.181)	(0.052)
Max. Log likelihood	251.080	212.983	144.310
No. of Countries	13	13	13
Hausman Test		0.000 (1.000)	

Note: The values in parentheses are asymptotic standard errors. The asterisks, ***, ** and * denote significance level at 1%, 5% and 10% respectively. The figures in parenthesis against Hausman represent the probability value of the test. The detailed estimates of the different models are presented in Appendix D.

The results further indicate that when homogeneity assumption is imposed on the long run coefficients, it tends to increase the standard errors and alter the coefficient under the null hypothesis of no significant difference between MG and PMG, and that PMG is

more efficient. This is clear from the non-significance of the Hausman test of χ^2 value, 0.000 with a probability of 1.000. If homogeneity of all variables is imposed on all the long run coefficient, then the maximum log likelihood (MLL) falls from the MG value of 251.080 to that of PMG value 212.983.

The advantage of the PMG model over the usual DFE is that it allows the dynamic specification to differ among countries in the short run. It is equally important to stress that the estimates of ARDL (1,1,1,1,1,1,1) are robust to misspecification bias. This is because, in addition to the lag length selection, the time length is found larger than the entities. Finally, the results in Table 5.4 indicate that the estimates of the PMG seem quite robust to misspecification bias, outliers and lag order selection. Hence, the most appropriate model based on Hausman test presented beneath Table 5.5.

The parameter estimates of the PMG model reveal that one US dollar increase in the price of oil will lead to an average decrease in the ratio of NPLs by 0.02 percent. The coefficient is statistically significant at one percent level. The finding implies that an increase in the oil price for oil exporting economies like those of OPEC member states will improve the cash flow position of borrowing customers. This will enhance their ability to pay back loans as at when due, thereby reducing the ratio of the banks' NPLs. This finding is within the purview of systemic risks theory and credit-default theory which fall within the domain of financial intermediation theory of banking. Although there is no much empirical evidence on the relationship between oil price and NPLs, however, the result of this study aligns with the interesting study of Al-Khazali and

Mirzaei (2017) which reports an inverse relationship between oil price changes and NPLs. The finding reveals that a rise in oil price leads to a decrease in NPLs and conversely a fall in oil price leads to an increase in NPLs amongst the oil-exporting countries of the world. Furthermore, the study of Miyajima (2016) reveals a negative relationship between the lower growth of oil price and NPLs. The result of his study indicates that a decline in oil prices increases the level of NPLs and vice-versa in Saudi Arabia.

The result of the current study also justifies the adoption of the underpinning theories of the study which presume a negative relationship between adverse oil price changes and NPLs among oil exporting countries of OPEC. A negative change in oil price in OPEC member states is simply a crystallisation of systemic risk which interferes with the economic units' ability to generate enough cash flows whose consequences are transferred to the borrowing customers as presumed by the financial intermediation theory of banking (see, for example, Demirgüç-Kunt & Detragiache, 1998; Hester, 1994; Baltensperger, 1980). This situation further affects economic units' ability to meet up production, consumption, savings needs and loan repayment ability hence NPLs as stipulated by the systemic risks theory (see, for example, Collier *et al.,* 2013; Haldane & May, 2011; Cochrane, 2004; Berger & DeYoung, 1997). Furthermore, the net worth of the economic agents will be constrained or impaired to the extent that they default in the credit obligations thereby creating NPLs or further deteriorating the NPLs situation as stipulated by the credit-default theory (see, for example, Sy, 2007; Crook & Banasik, 2005; Pyle, 1997; Davis, 1995).

Furthermore, the finding also shows that corruption is positively related to NPLs. The results from the estimates indicate that on average, an index increase in the level of corruption will cause about 4.49 percent increase in the ratio of NPLs. The result is statistically significant at 99 percent level of confidence. This implies that an increase in country-wide corruption which also includes the banking sector will lead to the inappropriate approval of loans as well as make the recovery of loans very difficult. This will result in an increase in the banks' NPLs. This finding is in consonance with that of Park (2012) which study provides a substantial evidence that corruption significantly aggravates the problem of bank asset quality across countries of the world. Additionally, the finding of this study is similar to that Goel and Hasan (2011) which reveals a significant positive relationship between corruption and deterioration of bank asset quality amongst 60 cross-countries of the world. These studies evidently suggest that greater corruption is associated with higher banks' bad loans. Therefore, the result seems to hold irrespective of the index and source of data used in the estimation process.

The result of the current study is also in line with the theoretical expectations that occurrence of corruption which is a systemic risk will increase the level of NPLs as assumed by the systemic risk theory. In the same manner, increased level of corruption will lead to an increased cost to the borrowing customers hence reducing their net worth thereby leading to credit-default which subsequently propels NPLs ratio as presumed by the credit default theory (see, for example, Sy, 2007; Crook & Banasik, 2005; Pyle, 1997; Davis, 1995). Hence, in line with the systemic risk theory which postulates the influence of external/macro risks on bank loan asset quality (see, for example, Collier *et al.*, 2013; Haldane & May, 2011; Cochrane, 2004; Berger & DeYoung, 1997). It is also

within the purview of financial intermediation theory of banking which stipulates the role of banks in intermediating between the surplus and deficit economic units. Also, it recognises the inherent risks associated with a mismatch of maturities of deposit taking and lending which can lead to credit default and subsequent NPLs (see, for example, Demirgüç-Kunt & Detragiache, 1998; Hester, 1994; Baltensperger, 1980).

Similarly, the coefficient of political instability also reveals a positive and significant relationship with NPLs. The result which is statistically significant at one percent indicates that an index increase in political instability will lead to an average increase in the ratio of NPLs by 4.28 percent. This is true in politically unstable economies because violence and unstable government interrupt with business processes and cash flows of economic units which affect their loans repayment abilities thereby creating and/or propelling the existence of NPLs. This is not surprising in the case of OPEC member states where almost all the economies are confronted with a high level of political instability. Even though unavailability of empirical evidence between political instability and NPLs is one of the motivations of this study. However, it contradicts the study of Rehman *et al.* (2016) which reveals a positive relationship between the democratic regime and NPLs in Pakistan. The possible reason for this contradiction might be that democratic governments in Pakistan politicise the management of banking system thereby creating NPLs while the OPEC member states' high level political instabilities positively affect NPLs.

The finding of present study reaffirms the systemic risks theory which stipulates that systemic risk factors such as political instability affect economic activities such as

expected country default rate, country creditworthiness and savings hence NPLs (see for example, Collier *et al.,* 2013; Haldane & May, 2011; Cochrane, 2004; Berger & DeYoung, 1997). It also, confirms the prediction of credit-default theory which holds that adverse occurrence of events such as political instability can influence the cash flow as well as the net worth of economic units to the extent that their capacity to save and repay loans will be constrained thereby leading to credit default hence NPLs (see, for example, Sy, 2007; Crook & Banasik, 2005; Pyle, 1997; Davis, 1995). Therefore, these lend support to the financial intermediation theory of banking which presumes that the associated risks of financial intermediation especially the mismatch of maturities can result in delinquencies and the liability transferred the borrowers (see, for example, Demirgüç-Kunt & Detragiache, 1998; Hester, 1994; Baltensperger, 1980).

Furthermore, the coefficient of environmental risks is found positively related to NPLs. The coefficient implies that an index increase in the level of environmental risks will lead to on average, about 0.17 percent increase in the ratio of NPLs in the OPEC member states. The statistic is significant at 99 percent confidence interval. The probable explanation of this scenario is that on the out break of a major natural and/or technological disaster, the loan repayment process can be put to a halt because the affected economic units will lose their source of revenues, employees will lose their sources of earnings as well as demand for goods and services will decrease due to the sustained losses (Klomp, 2014). Furthermore, the sources of government revenues through taxations will be constrained and the governments' spending will be geared toward resettlement and other recovery efforts as against developmental purposes. This

will affect savings and eventually loan repayment capacities of the economic agents, thereby creating bad loans.

Although, unavailability of empirical evidence between environmental risks and bank asset quality is one of the motivations of this study. However, the findings of this study are related to the findings of Collier *et al.,* (2011) which reveal a positive relationship between the disaster of El Nino and problem loans specifically the level of restructured loans in Northern Peru. Further, it is closely related to the result of the study of Klomp (2014) which was conducted taking evidence from 160 countries of the world which reveal a positive relationship between natural disasters and bank asset qualities.

The result of environmental risks variable in the current study is highly related to the systemic risks theory because of the sudden nature of disasters and their level of devastations especially in developing countries and emerging economies such as those of OPEC member states where vulnerabilities are high. The systemic risk theory underscores the finding of a statistically significant and positive relationship between environmental risks and NPLs in this study (see, for example, Collier *et al.,* 2013; Haldane & May, 2011; Cochrane, 2004; Berger & DeYoung, 1997). It is also further strengthened by the credit-default theory which holds that the effect of the adverse occurrence of an event constrains the cash flow and net worth of economic units to the point of credit default and subsequent NPLs (see, for example, Sy, 2007; Crook & Banasik, 2005; Pyle, 1997; Davis, 1995). This also reaffirms the significance of financial intermediation theory of banking in explaining the role of financial intermediation role played by the bank in creating lending to deficit economic units from

the deposits they mobilise from the surplus economic agents as well as the attendant risks of defaults which can lead to deterioration of loan quality (see, for example, Demirgüç-Kunt & Detragiache, 1998; Hester, 1994; Baltensperger, 1980).

The study controlled for real gross domestic products (RGDP) and unemployment in the estimation process. This is because the RGDP and unemployment are consistently providing negative and positive relationship respectively. This study is not an exception, the coefficient of RGDP is statistically significant at one percent level. It suggests that a billion US dollars' increase in RGDP will lead to a reduction in the ratio of NPLs on average by 4.09 percent. This is at least true for the OPEC member states. It is usually argued that an increase in RGDP of a country will lead to improvement in the general welfare of its economic agents. This will increase their spending capacities as well as their loan repayments abilities. This is in line with other series of studies in both developed countries of Europe, US, Australia, and other developing countries such as Nigeria and Tunisia (Abid *et al.*, 2014; Akinlo & Emmanuel, 2014; Makri *et al.*, 2014; Zaib *et al.*, 2014; Castro, 2013; Louzis *et al.*, 2012).

On the contrary, the coefficient of unemployment is positively and statistically significant. This shows that OPEC like other countries in the World, one percent increase in the level of unemployment will cause an average increase in the ratio of NPLs by 0.25 percent. Meaning that increase in the number of unemployed in an economy usually goes a long way with increased loans quality deterioration especially in a politically unstable economy with a high degree of corruption. The loans might not be paid back due to low cash flows because of unemployment and its attendant negative

consequences on general demand for goods and services, savings as well as government revenues. This will render many loans to be bad in the countries. This finding is in consonance with the results of studies such as Anastasiou *et al.* (2016a, 2016b), Konstantakis *et al.* (2016) Castro (2013) and Messai and Jouini (2013) who equally found a positive relationship between unemployment rate and NPLs.

The Table also displays the coefficient of the error correction term. This measures the speed or degree of adjustment. It is the reasonable length of time taken for deviation to adjust back to equilibrium in the long run. It is often that deviations usually occur in the short run, however, it is expected to adjust and revert back to equilibrium in the long run. The speed of adjustment in this study indicates that about 47 percent of deviations that occur among the group of countries in the short run will adjust back to equilibrium within the subsequent year. This is considered reasonable enough especially for OPEC member states which are bedevilled with the uncertainty of oil price which is their major source of dependence.

5.4 Sensitivity/Robustness Analysis

The characteristics of the data mandate us to run a sensitivity analysis to confirm the revealed estimates of the PMG model. This includes averaging the available data to estimate static panel models which assumed homogeneity of the parameters. This is based on the assumption that provided the slope of the coefficients is identical. The static model will yield the most consistent and efficient estimates (Wooldridge, 2002; Cameron & Trivedi, 1990). There are several regression models in static panel data analysis, the present study focuses on three static panel data estimation models. These

are Pooled Ordinary Least Squares (OLS), Random Effects (RE) and Fixed Effects (FE) models. Each of these models is associated to underlying characteristics which must be satisfied for estimates of the models to be efficient, reliable and unbiased (Gelman & Hill, 2007).

The pooled OLS model employed single regression estimate assuming that all the characteristics of each country in the sample are similar while dropping all unobserved specific effects (Baltagi, 2008). It means that the entire series in the sample have constant intercepts and slope of coefficient overtime. The fixed effect model basically captures specific effects in panel data set employed to analyse the effect of factors that vary over time (Frees, 2004). According to Torres-Reyna (2011), the fixed effect model assumed that each entity is considered distinct without any correlation between the intercept and the disturbance term. Whereas, the random effect assumes that variations across entities are randomly uncorrelated with each variable in the model (Tauringana & Afrifa, 2013).

5.4.1 Model Selection Criteria

The model selection to determine the appropriateness of a model among the three types of static modelling techniques may begin with Breusch and Pagan Lagrange Multiplier (LM) test. This determines the heterogeneity and suitability of random effect and Pooled OLS models. The test result in this study reveals a probability value of 0.030. Therefore, the result presented in Table 5.6 indicates that the estimated random effect model is more appropriate compared to the Pooled OLS model. This appropriateness is similarly argued in (Gelman & Hill, 2007).

The subsequent procedure is to compare between random effect and fixed effect models. This is carried out using Hausman (1978) specification test (Clarke, Crawford, Steele, & Vignoles, 2010). The estimate of the Hausman test presented in Table 5.6 reveals a probability value of 0.001. The Hausman specification test rejects the null hypothesis. This portrays that the fixed effect model is more appropriate compared to the random effect model (Hausman, 1978). Considering the nature of OPEC member states, the choice might be true for this type study since fixed effect model is more appropriate when the study concentrates on a specific set of *n* units of entities that are not randomly selected from a very large sample (Tauringana & Afrifa, 2013).

Table 5.6 presents the result of the alternative estimates for the model based on static modelling techniques. The results of the fixed effect model are therefore considered the most appropriate and hence interpreted. For further robustness check, the study increased the number of the explanatory variables to control for the possible effect of lending interest rate, real exchange rate and inflation. The results are discussed in turn.

The results in Table 5.6 suggest that the magnitude of the coefficients is almost similar to that reported in Table 5.5 for the pooled mean group model. The parameters maintain the same sign for all the series entered in the two models. Under the FE model, the oil price variable is negatively related to NPLs. The coefficient is equally significant as reported for PMG although the magnitude of the coefficient is higher in the short run (FE model) than the long run coefficient (PMG result). The coefficient suggests that a dollar increase in the price of oil will cause an average decrease in the ratio of NPLs by

almost 2 percent. It implies that the response is higher in the short run compared to the long run coefficient.

Table 5.6
Static Panel Model: Dependent Variable: NPLs for OPEC Member States

Variables	**Pooled OLS**	**Fixed Effect**	**Random Effect**
OP	-1.909***	-1.906***	-1.909***
	(0.617)	(0.554)	(0.617)
CORR	2.851***	4.173***	2.850***
	(1.013)	(1.279)	(1.013)
PIS	2.008**	3.203***	2.008**
	(0.968)	(0.851)	(0.968)
ERS	-0.097	0.300**	-0.097
	(0.360)	(0.135)	(0.360)
RGDP	-0.441	-1.046	-0.441
	(0.844)	(1.148)	(0.844)
UNEMP	-1.181	0.837	-1.181
	(1.044)	(1.075)	(1.045)
RER	-1.039	-1.178	-1.039
	(0.916)	(0.851)	(0.916)
LIR	-2.348**	-3.189***	-2.348**
	(1.116)	(0.934)	(1.116)
INF	2.123**	1.927**	2.123**
	(0.954)	(0.806)	(0.954)
CONS	16.706**	16.350**	16.706**
	(7.346)	(7.850)	(7.346)
R^2		28%	
Adjusted R^2		25%	
F-Wald		6.890	
Prob. F-Wald		0.000	
LM Chi-Square		3.687	
LM Probability		0.030	
Hausman Chi-square		27.80	
Hausman Probability		0.001	

Note: LM denotes Lagrange Multiplier, ***, **, * indicate that the parameter estimates are statistically significant at 1%, 5% and 10%, respectively. The figures in parentheses are the asymptotic standard errors. The detailed estimates of the different models are duplicated in Appendix E.

Likewise, the short run (FE) coefficients of corruption, political instability and environmental risks are similar to that of the long run (PMG) estimates. They are all equally significant at one percent except for environmental risks variable under FE model which is statistically significant at five percent level. However, the magnitude of the coefficient of ERS is higher in the short run than the long run. This is also an indication that the reaction of the borrowers to out-break of a major disaster is higher in the short run compared to the long run condition. It highly affects the loan repayment process of economic agents within the short period than it does in the long run when other repayment alternatives are available to the borrowers. Further, the menace of political instability in the OPEC member states is more severe in the long run compared to the short run. This implies that the interruption in business processes and cash flows of economic units which affect their loans repayment abilities is higher in the long run. This might not be unconnected to the gradual transmission mechanism involved in the political instability of nations especially the OPEC member states who experienced a long period of political instability except for Ecuador, Kuwait and United Arab Emirates (UAE).

However, the only difference between the heterogeneous and static panel models is that the coefficients of real gross domestic products which is found negative and significant under the PMG model, here (under the FE model) it is negative but statistically not significant. Similarly, the coefficient of unemployment for the PMG model is positive and statistically significant. For static FE model, it is only positive but statistically not significant. The non-significance might be explained by the dynamic nature of the variables which mostly take effect in the long run as in the case of the PMG model. The

time in the static panel model might be too short to accommodate the changes that can lead to the significance of the variables. Most importantly is the sign of the coefficient which is found to be the same irrespective of the method employed and the time length of the data as well as the statistical consideration of the long and short run conditions.

The finding of the static model, the short run estimate is in conformity with the pooled mean group which estimates the long run coefficient. Meaning that regardless of the time horizon considered for this study, the inference remains the same. Therefore, the hypotheses of this study are supported irrespective of the adopted modelling.

The study further includes additional control variables to account for the possible effect of RER, INF and LIR on NPLs of OPEC member states. The coefficient of real exchange rate is found statistically not significant for OPEC member countries. However, it reveals that an increase in exchange rate leads to a decrease in the ratio of NPLs by 1.178 percent. Although the coefficient is not statistically significant, yet the result of the study is in line with the findings of Alhassan *et al.* (2014) and Yurdakul (2014) which established an inverse relationship between exchange rate and NPLs.

Similarly, the coefficient of OPEC lending interest rate reveals an inverse relationship between LIR and NPLs. The coefficient is statistically significant at one percent. The result indicates that a one percent increase in the lending interest rate will lead to an average decrease in the ratio of OPEC NPLs by 3.189 percent. The implication of this result is that when a LIR is reduced, the propensity of NPLs will increase for OPEC member states which is contrary to the findings of Zaib *et al.* (2014). However, the

inverse relationship revealed by this study is in line with findings of Ali and Daly (2010) and Goel and Hasan (2011).

However, the coefficient of inflation in relation to NPLs is statistically positive and significant at five percent level. The result shows a percentage increase in inflation rate will go a long way with an increase in the average NPLs by 1.927. The result implies that an increase in inflation rate will reduce the monetary/purchasing values of borrowing customers, thereby increasing the rate of credit default which will create and/or increase the level of NPLs. This finding is in support of other similar studies such as Ghosh (2015), Abid *et al*. (2014) and Mileris (2012).

Generally, the R-square of the fixed effect model is less relevant in explaining the variation explained in the dependent variable by the explanatory variables (Wooldridge, 2002). The coefficient of determination in this study explained about 28 percent of the variation in NPLs by the estimated systemic risks factors similarly the adjusted R-square is around 25 percent. This is within the ranges of R-squares reported by Ivashina and Scharfstein (2010), Shehzad *et al.* (2010), Nair-Reichert and Weinhold (2001) and Haddad and Harrison (1993). Furthermore, the F-Wald chi-square probability value of this model justifies the statistical adequacy of the model at one percent level of significance. Therefore, the estimated coefficients in the model can adequately explain the behaviour of the OPEC NPLs.

5.4.2 Diagnostics Test

The study conducts post estimation diagnostic tests to avoid reporting and drawing inference on spurious results. The study conducts the test based on the favoured and interpreted model of the study. The discussed model is the fixed effect which allows for assessment of heteroscedasticity, autocorrelation, normality of residuals and multicollinearity. Although the test for autocorrelation is not necessary for this type of sample where the time period is not more than 10 years, however, it is conducted to ensure consistency of estimates. The study conducts a test for heteroscedasticity using the modified Wald test for group wise heteroscedasticity in the fixed effect regression model proposed in (Baum, 2006). The Normality of residuals is tested based on Mardia (1980). The test of multicollinearity is carried out using variance inflation factor (VIF) (Hair, Black, Babin, & Anderson, 2009) and finally, the Wooldridge test for autocorrelation in panel data is employed (Wooldridge, 2002). The results of the conducted tests are shown in Table 5.7 and Table 5.8 for the variance inflation factor result.

The results in Table 5.7 indicates that the chi-square value is not significant. This is revealed by the non-significance of the probability at any conventional level of significance.

This implies that the model fails to reject the null hypothesis that the variance of the model is constant over time (homoscedastic). Similarly using the residual value fitted plot (RVF), the result indicates that the pattern based on plots presented does not violate the assumption that NPLs is linear against the independent variables. The plot is

presented in Figure 5.1. Thus, the tests indicate that the model does not suffer the problem of non-constant variance (heteroscedasticity) in the model.

Table 5.7
Diagnostics Tests

Tests	**p-value**
Heteroscedasticity	0.126
Autocorrelation	0.573
Test for Normality	0.304

Note: The displayed statistics are the probability values against the tests statistics.

The Wooldridge test for autocorrelation in the panel data is also found statistically not significant. This is given by the non-significant probability value presented in Table 5.7. The test reveals that the data is not associated with the first-order autocorrelation. This is very likely from the nature of the data which is just averaged into years based on two non-overlapping years. The time period is considered short for the problem of serial correlation to manifest in the data generating process. That is probably the reason why the test is more appropriate in the case of a macro panel with long time series rather than the micro panel with very few years.

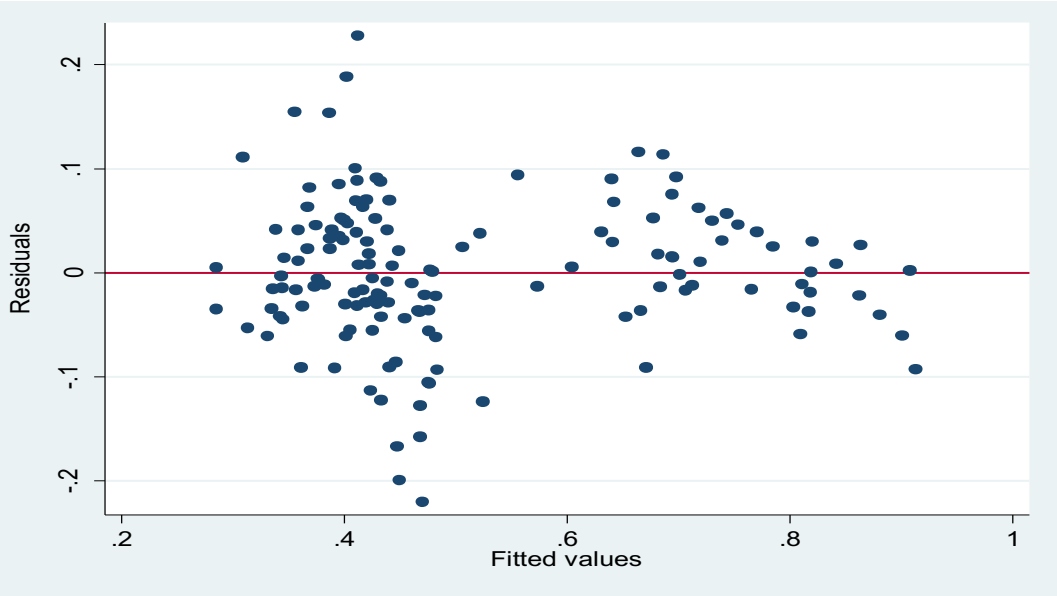

Figure 5.1
Residual vs. Fitted Value Plot

Furthermore, the results of Mardia normality test in Table 5.7 shows a probability value of 0.304. This is an indication that the residuals of the model are asymptotically normally distributed. The problem of multicollinearity in the data is investigated using the variance inflation factor presented in Table 5.8.

Table 5.8

Multicollinearity Test: Variance Inflation Factor

Variables	**VIF**	**1/VIF**
OP	2.54	0.393
CORR	2.63	0.380
PIS	4.78	0.209
ERS	4.49	0.223
RGDP	3.55	0.281
UNEMP	2.86	0.349
RER	1.76	0.568
LIR	5.28	0.190
INF	2.31	0.433
Mean VIF	3.36	

The basic concern in multicollinearity according to Kumar (1975) is that an existence of multicollinearity leads to unstable regression coefficient or parameter estimates and eventual inflation of standard error. The existence of high multicollinearity leads to unreliable regressions coefficient of the estimated parameters. The statistics presented in Table 5.8 reveals that the average variance inflation factor 3.36 which is below 5 and a maximum of 10 which show an extreme existence of multicollinearity. The statistics reported for this study is within the range suggested in Hair *et al.*, (2009). Therefore, the variables are purely independent of one another and that the reported standard errors in the model do not suffer the problem of multicollinearity.

5.5 Hypothesis Testing

The hypotheses earlier formulated to guide the study are discussed and related to the findings of this study under this subsection. The discussion is carried out based on the sign and significance of the coefficients of the parameters used in testing the hypotheses of the study.

5.5.1 Oil Price Changes and Non-Performing Loans

The first hypothesis of the study states that changes in oil price significantly affect NPLs in OPEC countries. The result of the oil price variable in Tables 5.5 and 5.6 for the PMG and FE models respectively indicate that the OP coefficient is negative and statistically significant at one percent level. The result suggests that increase in the oil price changes will improve the cash flow position of borrowing customers which will enhance their ability to pay back loans as at the maturity period (see, for example, Al-Khazali & Mirzaei, 2017; Miyajima, 2016). This is anticipated to reduce the ratio of the banks'

NPLs in the OPEC member countries. However, there is no much empirical evidence on the relationship between oil price and NPLs, yet, the result is still related to the most closely related studies in the area which are; Al-Khazali and Mirzaei study reveals that a rise in oil price reduce NPLs amongst major oil exporting countries and the study Miyajima (2016) which finds a lower growth in oil prices leads to a higher NPLs amongst oil exporting country of Saudi Arabian banks. The result of this study equally finds that a higher oil price leads to a lower NPLs amongst the oil exporting countries of OPEC. This hypothesis is therefore supported in both long run and short run conditions estimated using PMG and FE models respectively.

5.5.2 Corruption and Non-Performing Loans

The second hypothesis formulated to guide the study states that corruption significantly affects NPLs in OPEC countries. The coefficient estimates of corruption both in the long and short run conditions presented in Table 5.5 and Table 5.6 reveal that there exists a significant relationship between corruption and NPLs. This is evident by the one percent significance and positive relationship between the series. Impliedly, the result explains that an index increase in the level of corruption will cause more than four percentage point increase in the ratio of NPLs. This means that an increase in country-wide corruption will cause inappropriate approval of loans which may be detrimental to quality loan portfolios. This type of result is similarly reported in Park (2012) which reveals a significant positive relationship between corruption and the assets quality of the banking sector, that is, NPLs. Further, Goel and Hasan (2011) also find a significant positive effect of corruption and bad loans, that is, a greater corruption increases bad

loans which are NPLs. The finding evidently supports the hypothesis that corruption significantly affects NPLs in OPEC countries.

5.5.3 Political Instability and Non-Performing Loans

Given the nature of political instability of the OPEC member states and the insufficient empirical literature between political instability and NPLs, the study developed a hypothesis which predicts that political instability significantly affects NPLs in OPEC countries. The estimated coefficient of the political instability variable shows a positive and significant relationship between the variables. This holds true both in the main model and sensitivity analysis. The significant relationship is explained by the fact that countries that are politically unstable are faced with violence and unstable government which usually interrupt with business processes and cash flows of economic units. This will immensely affect their loans repayment abilities. This might be particularly true for the OPEC member states who are bedevilled with a high level of political instability. This finding might be related to the study Rehman *et al.* (2016) which was on the relationship between the political system of a country and its NPLs. The study of Rehman *et al.* finds a positive relationship between the democratic political system and NPLs in Pakistan in the period 1998-2009. The implication of this finding is that the formulated hypothesis is strongly supported at least using OPEC data.

5.5.4 Environmental Risks and Non-Performing Loans

The fourth hypothesis of the study enquires about whether environmental risks significantly affect NPLs in OPEC countries. Although the coefficient of environmental risks is found weaker than the rest of the systemic risk factors, however, the parameter

estimate is statistically significant at one percent and five percent levels for the main model (PMG) and robustness check (FE) model respectively. The finding is explained by the natural and technological disasters which usually lead to the destruction of lives, properties and means of livelihood which eventually lead to credit default and bad loans (see, for example, Klomp, 2014). This is aggravated by both internal and external shocks especially oil spillage which affects the general ecology of the environment which in turn affects the harvest and repayment ability of the borrowers. This finding can also be related to the studies of Klomp and Collier *et al.* (2011) who found a relationship between environmental risks of disaster and, loan repayment performance of borrowers as well as problem loans respectively. More specifically, The study of Collier *et al.* reveals that El Nino disaster significantly increased problem loans in Northern Peru within the period of 1997-1998. Thus, the result of this study supports the hypothesis which postulates that environmental risks significantly affect NPLs in OPEC countries.

5.6 Summary of Hypotheses Testing Results

The summary of the results of the four research hypotheses tested is provided in Table 5.9. The four variables of interest of oil price changes, corruption, political instability and environment risks of this study under the main model (PMG) have all been found to be statistically significant and positive except oil price changes which was found to be negative but also significant at one percent levels. Furthermore, the results did not vary under sensitivity/robustness check (FE) model as they are under the main model (PMG) in terms of the level of significance and signs except the parameter estimate of environmental risks variable. The parameter estimate of the environmental risks under

the robustness check model (FE) is statistically significant and positive but at five percent level.

Table 5.9
Summary of Objectives and Results of Tested Hypotheses

Research Objective		**Hypothesis**	**Expected Sign**	**Results**	**Decision**
To examine the effect of oil price changes on Non-performing loans in OPEC countries.	H_1	Oil price changes significantly affect NPLs in OPEC countries.	-	Significant Negative	Supported
To investigate the effect of corruption on Non-performing loans in OPEC countries.	H_2	Corruption significantly affects NPLs in OPEC countries.	+	Significant Positive	Supported
To examine the effect of political instability on Non-performing loans in OPEC countries.	H_3	Political instability significantly affects NPLs in OPEC countries.	+	Significant Positive	Supported
To determine the effect of environmental risks on Non-performing loans in OPEC countries.	H_4	Environment risks significantly affect NPLs in OPEC countries.	+	Significant Positive	Supported

5.7 Chapter Summary

The chapter estimates, interprets and discusses the relationship between NPLs and systemic risks factors. The empirical analysis establishes new and additional evidence with regard to the effects of systemic risks, namely, oil price changes, corruption, political instability and environmental risks on NPLs. Furthermore, both the new and additional evidences are in compliance with the underpinning theories adopted for the study. The study further explains the relationship between control variables such as real gross domestic products, and unemployment in the main model, as well as inflation, lending interest rate and real exchange rate in addition to the earlier mentioned control

variables in the sensitivity analysis. The key findings of the study include the following.

The results of the estimated models support the hypotheses of the study. The coefficient of the oil price changes is negative as expected and obtained in other related studies and statistically significant. However, the other systemic risks coefficients are found positive and statistically significant. So also, the coefficients of the control variables are found mostly as expected and statistically significant in the main model and commonly significant in the sensitivity analysis except for real gross domestic products, unemployment and real exchange rate which are found statistically not significant under the chosen model, that is, fixed effect.

Fascinatingly, the robustness analysis in Table 5.6 mostly support the findings reported in the main model. This is a pointer to the fact that the inference drawn based on the hypotheses of this study are not sensitive to changes in the long and short run situation, models of estimation. Finally, the results do not vary as a result of an increase in the number of control variables in the model.

CHAPTER SIX

CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

This is the sixth chapter of the study which presents the summary of the key findings of the research. The chapter proposes policy implications of the findings. It also highlights the encountered challenges, limitations of the study and finally, outlines possible recommendations for future studies. The enumerated subsections of the chapter are discussed in turn.

6.2 Summary of Findings

The study focuses on the effects of systemic risks on the ratio of NPLs of 13 OPEC member states. The study examines four objectives using annual panel data set for 20 years, spanning 1996 to 2015. The first research objective examines the effect of oil price changes on NPLs in OPEC member states.

The first objective of the study investigates the effect of oil price change on NPLs in OPEC countries. The result of the study shows the estimated coefficient of oil price changes is found negative and significantly related to NPLs in OPEC countries. This is investigated both in the long run using dynamic panel ARDL (Pooled Mean Group) and as a sensitivity analysis using a static panel of fixed effect model. Although both the methods reveal a negative and significant relationship between the variables, however, the extent of the effect is higher in the short run (sensitivity analysis) compared to the long run estimates of the main model. This evidently indicates that positive changes in

the oil prices lead to a decrease in the ratio of NPLs. The result exists regardless of controlling or otherwise for other variables such as real GDP, unemployment, inflation, lending interest rate and exchange rate. The possible explanation of this finding is that crude oil price appreciation will improve the net worth position of borrowers and that will decrease their chances of credit default. This is particularly true for all the OPEC member states who depend basically on crude oil as a source of their revenue. The countries are sensitive to oil price changes which have been persistent over the years. Similarly, a decrease in oil price will certainly depreciate the net worth of economic units thereby reducing their ability to pay back loans hence propelling the ratio of NPLs as it is most evident in the current downward slope of oil prices.

The second objective deals with the impact of corruption on the ratio of NPLs in OPEC member states. The finding reveals that the coefficient of corruption is found positive and statistically significant. It indicates that rise in the level of corruption aggravates the ratio of NPLs in the studied countries. This is equally found similar using both PMG and static FE model. The magnitude of the effect in the main model is not far from the model of the sensitivity analysis. The estimates specify that economy-wide corrupt practices will lead to the creation of inappropriate credits, insider credits as well as the diversion of loans to projects other than those approved by the credit committees which eventually turns out to be bad loans hence leading to high ratios of NPLs. It also increases the cost of the loans which makes it difficult for the borrowers to pay back their loans. Most of the OPEC countries with much higher indexes of corruptions such as Nigeria, Libya, Iraq, Algeria and Indonesia are also faced with the challenges of corruption among law enforcement agencies and Judges thereby making loan recoveries extremely difficult.

The study further reveals that the result is true even after controlling for other factors mentioned earlier. Interestingly, the results of the corruption coefficients did not vary throughout the estimation process.

The third objective of the study determines the effect of political instability on NPLs in OPEC countries. This is similarly carried out using both the PMG and static FE models. The finding indicates that the coefficients of political instability are positive and significantly different from zero at least for the politically unstable OPEC member states. Thus, the estimates reveal that a rise in the level of political instability specifically in the OPEC countries will cause loan defaulting with a magnitude higher than the rate of increase in the index of political instability. The same findings with slightly different magnitude are obtained in both the main and supplementary models. It therefore, showcases that the prolonged and wide spread of political instabilities existing in the Middle-East and North Africa (MENA) where about 60 percent of OPEC nation states come from, that is, Iraq, Iran, Saudi Arabia, Kuwait, Libya, Qatar, Algeria and the United Arab Emirates is affecting business activities and government spending which invariably affect banking business such as lending and loan repayment. The issue of political instability is equally getting more pronounced in other OPEC countries such a Nigeria, Angola, Venezuela and Indonesia ranging from terrorism, internal civil conflicts, separatists' activities and unstable governments. These affect economic units' cash flows, depreciated their net worth and depleted demand for goods and services hence causing credit-defaults and NPLs.

The last objective of the study examines the influence of environmental risks on NPLs. The estimated results from both the dynamic and static panel models indicate that the environmental risks positively affect the NPLs of the OPEC countries. Although the size of the coefficient is higher in the sensitivity model, which considers short run estimates, the long run coefficient is found to be more significant compared to the static estimates. This is an indication that sudden environmental shocks are more deadly to NPLs of the OPEC member states than the sustained environmental shocks. However, the sustained shocks tend to appear stronger than the sudden shocks. The most likely interpretation of this finding is that the persistent natural and technological disasters affecting most of the OPEC member states in form of oil spillages, flooding, earthquakes, severe and extreme weather conditions, epidemics, tsunamis, droughts and various forms of industrial accidents such as plane crashes have immensely interrupted business processes. The impacts of such disasters have destroyed business formations, caused deaths and permanent disabilities to employees and consumers alike which have eroded their means of livelihood leading to credit defaults hence NPLs. The spending of governments of the affected countries have equally being affected were attentions have always been diverted to response and recovery actions during and in the aftermath of disasters.

6.3 Policy Implication of the Findings

Generally, the findings of this study have interesting policy implications, since they provide new and additional evidences of the systemic importance of oil price changes, corruption, political instability and environmental risks for bank asset quality in oil exporting countries of OPEC. The findings of the study reveal that there exists a significant relationship between oil price changes and NPLs. The sign of the coefficient

indicates that increase in the oil price leads to an average decrease in the ratio of NPLs. The policy implication of this finding is that for the OPEC member countries to achieve a continuous minimization of bad loans and subsequent financial stability the OPEC economies should efficiently increase their earnings from the oil exportation. This should be pursued through a decrease in output or strong cartel strategies among the OPEC countries. Besides, this can be alternatively achieved through increased diversification of the OPEC economies from the monoculture economic activity of oil exportation. A recent study, Al-Khazali and Mirzaei (2017), posits that for the oil-exporting countries to reduce high NPLs they should diversify their economies by promoting non-oil sectors. This can be actualized through focusing on investment into agriculture and manufacturing sectors to ensure strong export ability from alternative sources. It will provide an additional source of earnings to the countries which will increase the cash flow and net worth position of the teeming borrowers and that will decrease their chances of credit default. Moreover, it will tend to reduce the usual shocks emanating from the uncertainty of oil prices as also recommended in Al-Khazali and Mirzaei.

Further, the findings highlight systemic implications of oil price changes on bank asset quality which underscores the relevance of macro prudential policies in OPEC countries that will serve as mitigation mechanism against the proliferation of NPLs and promote financial stability. This policy implication is not different from those discovered in the studies of Al-Khazali and Mirzaei (2017) and Miyajima (2016) in oil exporting countries and Saudi Arabia respectively. The finding of their studies implied the urgent needs for adaptation of macro prudential policies that will mitigate the adverse impact of oil price

fluctuations amongst oil exporting countries. For example, tying bank capitalisation to oil price shocks will help in mitigating procyclical bank lending and oil price fluctuations should be taken into account in bank credit appraisals, loan stress-testing and loan monitoring functions of the lending banks.

Moreover, the OPEC economies should work towards policies that enhance exchange rate stability and appreciation as it was implied in the study of Farzanegan and Markwardt (2009) of the oil exporting country of Iran. Their findings indicate positive oil price changes improves real exchange rate and leads to an appreciation of local currency. This can also be realised through an increase in productivity as well as an external trade which will improve the climate for foreign investment (Al-Khazali & Mirzaei, 2017). These will encourage more demand for the domestic currencies which better off the domestic clients in their loans repayment. Similarly, the OPEC economies should try to curtail inflation to avoid eroding the value of cash flows into the economies as suggested for Iran that faced a related problem which was reported by Farzanegan and Markwardt. This can be achieved through keeping money supply to the barest minimum to discourage persistent level of high consumer prices in the economies(see, for example, Beck *et al.,* 2015; Ghosh, 2015; Castro, 2013).

The findings of the second objective reveal that corruption in the OPEC countries tends to intensify the level of the nations' NPLs. This is evident from the results of the study under both the main and alternative models. The probable implication of this finding is that the prevailing level of corruption in the economies will continue worsening the NPLs of OPEC member states. Park (2012) contends that corruption distorts the

allocation of bank funds from good project to bad projects which decrease the quality of private investments. This has serious adverse consequences on not only bank asset quality and financial stability but also it leads to decreases in economic growth. This should be addressed through appropriate enforcement of law and order that will sanitise the level of corruption in the countries. The regulatory agencies should objectively prevent inappropriate credits issuance, insider credits and loan diversion which lead to high ratios of NPLs. Therefore, Goel and Hasan (2011) opine that bad loans can be lowered government policy perspective, that is, promulgating policies that will strengthen institutional qualities. This will reduce the high costs of issuing loans which are usually inflated through corrupt practices which make it difficult for the borrowers to pay back their loans. Therefore, the result of this study on corruption gives an impetus to the fight against corruption in other to protect the banking sector and improve financial stability as it was implied in the study of Weill (2011) which took evidence from Russian banks.

Governments of the affected countries should re-constitute their institutional qualities through effective supervisory functions, accountability and transparency of regulatory agencies. However, Park (2012) maintains that exerting efforts to fight corruption is an important component of enhancing the soundness of the banking sectors and ensuring general financial stability otherwise, the regulatory measures and/or the improvement of managerial skills of bank management skills will not be effective. This can be appropriately monitored through mechanisms of stringent prudential guidelines as well as continuous monitoring of the activities of lending financial institutions. The

establishment of institutions like independent financial crime detection and prevention agencies, and adequate punitive sanctions against corrupt practices.

The fight against corruption should also be taken to the next level through the global cooperation of nation states especially those that serve as a safe haven for corruption. This policy implication to the OPEC countries is similar to that of ECOWAS countries in the study of Abu *et al.* (2015) which implied that in the fight against corruption there is the need for the governments to seek for international cooperation of the international community especially the developed countries where the proceeds of corruption are kept. Furthermore, the legislation of whistleblowing and its attendant positive sanctions be intensified as it has proven to be effective in other sectors especially the public sector of the world such as Nigeria in the recent time. The regulatory bodies should be accorded a magnificent autonomy in their operation. Base on the corruption index it is pertinent to mention that the enforcement of rules to curtail the menace of corruption, the policy makers in Nigeria, Libya, Iraq, Algeria and Indonesia require a high degree of discretion to rationally erode the high level of the corruption which has eaten deep into the attitudes of the populace. The fight against corruption is very important despite its positive impact on economic growth as reported by other studies in the literature which must be interpreted with caution as they do not imply that corruption should be encouraged (Okada & Samreth, 2014).

Furthermore, the implication of finding emanating from the third objective of this study is that political instability in the studied countries has significantly affected the NPLs of OPEC member states. This is accounted for by the prolonged and wide spread of

political instability existing in the Middle-East and North Africa (MENA) countries. The implication of the aforesaid is that it affects the economic units' cash-flows, depreciates their net worth and depleted aggregate demand for commodities and services. This will eventually cause credit defaults and NPLs in the economies. Thus, the OPEC governments of the concerned economies should focus on policies that will ensure political stability. This is related to the implications of the findings of Abu *et al.* (2013) in ECOWAS countries on how political instability interrupted with economic activities to the extent that country-wide savings dropped. Further, the study of Abu *et al.* implied the promotion of political stability in ECOWAS countries in order to raise savings. Also, the policy implications of the findings of the present study is related to those of Cuadra and Sapriza (2008), Busse and Hefeker (2007), Dinç (2005) and Le (2004) which reported adverse effect of political instability on economic activities hence suggested effort towards political instability in their countries of study.

However, the policy implication of the finding of Rehman *et al.* (2016) is contrary to the policy implication of the present study because the former study reports that democratic (political stability) increases NPLs. Therefore, the policymakers OPEC member states should pay attention to fight against terrorism, internal civil conflicts, and separatists' activities. Furthermore, the policymakers should minimise rampant changes in financial and other economic policies, thereby ensuring political stability in the economies. While ensuring the political stability, special attention should be paid to OPEC states like Iraq, Libya, Nigeria, Algeria, Venezuela and Indonesia through good governance. Therefore, from the above policy perspectives, the main implication of the finding on the effect of political instability on bank asset quality in OPEC member states is that of creating and

restructuring political institutions as well as good governance which will minimize political instability. Consequently, such measures will not only have a positive impact bank asset riskiness but also on financial stability hence on economic growth and welfare of the citizens (see, for example, Svensson, 1998).

The policy implication of finding of the fourth objective of the study is that environmental risks are found to be aggravating the menace of NPLs of the OPEC countries. This is not unrelated to persistent natural and technological disasters bedevilling most of the OPEC member countries. This includes the usual phenomenon of oil spillages, earthquakes, flooding, extreme weather conditions, epidemics, and various forms of industrial accidents such as plane crashes already highlighted elsewhere in this study. In a related study on the relationship between environmental risks and financial fragility Klomp (2014) posits geophysical and meteorological disasters have an adverse effect on bank riskiness. These will immensely interrupt the countries' business practices. It is also said to have destroyed business formations, caused deaths and permanent disabilities to employees and consumers which lead to credit defaults and increased NPLs. Although, this depends on the size and scope of the catastrophe as well as the rigorousness of the financial regulation and supervision of the particular countries under consideration (Klomp).

Notwithstanding, these disasters are mostly natural in nature with fewer governments control over their occurrence, yet, the governments of OPEC member states can mitigate their effects on NPLs within their limits by ensuring strong legislation for all businesses and economic units in the countries to take adequate insurance cover against these

calamities. This policy implication is similar that of Klomp (2014) which suggests that to remain stable, policy makers should connect reserve requirement to environmental risks present in countries which frequently hit by natural disasters. This will lessen the rate of risks and the traditional government spending on the affected entities in form of bailouts, transfers and rehabilitations.

Consequently, governments of OPEC member countries should ensure that their prudential guidelines cover lending to business activities that are prone to such disasters. This can be done through the spread of loans across different geographical areas and sectors of the economy as well as adequate disasters response action plans. This similar policy implication is also revealed in the study of Collier *et al.* (2011) which argued that the correlated risk exposure of many small borrowers can significantly affect the lender as well as the importance of considering the bank management in assessing disaster risks of financial institutions. Also, the findings of the study of Collier *et al.* (2013) which show that disasters lead to large loans losses cause lenders to contract credit implied the need for the insurance-like mechanism (insurance policy) to be purchased by financial intermediaries that could transfer their environmental risks. Thus, Collier and Skees (2012) maintain that insurance allows the lender to manage environmental risks more effectively and efficiently.

Besides, Weber *et al.* (2008) in the study of the impact of integrating environmental risks in the credit risk management process of European banks, the policy implication of the findings was that of an improved risks management performance and lower credit-defaults. This is consistent with that of Weber, (2012) which stipulates the importance of

reactiveness regarding environmental examinations of loans to the business performance of Canadian banks and other financial institution. Thus, the general policy implication of the finding on the relationship between environmental risks and bank asset quality in OPEC member countries is the relevance of macro prudential guidelines that will cover risks in relation to bank lending. This is anticipated to cover the role of the banks in incorporating environmental risks in credit management functions such as credit appraisals and approvals, bank loan monitoring through disaster risks scanning and insurance covers for loans that are prone to disaster risks.

Overall, the policy implications of the findings of this study on the relationship between systematic risks factors of oil price changes, corruption, political instability, environmental risks and bank asset quality are high relevance to financial stability. Hence, there is a need for macro prudential policy and action plans that will mitigate the impacts of these systematic risks on loan performance and financial stability. Consequently, this should involve policy responses such as diversification of OPEC countries economies to reduce the impact of oil price fluctuations and intensified efforts through international community collaboration in the fight against corruption. Further, the policy response should include good governance through restructuring of political institutions for better performance that will reduce level of political instability in OPEC member countries as well as concerted by the governments to develop action and response plans that will mitigate the impact of environmental risks on bank asset quality and insurance covers to ameliorate the effects of disasters on loan performances and financial stability.

6.4 Limitations of the Study

This study like others is not without having limitations. Specifically, some of the limitations comprise; unavailability of longer sample data for the OPEC member states, say monthly observations that could have allowed the estimation based autoregressive conditional heteroscedastic (ARCH) model to allow for volatility since one of the variables of interest is oil price changes. Similarly, the study covers only the organisation of petroleum exporting countries which is not regional specific. The only oil exporting countries considered in this study are Algeria, Angola, Ecuador, Indonesia, Iran, Iraq, Kuwait, Libya, Nigeria, Qatar, Saudi Arabia, United Arab Emirate and Venezuela.

The study is also limited to the use of Worldwide Governance Indicators for corruption and political instability. Although the indices are sufficient, and widely used in the modern researches, however, the results might have been different using indices from transparency international and US State Department. This might have altered at least the magnitude of the response of NPLs in the OPEC member states. This might have been caused by the insufficient data for some of the OPEC countries from the later data sources. However, the availability of data from the Worldwide governance indicators and their fascinating methodologies compared to the alternative sources justify its usage.

Moreover, this study estimates the long run relationship between NPLs and systemic risks factors using the methodology developed in Pesaran *et al.* (1999) because of the common product of OPEC member states which is expected to influence the long run coefficient in a similar way. This, therefore, constrains the long run estimates to be

similar among countries while assuming variation in intercepts and short run coefficient. However, another limitation of the study is the inability to estimate this type of relationship for all regions or similar groups of countries such as Sub-Saharan Africa, Economic Community of West African States (ECOWAS), Gulf Cooperation Council (GCC), European Union (EU) among others. Although this is not within the scope of this study investigating such relationship will bring about wider generalizability or otherwise of the tested hypotheses among different countries.

The sensitivity analysis conducted in this study uses two years non-overlapping averaged data to estimate static panel, fixed effect model. This would have been conducted using other dynamic panel data techniques such as Generalised Method of Moments (GMM) estimators proposed in Arellano and Bond (1991) and Arellano and Bover (1995) to account for the anticipated dynamism in the model. However, it is constrained due to quite a few number of entities emanating from the sample of the study as well as the possible fear of instrument proliferation.

Generally, the present study is limited to concentration on aggregate NPLs without taking into account the distinctive features of Islamic banking. However, the comparative analysis of this type is outside the scope of this study.

6.5 Recommendations for Future Research

This study attempts to address several issues found in the literature that hindered appropriate financial policy formulation especially in the cartel of countries exporting

petroleum resources. However, the study does not absolutely address all the weaknesses of the previous studies.

First, the study uses annual data from OPEC member states to investigate the effects of systemic risks on NPLs. Based on the limited sample of OPEC economies, the study recommends that future studies should be conducted considering other countries of the world that export petroleum products even if they are not OPEC members. Further studies should extend the present research using higher frequency data to appropriately account for the volatility in the oil price changes. Similar methodologies should be used to conduct this type of study in other countries or group of countries different from OPEC.

Secondly, the study employs Worldwide Governance Indicators for corruption and political instability to test their effect on NPLs of OPEC countries. The study recommends using indicators from other rating agencies such as Transparency international and US state department among others. Further studies should consider a new set of information to further determine the factors that explain NPLs in the OPEC member countries and even beyond.

Furthermore, in small open economies like most of the OPEC countries which are confronted with financial stress and excessive interest rate liberalisation, such variables like; financial stress, country risk perception index and interest rate liberalisation among others Torres (2003) should also be examined in the estimation process. Although the study accounted for environmental risks in the analysis, however, further studies should

also consider the influence of structural breaks. This entails that the influence of the break should be examined using appropriate methodologies. These methods may include but not limited to Gregory and Hansen (1996) and Johansen, Mosconi and Nielsen (2000) for analysing co-integration in the presence of structural breaks.

Even though this study estimates the long run relationship between NPLs and systemic risks factors using the Pooled Mean Group (PMG) otherwise called Autoregressive Distributed Lags (ARDL) Model. The study also conducted a sensitivity analysis using static panel approach of fixed effect model assuming homogeneity of the estimates. However, future studies should increase the sample of entities to carry out the analysis using dynamic panel methods like GMM estimators proposed in Arellano and Bond (1991) and Arellano and Bover (1995). This takes account of both serial correlation and heteroscedasticity in the model. It provides consistent and efficient estimates in the presence of a large number of entities. The study further recommends that similar studies should be conducted using other models such as non-stationary panels to account for trending characteristics of the data which leads to non-stationarity of series. Given the length of the data, this may include Pedroni (2004) and Kao (1999) panel Cointegration tests to mention but only a few.

The study also recommends that future studies should look at the comparative analysis between NPLs in the conventional and Islamic banking platforms. Thus, the same study should be replicated irrespective of whether oil exporting or importing countries to see the severity of systemic risks on the ratio of their NPLs.

6.6 Contributions of the Study

This is study has numerous contributions to policy makers, practitioners, and to the field of banking establishing an empirical link between systemic risks of oil price changes, corruption, political instability, environmental risks and NPLs. These contributions are categorised into practical, theoretical, methodological and contribution to knowledge as highlighted below:

i. Policy Implication Contribution

The findings of the study will allow for micro-stress and macro-stress tests of loans against certain systemic risks factors. It will help in identifying key vulnerabilities and formulation of policies that will strengthen general financial stability and resilience of banks against systemic risks. The bank regulators and management can incorporate systemic risks in their credit decision criteria and loan monitoring. Therefore, this study has made policy recommendations to the policy makers which will help regulators and bank management and practitioners in achieving financial stability amongst the OPEC member states.

ii. Theoretical Contribution

Most of the previous studies on NPLs such as those of Anastasiou *et al.* (2016a), Konstantakis *et al.* (2016), and Beck *et al.* (2015) did not give much attention to systemic risks and were mainly restricted to the conventional determinants of NPLs. The empirical analysis of this study establishes new and additional evidence to the studies of Al-Khazali and Mirzaei (2017), Miyajima (2016), Rehman *et al.* (2016), Park (2012) and Collier *et al.* (2011) with regards to the effects of systemic risks, namely, oil price

changes, corruption, political instability and environmental risks on NPLs. Consequently, this study has added to the understanding of the underpinning theories of this study as they relate to NPLs.

iii. Methodological Contribution

Unlike many previous studies, this study is among the few studies like those of Nikolaidou and Vogiazas (2017), Yurdakul (2014) and Adebola *et al.* (2011) that employed a more efficient PMG/ARDL estimator in modelling NPLs. Nevertheless, this study has made it possible to estimate the long run effects of the systemic risks on NPLs using the PMG methods. Thus, the use of PMG in this study has contributed to the long run modelling of NPLs.

iv. Contribution to the Body of Knowledge

The results of this study have contributed to expanding the frontier of knowledge of banking and how systemic risks are embedded in the banks' business environment and their effects on bank assets qualities as well as their implications to financial stability.

6.7 Conclusion

In conclusion, this study investigates the effect of systemic risk factors of oil price changes, corruption, political instability and environmental risks on NPLs amongst OPEC member states. The study relied on the financial intermediation theory of banking, systemic risks theory and credit-default theory as the underpinning theories in explaining the relationship between the variables. This chapter concludes the study by availing the summary of the findings made by the research, policy implications of the

findings and made recommendations. This chapter also highlighted the limitations of the study and provided suggestions for future research.

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Appendix A

Table 1.3
OPEC Member States' TI Corruption Perception Index
Corruption Perception Index

Year	ALGERIA	ANGOLA	ECUADOR	IRAN	IRAQ	KUWAIT	LIBYA	NIGERIA	QATAR	S/ARABIA	UAE	VENEZUELA
2000	NA	1.7	2.6	NA	NA	NA	NA	1.2	NA	NA	NA	2.7
2001	NA	NA	2.3	NA	NA	NA	NA	1	NA	NA	NA	2.8
2002	NA	1.7	2.2	NA	NA	NA	NA	1.6	NA	NA	NA	2.5
2003	2.6	1.8	2.2	3	2.2	5.3	2.1	1.4	5.6	4.5	5.2	2.4
2004	2.7	2	2.4	2.9	2.1	4.6	2.5	1.6	5.2	3.4	6.1	2.3
2005	2.8	2	2.5	2.9	2.2	4.7	2.5	1.9	5.9	3.4	6.2	2.3
2006	3.1	2.2	2.3	2.7	1.9	4.8	2.7	2.2	6	3.3	6.2	2.3
2007	3	2.2	2.1	2.5	1.5	4.3	2.5	2.2	6	3.4	5.7	2
2008	3.2	1.9	2	2.3	1.3	4.3	2.6	2.7	6.5	3.5	5.9	1.9
2009	2.8	1.9	2.2	1.8	1.5	4.1	2.5	2.5	7	4.3	6.5	1.9
2010	2.9	1.9	2.5	2.2	1.5	4.5	2.2	2.4	7.7	4.7	6.3	2
2011	2.9	2	2.7	2.7	1.8	4.6	2	2.4	7.2	4.4	6.8	1.9
2012	34	22	32	28	18	44	21	27	68	44	68	19
2013	36	23	35	25	16	43	15	25	68	46	69	20
2014	36	19	33	27	16	44	18	27	69	49	70	19

Source: Transparency International (2015)

Appendix B

Table 1.4
OPEC Member States' Political Instability Index
US State Department Political-Terror Scale and Ranking

Year	ALGERIA	ANGOLA	ECUADOR	IRAN	IRAQ	KUWAIT	LIBYA	NIGERIA	QATAR	S/ARABIA	UAE	VENEZUELA
2000	4	5	3	3	5	1	3	3	1	3	1	3
2001	4	4	3	3	5	1	3	4	1	3	2	3
2002	4	4	3	3	5	2	3	4	1	3	2	4
2003	4	4	3	3	5	2	3	4	1	3	2	3
2004	4	4	3	3	5	2	3	4	1	3	2	3
2005	4	4	3	3	5	2	3	4	1	3	2	3
2006	4	3	3	3	5	2	3	4	1	3	2	4
2007	3	4	3	3	5	2	3	3	2	3	2	4
2008	3	3	3	3	5	2	3	4	1	3	2	4
2009	2	4	3	4	4	2	3	4	1	4	1	4
2010	3	3	2	3	4	2	3	5	1	3	2	3
2011	3	3	3	3	3	2	5	4	1	3	2	3
2012	2	3	3	3	4	2	4	4	1	3	2	4
2013	2	3	2	3	5	2	4	4	2	3	3	3
2014	3	3	2	3	5	2	4	5	2	3	3	4

Source: The Political Terror scale (2015)

Appendix C

Table 1.5
OPEC member States' Major Environmental Disasters
EM-DAT: The CRED/OFDA International Disasters Epidemiology

Year	ALGERIA	ANGOLA	ECUADOR	IRAN	IRAQ	KUWAIT	LIBYA	NIGERIA	QATAR	S/ARABIA	UAE	VENEZUELA
2000	6	14	7	16	1		1	54		4		2
2001	1	12	4	19				44		2	1	2
2002	9	3	9	24			2	38		5	1	2
2003	12	4	4	19	3	1		23		6		3
2004	9	8		17	3		2	25		2	1	4
2005	6	2		23	3			32		2		9
2006	4	4	4	12	5			22		3		1
2007	7	5	3	6	3			20		3		1
2008	3	6	2	13	3		1	15		2	1	4
2009	6	6	2	6	2	1	1	12	1	1		2
2010	2	3	7	10	3		1	11		2	1	3
2011	1	5	2	5	1		1	13		2		5
2012	3	2	4	8	1		1	11	1	3		2
2013		2	5	6	1		3	11		2	1	1
2014	4	1	5	4			9	9	1	1	1	

Source: EM-DAT-Centre for Research on the Epidemiology of Disasters (2015)

Appendix D

Table A1

Pooled Estimate of ARDL (1,1,1,1,1,1,1): Mean Group: NPLs for OPEC Countries

Variables	Coefficient	Std. Error	t-stat	Prob. Value	95% Conf. Interval	
OP	1.350186	1.387445	0.97	0.330	-1.369156	4.069528
CORR	9.95931	4.72412	2.11	0.024	-16.33893	96.25754
PIS	5.8119	3.15195	1.84	0.076	-28.76437	140.3882
ERS	-.5870548	1.078531	-0.54	0.586	-2.700936	1.526826
RGDP	-4.581622	0.581622	-7.87	0.000	-4.398193	13.56144
UNEMP	25.99688	24.76539	1.05	0.294	-22.5424	74.53615
Speed of Adj.	-.6517094	.2948404	-2.21	0.027	-1.229586	-.0738329

Table A2

Pooled Estimate of ARDL (1,1,1,1,1,1,1): Pooled Mean Group: NPLs for OPEC Countries

Variables	Coefficient	Std. Error	t-stat	Prob. Value	95% Conf. Interval	
OP	-.0196904	.0063031	-3.12	0.002	-.0320443	-.0073364
CORR	4.492702	.9073558	4.95	0.000	2.714317	6.271087
PIS	4.276017	.8024085	5.33	0.000	2.703325	5.848709
ERS	.1744239	.0607458	2.87	0.004	.0553644	.2934835
RGDP	-4.089691	.9735577	-4.20	0.000	-5.997829	-2.181553
UNEMP	.249103	.0861685	2.89	0.004	.0802159	.4179902
Speed of Adj.	-.4678951	.1812658	-2.58	0.010	-.8231696	-.1126205

Table A3

Pooled Estimate of ARDL (1,1,1,1,1,1,1): Dynamic Fixed Effect: NPLs for OPEC Countries

Variables	Coefficient	Std. Error	t-stat	Prob. Value	95% Conf. Interval	
OP	.1170435	.2278736	0.51	0.608	-.3295806	.5636676
CORR	-22.20999	21.12722	-1.05	0.293	-63.61859	19.1986
PIS	-4.425497	11.43852	-0.39	0.699	-26.84459	17.99359
ERS	.7428581	1.277382	0.58	0.561	1.760765	3.246481
RGDP	40.01993	28.37915	1.41	0.158	15.60218	95.64204
UNEMP	-.3221543	1.809064	-0.18	0.859	-3.867854	3.223546
Speed of Adj.	-.2011697	.052498	-3.83	0.000	-.3040638	-.0982755

Appendix E

Table B1

Static Panel Model: Pooled OLS: NPLs for OPEC Member States

Variables	Coefficient	Std. Error.	t-stat	Prob>|t|	95% Conf. Interval	
OP	-1.908997	.6174873	-3.09	0.004	-3.170074	-.6479193
CORR	2.850602	1.013195	2.81	0.009	.7813825	4.919821
PIS	2.007778	.9681731	2.07	0.047	3.985052	-.0305053
ERS	-.0968959	.3600678	-0.27	0.790	-.8322524	.6384607
RER	-1.039404	.9156386	-1.14	0.265	-2.909388	.830579
RGDP	-.441077	.8439357	-0.52	0.605	-2.164624	1.28247
LIR	-2.34756	1.116433	-2.10	0.044	-4.627621	-.0674984
INF	2.123405	.9541383	2.23	0.034	.174795	4.072016
UNEMP	-1.181169	1.044535	-1.13	0.267	-3.314395	.9520564
CONS	16.70586	7.345995	2.27	0.030	1.703341	31.70839

Table B2

Static Panel Model: Fixed Effect: NPLs for OPEC Member States

Variables	Coefficient	Std. Error.	t-stat	Prob>|t|	95% Conf. Interval	
OP	-1.906311	.5542309	-3.44	0.002	-3.043499	-.7691232
CORR	4.172629	1.278972	3.26	0.003	1.548396	6.796863
PIS	3.20318	.8510897	3.76	0.001	-4.949472	-1.456889
ERS	.299915	.1345291	2.23	0.033	-1.071261	.4714306
RER	-1.178005	.8512924	-1.38	0.178	-2.924713	.5687025
RGDP	-1.046278	1.148223	-0.91	0.370	-3.402236	1.30968
LIR	-3.189375	.9337393	-3.42	0.002	-5.10525	-1.2735
INF	1.926914	.8057014	2.39	0.024	.2737516	3.580077
UNEMP	.8369624	1.074839	0.78	0.443	-1.368424	3.042349
CONS	16.35046	7.8498	2.08	0.047	.2440035	32.45692

Table B3

Static Panel Model: Random Effect: NPLs for OPEC Member States

Variables	Coefficient	Std. Error.	t-stat	Prob>|t|	95% Conf. Interval	
OP	-1.908997	.6174873	-3.09	0.002	-3.11925	-.6987438
CORR	2.850602	1.013195	2.81	0.005	.864777	4.836427
PIS	2.007778	.9681731	2.07	0.038	3.905363	.1101942
ERS	-.0968959	.3600678	-0.27	0.788	-.8026158	.6088241
RER	-1.039404	.9156386	-1.14	0.256	-2.834023	.7552142
RGDP	-.441077	.8439357	-0.52	0.601	-2.095161	1.213007
LIR	-2.34756	1.116433	-2.10	0.035	-4.535729	-.1593903
INF	2.123405	.9541383	2.23	0.026	.2533287	3.993482
UNEMP	-1.181169	1.044535	-1.13	0.258	-3.228421	.8660823
CONS	16.70586	7.345995	2.27	0.023	2.307979	31.10375

Appendix F

Table 1.1 Total Assets and Liabilities of Banks of OPEC member states

Years	Total Assets	Total Customers Deposits	Gross Loans	Total Equity
2000	587.00	336.00	214.00	70.13
2001	534.00	301.00	187.00	72.20
2002	595.00	329.00	224.00	83.02
2003	664.05	358.00	256.01	82.11
2004	860.47	474.04	340.01	121.52
2005	1196.00	652.10	437.38	166.59
2006	1479.00	886.00	566.58	185.36
2007	2084.00	1221.00	808.97	232.04
2008	2439.00	1472.00	1002.00	243.55
2009	2480.00	1506.00	983.00	267.09
2010	2738.00	1646.00	1052.00	288.00
2011	3027.00	1802.00	1208.00	340.00
2012	3652.00	2214.00	1437.00	368.00
2013	3864.00	2224.00	1411.00	382.00
2014	3577.00	2186.00	1401.98	318.27

Appendix G

Table 1.2 Average NPL Ratios of Global, OPEC, G7, G8 AND BRICS

Year	OPEC	G7	BRICS	G8	GLOBAL
2000	9.99	2.05	12.22	2.06	na
2001	8.74	2.37	11.99	2.28	na
2002	8.36	3.14	12.19	2.99	na
2003	6.99	2.74	11.19	2.60	na
2004	5.82	1.95	6.96	1.89	na
2005	5.56	1.69	4.67	1.62	na
2006	4.31	1.26	4.72	1.29	3.10
2007	4.43	1.36	4.17	1.40	2.70
2008	5.75	1.98	3.94	2.07	3.00
2009	8.19	2.64	5.33	3.10	4.20
2010	6.29	2.47	5.08	2.96	4.10
2011	8.00	2.59	11.78	2.76	4.00
2012	8.94	2.19	4.01	2.30	3.80
2013	8.31	1.99	4.16	2.16	4.20
2014	8.00	1.84	4.00	2.07	4.20