UNIVERSITI PUTRA MALAYSIA

IMPACT OF OIL PRICE ON INFLATION, TRADE BALANCE AND ECONOMIC GROWTH IN AFRICAN OPEC MEMBER COUNTRIES

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IMPACT OF OIL PRICE ON INFLATION, TRADE BALANCE AND ECONOMIC GROWTH IN AFRICAN OPEC MEMBER COUNTRIES

By

UMAR BALA

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfillment of the Requirements for the Degree of Doctor of Philosophy

April 2017

DEDICATION

I dedicated this research work to my parent and the entire family at large

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfillment of the requirement for the Degree of Doctor of Philosophy

IMPACT OF OIL PRICE ON INFLATION, TRADE BALANCE AND ECONOMIC GROWTH IN AFRICAN OPEC MEMBER COUNTRIES

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April 2017

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This study examined the impact of oil price on inflation, trade balance and economic growth in African OPEC member countries. The study applied transmitted channels of oil price to various economic sectors as a theoretical framework. Moreover, this study used annual panel data of four African OPEC members namely Algeria, Angola, Libya and Nigeria ranging from 1995 to 2014. Within this period the African OPEC countries witnessed a rapid increase in economic growth as oil price increases, while decreases in oil price produce ambiguity. In addition, this study used three different proxies of oil price in the analysis namely specific spot oil price of individual countries, OPEC reference oil price and an average of Brent, Dubai and West Texas Intermediate (WTI) oil price.

The first objective of this study is to explore the non-linear impact of oil price on inflation in African OPEC members. The inflation rate is usually volatile in response to oil price changes. The dynamic panels ARDL (PMG and MG models) were used to examine the short and the long-run impact of oil price changes on inflation. In the linear models, this study found that the long-run coefficient of oil price, money supply, exchange rate and GDP are positively encouraging inflation while food production negatively influenced inflation. We further estimated the model using NARDL specification which decomposing the oil price into positive and negative changes. In the nonlinear model, the study found that the positive and negative changes in oil price are positively encouraging inflation but the impact is larger when oil price dropped.

Motivated by whether the the OPEC members can improve their trade balance via higher oil price or higher oil export, the second objective of this study examines the threshold effect of oil price on the trade balance in African OPEC members. Then, this study investigated the impacts of oil export as a substitute proxy of oil price on the trade balance models. The Panel fully modified OLS and dynamic OLS estimators to

examine the long-run impact of oil price on import, export and trade balance. This study found that increase in oil price and oil export positively encourage import, export and trade balance while exchange rate depreciation significantly discourages import and insignificantly in export and trade balance models. From the results of trade balance, the study found that there is a threshold effect of oil export. Increase in oil export improves the trade balance when oil export is above a certain threshold.

It is observed that economic growth of African OPEC members showed larger adjustment during the fall of oil price compared to the hike in oil price and this may due to different level of financial development. The third objective of this study investigates the threshold effect of oil price and financial development on economic growth in African OPEC members. The fully modified OLS and dynamic OLS were used to examine the long-run impact of oil price on economic growth. The findings portrayed that increases in oil price positively encourage economic growth and better financial development leads to higher economic growth in African OPEC countries. Based on the threshold results, the study found that the threshold effect of financial development is significant and has a larger impact when it is above the threshold.

The policy implications from this study are: (1) The policy makers should use different policy between positive and negative oil price changes as shown that inflation is high when oil price decrease. The policy makers can use the contractionary monetary policy to reduce the inflation rate. In additiona, the government should encourage domestic food production both in quantity and quality in order to reduce inflation. (2) For those countries that are highly dependent on oil export, the government can increase oil export to improve the trade balance. (3) In promoting economic growth, the government can make necessary effort to benefit from higher oil prices but emphasize a need to encourage investing in financial services for stronger financial development, hence promote economic growth in African OPEC member countries.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk Ijazah Doktor Falsafah

KESAN HARGA MINYAK KE ATAS INFLASI, IMBANGAN PERDAGANGAN DAN PERTUMBUHAN EKONOMI DI NEGARA ANGGOTA OPEC AFRIKA

Oleh

UMAR BALA

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Pengerusi : Profesor Madya Lee Chin, PhD
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Kajian ini mengkaji perubahan harga minyak dan kesan-kesannya terhadap inflasi, imbangan perdagangan dan pertumbuhan ekonomi di negara ahli OPEC Afrika. Kajian ini menggunakan peisrubahan harga minyak disalurkan kepada pelbagai sektor ekonomi sebagai satu rangka kerja teori. Kajian ini menggunakan data panel tahunan daripada empat ahli OPEC Afrika iaitu Algeria, Angola, Libya dan Nigeria yang terdiri dari tahun 1995 hingga 2014. Dalam tempoh ini Negara OPEC Afrika mengalami peningkatan yang pesat dalam pertumbuhan ekonomi kerana kenaikan harga minyak, manakala penurunan harga minyak memberi kesan yang tidak tentu. Kajian ini menggunakan tiga penunjuk harga minyak yang berbeza dalam menentu iaitu harga minyak di tempat tertentu, harga minyak rujukan OPEC dan purata harga minyak UK Brent, Dubai Texas.

Objektif pertama kajian ini mengkaji kesan bukan linear harga minyak terhadap inflasi di negara ahli OPEC Afrika. Panel dinamik ARDL (model PMG dan MG) telah digunakan untuk menguji kesan jangka pendek dan kesan jangka panjang perubahan harga minyak terhadap inflasi. Dalam model linear, kajian ini mendapati bahawa pekali jangka panjang harga minyak, bekalan wang, kadar pertukaran dan KDNK secara positif menggalakkan inflasi manakala pengeluaran makanan mempengaruhi inflasi secara negatif. Kajian selanjutnya menganggarkan model menggunakan spesifikasi NARDL dengan mengurai harga minyak ke dalam perubahan positif dan negatif. Dalam model tak linear, kajian ini mendapati bahawa perubahan harga minyak yang positif dan negatif menggalakkan inflasi tetapi ia memberi impak yang lebih apabila harga minyak turun.

Didorong oleh sama ada ahli-ahli OPEC boleh memperbaiki imbangan perdagangan mereka melalui harga minyak yang lebih tinggi atau eksport minyak yang lebih tinggi, objektif kedua kajian ini ialah untuk mengkaji kesan ambang harga minyak ke atas imbangan perdagangan dalam negara ahli OPEC Afrika. Seterusnya, kajian ini juga mengkaji kesan eksport minyak sebagai proksi pengganti harga minyak pada model-model imbangan perdagangan. Panel OLS diubahsuai sepenuhnya dan OLS dinamik telah digunakan untuk mengkaji kesan jangka panjang daripada harga minyak ke atas import, eksport dan imbangan perdagangan. Hasil kajian mendapati bahawa kenaikan harga minyak dan eksport minyak menggalakkan import, eksport dan imbangan perdagangan manakala susut nilai kadar pertukaran mengurangkan import tetapi tidak signifikan dalam model eksport dan model imbangan perdagangan. Berdasarkan keputusan imbangan perdagangan, kajian ini mendapati bahawa terdapat kesan ambang eksport minyak, peningkatan dalam eksport minyak dapat memperbaiki imbangan perdangangan apabila eksport minyak adalah di atas ambang tertentu.

Dapat dilihat bahawa pertumbuhan ekonomi Negara ahli OPEC Afrika mengalami pelarasan yang lebih besar apabila harga minyak jatuh berbanding dengan kenaikan harga minyak dan ini mungkin disebabkan oleh tahap pembangunan kewangan yang berbeza. Objektif ketiga kajian ini mengkaji kesan ambang harga minyak dan pembangunan kewangan ke atas pertumbuhan ekonomi di negara ahli OPEC Afrika. OLS diubahsuai sepenuhnya dan OLS dinamik telah digunakan untuk mengkaji kesan jangka panjang harga minyak ke atas pertumbuhan ekonomi. Penemuan menunjukkan bahawa kenaikan harga minyak menggalakkan pertumbuhan ekonomi dan pembangunan kewangan yang lebih baik membawa kepada pertumbuhan ekonomi yang lebih tinggi di negara-negara OPEC Afrika. Berdasarkan keputusan ambang, kajian mendapati bahawa kesan ambang pembangunan kewangan adalah penting dan mempunyai kesan yang lebih besar apabila ia berada di atas ambang tertentu.

Implikasi dasar daripada kajian ini ialah: (1) Pengubal dasar perlu menggunakan dasar yang berbeza antara perubahan harga minyak positif dan negative disebabkan inflasi adalah lebih tinggi apabila harga minyak jatuh. Pengubal dasar boleh menggunakan dasar kewangan menguncup untuk mengurangkan kadar inflasi. Tambahan pula, kerajaan perlu menggalakkan pengeluaran makanan dalam negara samada kuantiti ataupun kualiti untuk mengurangkan inflasi. (2) Bagi negara-negara yang amat bergantung kepada eksport minyak, kerajaan boleh meningkatkan eksport minyak untuk memperbaiki imbangan perdagangan. (3) Dalam menggalakkan pertumbuhan ekonomi, kerajaan boleh mengusaha (perlu berusaha) untuk mendapat manfaat daripada harga minyak yang lebih tinggi tetapi menekankan keperluan untuk menggalakkan pelaburan dalam perkhidmatan kewangan untuk pembangunan kewangan yang kukuh dan seterusnya menggalakkan pertumbuhan ekonomi di kalangan ahli OPEC Afrika.

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I certify that a Thesis Examination Committee has met on 18 April 2017 to conduct the final examination of Umar Bala on his thesis entitled "Impact of Oil Price on Inflation, Trade Balance and Economic Growth in African OPEC Member Countries" in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the Doctor of Philosophy.

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LIST OF ABBREVIATIONS

ADF	Augmented Dickey and Fuller
AIC	Akaike Information Criteria
ARDL	Autoregressive Distributed Lag
B/D	Barrel per Day
CBN	Central Bank of Nigeria
CPI	Consumer Price Index
DOLS	Dynamic Ordinary Least Squares
E	Exchange Rate
ECT	Error-correction Term
EIA	Energy Information Administration
FD	Financial Development
FMOLS	Fully Modified Ordinary Least Squares
FPI	Food Production Index
FSC	Financial Sector Credit
GDP	Gross Domestic Product
IPS	Im, Pesaran and Shin
IRF	Impulse response function
IV	Investment
LDCs	Less Developed Countries
M	Import
M2	Money Supply
MG	Mean Group
NARDL	Nonlinear Autoregressive Distributed Lag
OLS	Ordinary Least Squares

OP	Average Oil Price of Brent, WTI and Dubai
OPC	Oil Price for Countries
OPEC	Organization of Petroleum Exporting Countries
OX	Oil Export
PMG	Pooled Mean Group
SAP	Structural Adjustment Program
SDR	Special Drawing Right
sq km	Kilometer Square
TB	Trade Balance
UAE	United Arab Emirate
UK	United Kingdom
US	United State
USD	United State Dollar
VDC	Variance decomposition
VECM	Vector Error-Correction Model
WDI	World Development Indicator
WTI	West Texas Intermediate
X	Export

CHAPTER 1

INTRODUCTION

1.1 Background of the Study

The issue of an oil price shock on macroeconomic performance is a dominant topic in energy economics literature that has been argued over recent time. The impact of oil price particularly influences the determinant of the economies of developing countries. More specifically those countries that have insufficient financial stability and they are weak in controlling external shock (Barsky and Kilian, 2004). For the past decades, oil exporting countries benefited from higher crude oil prices, the rate of growth has improved. The falling of crude oil price in the mid of 2014 has significantly affected the major oil exporting countries economic activities in Africa. The low oil price has slowed down the growth rate as low from 5 percent in 2014 to 3.4 percent in 2015 (World Bank, 2016). Due to the high dependency on oil, about 90 percent of their foreign earnings and oil exports consist of more than 80 percent of their total exports. While oil-importing countries falling in oil prices will improve their current account balance reported by (World Bank, 2014; Baffes et al., 2015).

The main factor for the slowdown is weak in oil price in the world market. The way these shocks can be absorbed is to associate with the effective monetary policy intervention. Although the adopting appropriate monetary tools that will stabilize the economy out of external and internal disequilibrium. The decision faces an argument among policy-makers on the effectiveness of those instruments in controlling the overall economic activities. Mostly this depends on the nature of the economy, it also depends on how the economy relies on the oil export (Feussi, 2013). External shocks can be transmitted into various economic channels such as via inflation, trade and output. Most of the oil exporting countries in African has been facing difficulties during decreasing oil price shock. The central authority always delays responding when oil price drops due to the uncertainty and some assume that the relationship is linear. Thus, they have treated the shock indifference between the positive and negative changes.

The increase in oil prices controlled the weakening of GDP, while the decrease does not accelerate the economic activities. Several explanations were suggested by the economists Mork (1989); Lee et al. (1995); Hamilton (1996) stressed the existence of an inadequate specification of the models and they proposed to restore oil price, macroeconomic relationship, non-linear specifications. Ferderer (1996) showed that the uncertainty and the stress of the financial market are the origins of this asymmetry. Balke et al. (2002); Brown and Yucel (2002) explained the asymmetry by the response of monetary policy of oil price shock. Meanwhile, Barsky and Kilian (2004); noted that the impact of oil price alone in modern market-based economies is hard to understand in a way in which policy is automatically resolved.

The oil supply has become relatively exogenous, which significantly affects the price of oil fluctuations this explanation fits the world experience in the 1970s. In contrast to this case, flexible oil supply case impersonates another case without oil supply shocks. The reason for this is obvious if the supply of oil responds endogenously to determine the organization of petroleum exporting countries (OPEC) which is the quantity to supply, the world oil supply will respond. Similarly, the relative price of oil is expected to regulate (Backus and Crucini, 2000).

In the literature, there are different views of evaluating the impact of oil export changes and oil price. Watkins and Strelfel (1998) concluded that the quota system shared among the OPEC members could not be portrayed by the relation of conventional supply function with a price. In the previous findings, Ramcharran (2002) found that the relationship between OPEC production and oil price is contradictory. In the same year, Krichene (2002) found that the supply price elasticity for oil production is low. Cleveland and Kaufmann (2003) revealed that oil supply and oil prices interchanges, increase in oil supply lead to the reduction of oil price. Kaufmann et al. (2008) claimed that the real prices usually have a positive impact on oil supply. In contrast, Ringlund et al. (2008) revealed a positive correlation between oil activities and oil price.

1.1.1 Overview of OPEC

The Organization of the Petroleum Exporting Countries (OPEC) is a perennial intergovernmental organization that was established during a conference in September 1960. The objective is to harmonize and unify petroleum strategies and policies, to protect fair and reasonable oil prices, an efficient and consistent supply of oil and other petroleum related products to importing countries. The OPEC head office was located in Geneva, Switzerland for the first five years and relocated to Vienna, Austria in September 1965. Among the core founders are Iran, Iraq, Kuwait, Saudi Arabia and Venezuela, then other producing countries joined the cartel as registered members individually like Qatar in 1961, Indonesia in 1962 and was suspended its membership in 2009, Libya in 1962, United Arab Emirates in 1967, Algeria in 1969, Nigeria in 1971, Ecuador in 1973 and suspended its membership in 1992 to 2007, Gabon in 1975 and withdraw its membership in 1995 and returned in 2016 and Angola in 2007. The African OPEC members that will be covered in this study are Algeria, Angola, Libya and Nigeria. The justification of this study for excluding Gabon in the sample of African OPEC members is that the Gabon membership is withdrawn within the study period 1995 to 2014. Figure 1.1 shows the 12 OPEC registered members in 2014. It can be seen that 6 out of the 12 members are from Arab region (Saudi Arabia, Iran, Iraq, Kuwait, Qatar and UAE), 4 from Africa (Algeria, Angola, Libya and Nigeria) and 2 from Latin American (Ecuador and Venezuela).

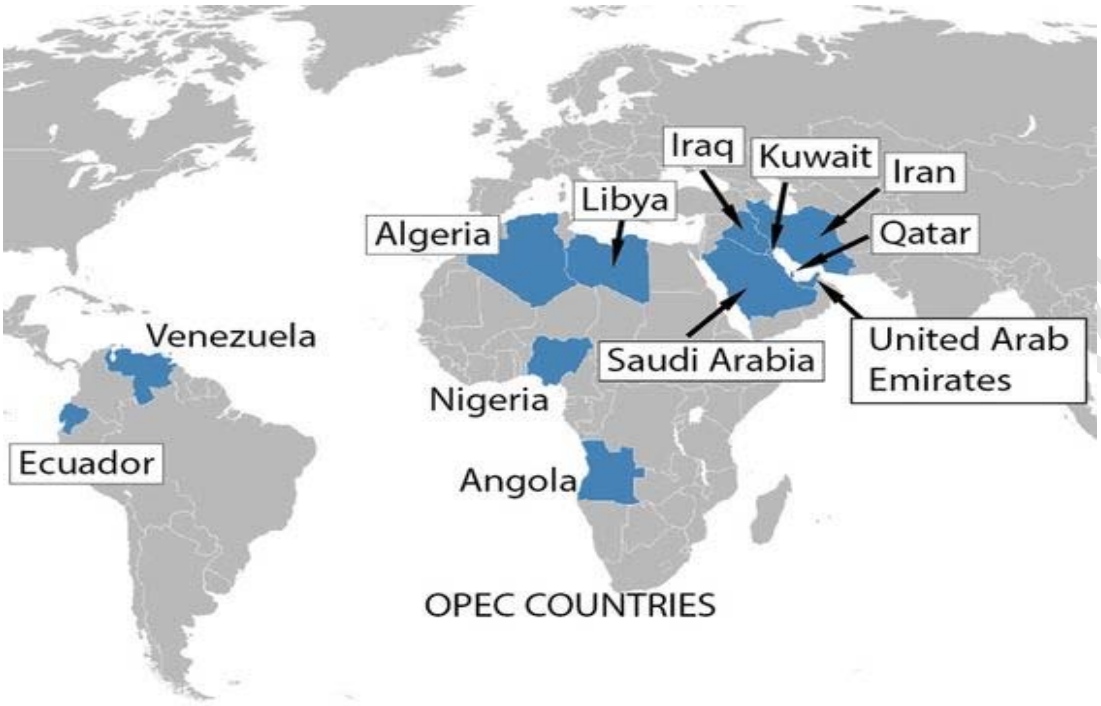

Figure 1.1 : Map of the Countries in OPEC Cartel in 2014

Table 1.1 shows the percentage of oil production and oil exports for each member for the year 2014. Among the 12 oil producing countries in OPEC cartel four are African countries, namely Algeria, Angola, Libya and Nigeria. Saudi Arabia is top oil producer produced 9713 b/d, followed by Iran 3117 b/d, Iraq 3110 b/d, Kuwait 2867 b/d, UAE 2,794 b/d, Venezuela 2683 b/d, Nigeria 1807 b/d, Angola 1654 b/d, Algeria 1193 b/d, Qatar 708 b/d, Ecuador 557 b/d, and Libya 480 b/d. Among the OPEC members production, African members produced and contributed 5,134 b/d in the total production of 30683 b/d. The percentage of production shared between the members are Saudi Arabia 31.66 percent, followed by Iran 10.16 percent, Iraq 10.14 percent, Kuwait 9.34 percent, UAE 9.11 percent, Venezuela 8.74 percent, Nigeria 5.89 percent, Angola 5.39 percent, Algeria 3.89 percent, Qatar 2.31 percent, Ecuador 1.18 percent and Libya 1.56 percent. Among the production percentage shared African members contribute 16.73 percent in the total OPEC production.

Based on the export, Saudi Arabia exported about 7153 b/d, followed by Iraq 2516 b/d, UAE 2497 b/d, Nigeria 2120 b/d, Kuwait 1995 b/d, Venezuela 1965 b/d, Angola 1608 b/d, Iran 1109 b/d, Algeria 623 b/d, Qatar 595 b/d, Ecuador 422 b/d, and Libya 42 b/d. Among the OPEC members export, African members export about 4392 b/d in the OPEC total export of 22644 b/d. The percentage of export shared between the members are Saudi Arabia 31.59 percent, followed by Iraq 11.11 percent, UAE 11.03 percent, Nigeria 9.36 percent, Kuwait 8.81 percent, Venezuela 8.68 percent, Angola 7.10 percent, Iran 4.90 percent, Algeria 2.75 percent, Qatar 2.63 percent, Ecuador 1.87 percent and Libya 0.18 percent. Among the production percentage shared African members contribute 19.39 percent in the total OPEC export. The total OPEC members' production is 30683 b/d and the total export is 22644 b/d, the remaining 8039 b/d is

for their consumption. The total percentage of OPEC shared with the world market were 55 percent in 1973 dropped to 42 percent in 2014 (Ramcharran, 2002; OPEC, 2015). Table 1.1 also presents the specific oil price among the OPEC members. The specific oil price among the OPEC members is range between the lowest oil price of Venezuela (Merey) at 86.88 USD to the highest oil price of Nigerian (Bonny light) at 100.85 USD.

Table 1.1 : OPEC Members Oil Production and Export

No	Country	Joint OPEC	Production of Oil	Production of Oil %	Export of Oil	% of Oil Exports	Specific Oil Price $
1.	Algeria	1969	1193	3.89	623	2.75	99.68
2.	Angola	2007	1654	5.39	1608	7.10	99.19
3.	Ecuador	1973	557	1.81	422	1.87	87.31
4	IR Iran	1960	3117	10.16	1109	4.90	96.18
5.	Iraq	1960	3110	10.14	2516	11.11	94.45
6.	Kuwait	1960	2867	9.34	1995	8.81	95.32
7.	Libya	1962	480	1.56	41	0.18	98.51
8.	Nigeria	1971	1807	5.89	2120	9.36	100.85
9.	Qatar	1961	709	2.31	595	2.63	96.39
10.	Saudi Arabia	1960	9713	31.66	7153	31.59	97.18
11.	U. A. E.	1967	2794	9.11	2497	11.03	99.45
12.	Venezuela	1960	2683	8.74	1965	8.68	86.88
Total	**OPEC**		**30683**	**100.00**	**22644**	**100.00**	**96.29**
	African OPEC		**5134**	**16.73**	**4392**	**19.39**	**99.56**

Note: The data for oil production, oil export and oil prices are for the year 2014.
Source: OPEC Annual Statistical Bulletin (2015)

The difference in oil prices among the OPEC members can be well shown in the graphical representation. Figure 1.2 clearly shows that the oil prices are different across the members in the cartel. Algeria oil (Saharan Brend) priced at 99.68 USD, Angola oil (Girassol) priced at 99.19 USD, Ecuador oil (Oriente) priced at 87.31 USD, Iran oil (Iran-Heavy) priced at 96.18 USD, Iraq oil (Basrah Light) priced at 94.45 USD, Kuwait oil (Kuwait Export) priced at 95.32 USD, Libya oil (Ess Sider) priced at 98.51 USD, Nigeria oil (Bonny Light) priced at 100.85 USD, Qatar oil (Marine) priced at 96.39 USD, Saudi Arabia oil (Arab Light) priced at 97.18 USD, UAE oil (Murban) priced at 99.45 USD and Venezuela oil (Merey) priced at 96.29 USD. The OPEC reference basket oil price is calculate based on the sum of the 12 members specific oil prices and divide the 12 to get an average which represents the oil price of the cartel. In 2014 the OPEC reference basket oil price is 96.29 as shown in the last bar of the chart.

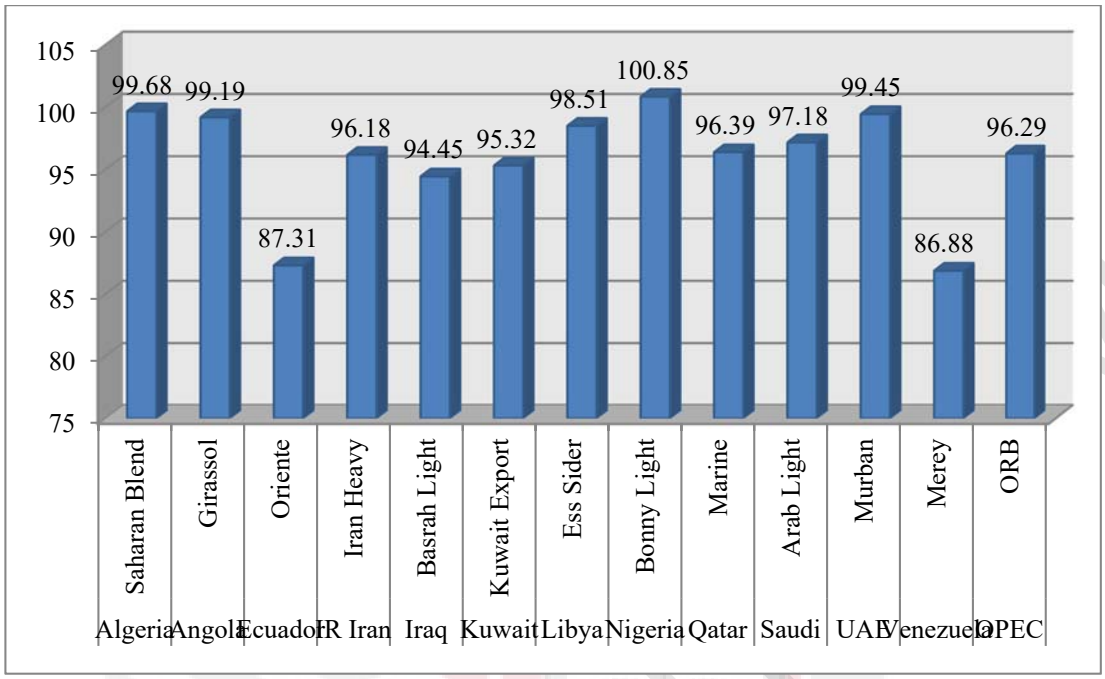

Figure 1.2 : Specific Countries Oil Prices in OPEC Cartel
(Source: OPEC Annual Statistical Bulletin (2015))

This study will use three proxies for oil price, namely specific country's oil price (Saharan Blend for Algeria, Girassol for Angola, Ess Sider for Libya and Bonny Light for Nigeria) OPEC reference oil prices (the average OPEC oil price) as the four countries are included in the OPEC cartel and usually are used this price as spot reference price and the average Brent, Dubai and WTI as in the literature are commonly used the three oil prices.

1.1.2 Overview of Economies of African OPEC Members

By the time of thesis writing, OPEC had four African countries Algeria, Angola, Libya and Nigeria for its members as explained in the overview Gabon withdrawn its membership in 1995 and returned in 2016. Therefore, this study limits the scope of the study to these four African OPEC Members. The African OPEC members are quite different in terms of capacity, this can be seen in Table 1.2 Nigeria has the highest population (178.271 million people), followed by Algeria (39.114 million people), Angola (24.383 million people) and Libya (6.213 million people). Based on the land area, Nigeria has the largest land area (923,768km^2), followed by Libya (1759.54km^2), Algeria (2381.741km^2) and Angola (1247.7km^2). In terms of the size of the economies, Nigeria is the largest with GDP of 561600.4 million USD in 2014 followed by Algeria with GDP of 228285 million USD GDP, Angola with GDP of 128564 million USD and Libya with of GDP 41148 million USD. While in terms of per capita GDP Nigeria classify as lower-middle-income with 3150 USD, Algeria an upper-middle-income country with 5836 USD. Angola an upper-middle-income country with 5273 USD and Libya an upper middle country with 6623 USD (OPEC, 2015).

In Algeria, the petroleum production and export is the economy's mainstay that represents about 35 percent of gross domestic product (GDP). The oil and gas sector boosts the Angolan economic rate growth which contributes about 45 percent of the GDP. Meanwhile, the Libyan economy relies mainly on the oil and gas industry which contributes about 60 percent of GDP In addition, the oil and gas production in Nigeria consist about 35 percent of the GDP. Averagely, the oil and gas exports in Algeria account about 67 percent of the total export earnings, Angola about 95 percent, Libya about 95 percent and Nigeria presents about 90 percent. The trend of oil production and export of African OPEC members dropped due to the lower oil price and other obstacles that arose such as the on-going war in Libya, poor political will and insecurity that affected the economy.

Table 1.2 : African Oil Producer's Economy

Country	Population Million	Land Area sq km	GDP per Capita $	Real GDP $	Contribution of to GDP %		Production of Oil b/d	Exports of Oil b/d
					Oil	Agric		
Algeria	39114	2382	5836	228285	35	10.3	1193	623
Angola	24383	1248	5273	128564	45	10.2	1654	1608
Libya	6213	1760	6623	41148	60	01.8	480	41
Nigeria	178271	924	3150	561600	35	20.3	1,807	2120
Total	**247981**	**6314**	**5220.5**	**959597**			**5134**	**4392**
OPEC	**453422**	**11862**	**7569**	**3432101**			**30683**	**22644**

Notes: All the data are in 2014. Land area Figures as per official websites.
Source: OPEC Annual Statistical Bulletin (2015)

The existing trends in food production and the long-run effects have not been well investigated in the previous literature. There are numerous concerns on how inflation originated in African OPEC member countries has the countries has affected with serious increases in the price level. In the previous studies among the factors that contribute are increases in money supply, exchange rate pass-through, increasing oil in price, growth, lack of effective policies etc. Moreover, the previous studies have overlooked the importance of domestic food production in reducing the inflation rate. Figure 1.3 illustrates the trend of food production index in African OPEC members. Even though there is an improvement in the food production especially in Angola and Algeria while Nigeria and Libya relatively low. The growth in food production within the period of study is considered low compared with the growth in the total population of the countries. The shortage of food production and supply will cause the price to increase.

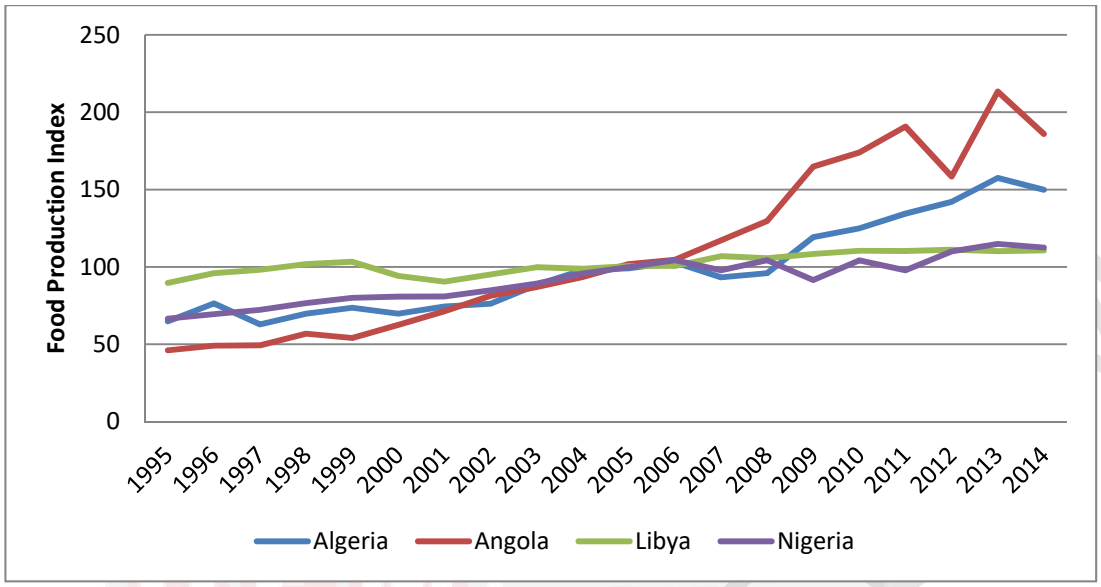

Figure 1.3 : Food Production Index (Source: World Bank Online Database)

1.1.3 African OPEC Members Oil Sector

According to the U.S. Energy Information Administration, Nigeria is the top crude oil producer in Africa. Figure 1.4 illustrates the oil production for African OPEC members. This can be seen that from 1980 to 2014, Nigeria had always been the top crude oil producer in Africa, averagely about 1807.047 barrels daily. Angola is the second-largest crude oil producer in Africa producing averagely about 1653.688 barrels daily. Algeria ranked the third crude oil producer in the African OPEC members' producing averagely about 1192.833 barrels daily. Libya holds the largest crude oil reserve in Africa. This plays a significant role in contributing to the supply of light and sweet crude in the world while producing an average of 479.899 barrels. From the oil production trend, Libya's production is severely affected by the ongoing political conflict and insecurity.

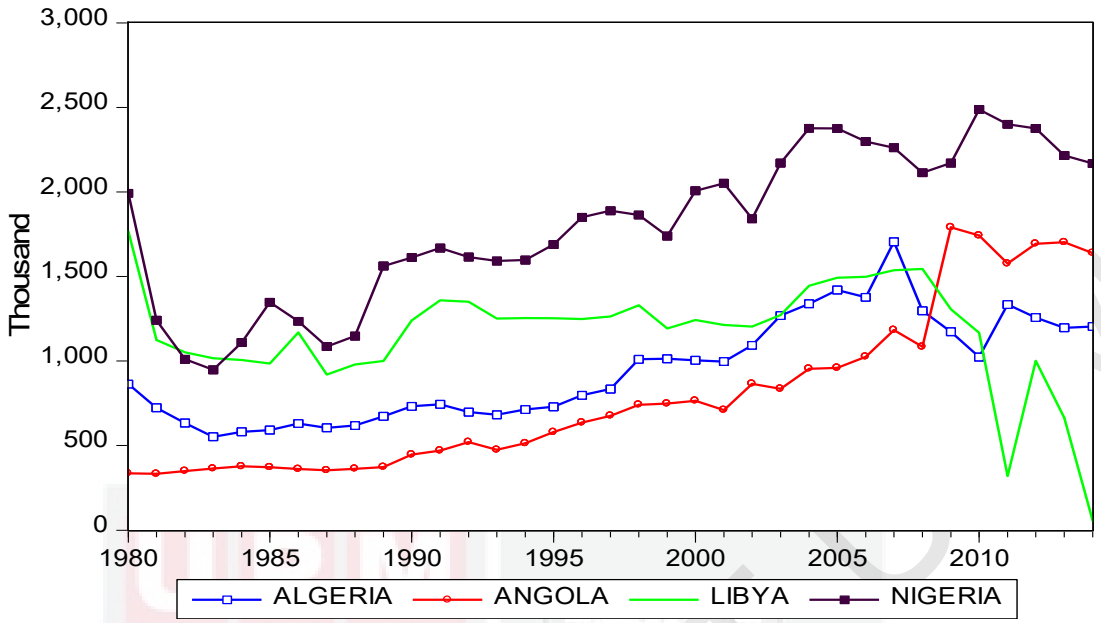

Figure 1.4 : Exports of Petroleum Products of African OPEC Members (1,000 b/d) (Source: OPEC Annual Statistical Bulletin (2015))

Figure 1.5 shows the African OPEC members crude oil export by destination according to regions in 2014. Europe is the main importer of crude oil; Algeria recorded 518 thousand barrels per day, North America 45 thousand barrels per day, Asia and Pacific 42 thousand barrels per day and Latin America 18 thousand barrels per day. Asia and Pacific are the top crude oil importer from Angola imported 1011 thousand barrels per day, Europe 341 thousand barrels per day, North America 132 thousand barrels per day and Latin America and Africa 62 thousand barrels per day each. The mining of the crude oil in Libya got worse in 2014 due to political instability and managed to export only 40 thousand barrels per day, Europe 37 thousand barrels and Asia and Pacific 3 thousand barrels per day. Europe leading the top oil importer from Nigeria imported about 969 thousand barrels per day, Asia and Pacific 558 thousand barrels per day, Africa 271 thousand barrels per day, Latin America 248 thousand barrels per day and North America 74 thousand barrels per day.

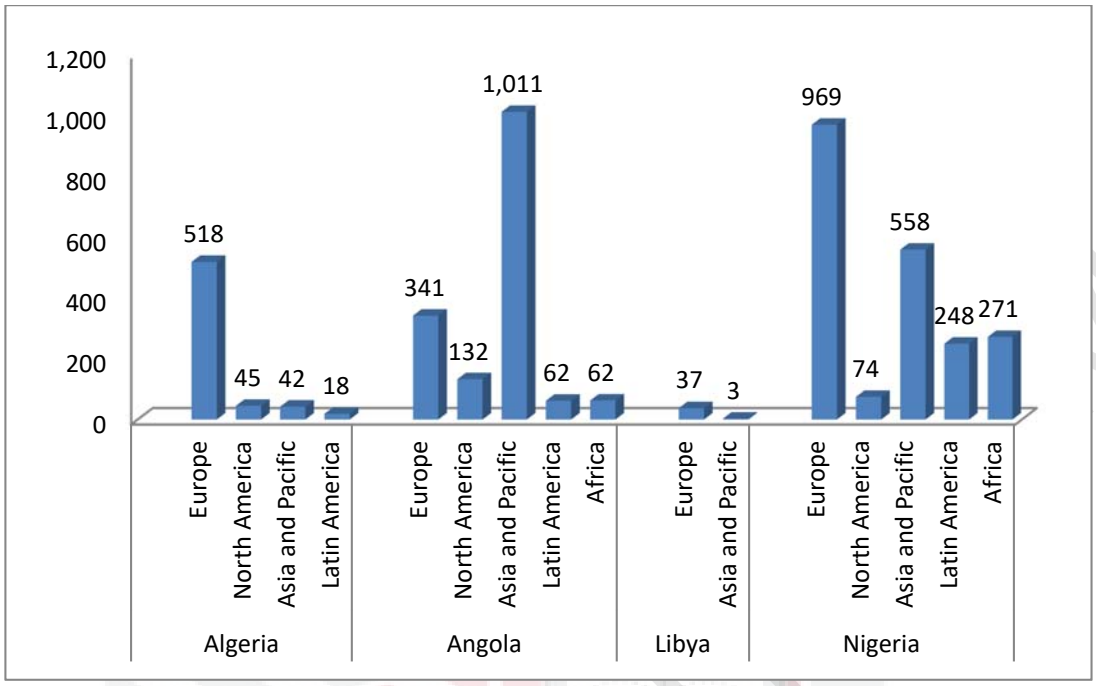

Figure 1.5 : Oil Exports by Region of African OPEC Members (1,000 b/d) (Source: OPEC Annual Statistical Bulletin (2015))

Based on the total production and export of the four African oil exporting countries this clearly shows that the countries heavily rely on oil production and export. Figure 1.6 compares the percentage of petroleum exports which shows how dependent on oil export between the countries. In1980 Algeria exported about 94 percent of petroleum products, Angola 86 percent, Libya 99 percent and Nigeria 96 percent while in 2014 Algeria exported about 58 percent of petroleum products, Angola 97 percent, Libya 46 percent and Nigeria 92 percent. The remaining percentage of the export is the non-oil products in 1980 Algeria 6 percent, Angola 14 percent, Libya 1 percent and Nigeria 4 percent while in 2014 Algeria 42 percent, Angola 3 percent, Libya 54 percent and Nigeria 8 percent. The figure shows clearly that the African OPEC members heavily rely on oil export.

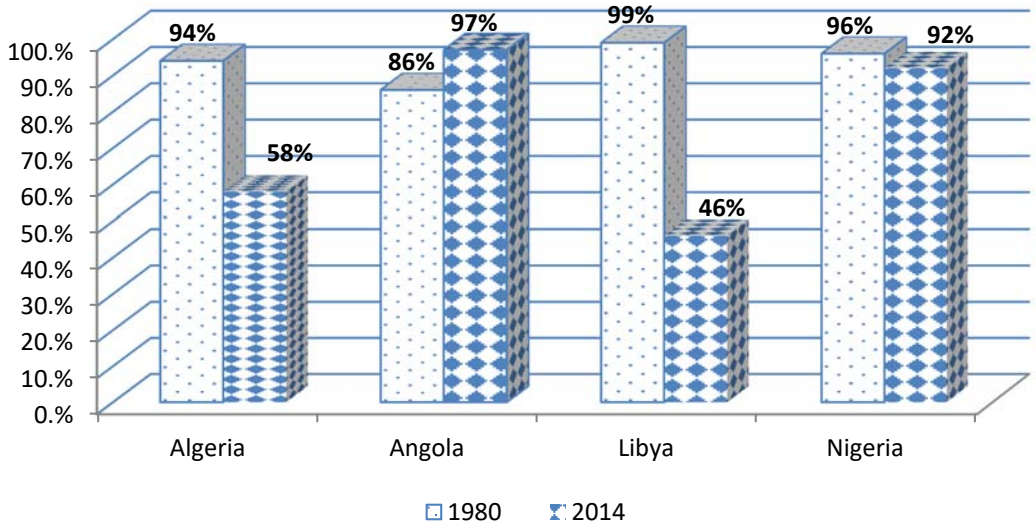

Figure 1.6 : Percentage of Petroleum Exports of African OPEC Members
(OPEC Annual Statistical Bulletin (2015))

1.1.4 Global Crude Oil Price Trent and Events

Figure 1.7 shows crude oil price trends which are observed from 1973 to 1974 and the price of crude oil increased due to Arab oil embargo. In 1974 to 1979 the crude oil price was reasonable steady, fluctuating about $12 to $14 per barrel. During the Iran-Iraq war and the Iranian revolution, from 1979 to 1980 the crude oil production was cut down by 10 percent, which influenced the oil price to increase from $14 to $35 per barrel even though the crude oil was not considered being as stable price (Rafiq et al., 2009a). The increasing oil price has forced the leading customers and firms to implement an economical product and led them to enlarge the search and increase the production of non-OPEC members. In early 1982 to 1985, OPEC made an effort to stabilize the price of crude oil through production quota but, this major protection, global economic meltdown and illegal quota produced by OPEC member countries have contributed to $10 drop in crude oil price per barrel.

In the middle of 1980s, the fluctuation in the price of oil has risen frequently than before. OPEC's contribution to world oil supply has decreased around 55 percent in 1976 to 42 percent in 2014 that has caused the oil price to drop. The oil price plays a major role in the economy from several aspects. The falling of oil price after reaching the maximum price level of $115 per barrel in June 2014 dropped lesser than $30 per barrel around January 2016 and this has been one of the most important global economic issues. During 1985 to 1986, oil exporters witness sharp falling of oil prices similar to this issue and this was caused by production cuts by OPEC members reversed. In addition, the global economic crisis from 2008 to 2009 has affected the oil prices. The continuous falling of oil price has been significantly steeper than the other non-oil price such: metals and food prices (Baffes et al., 2015).

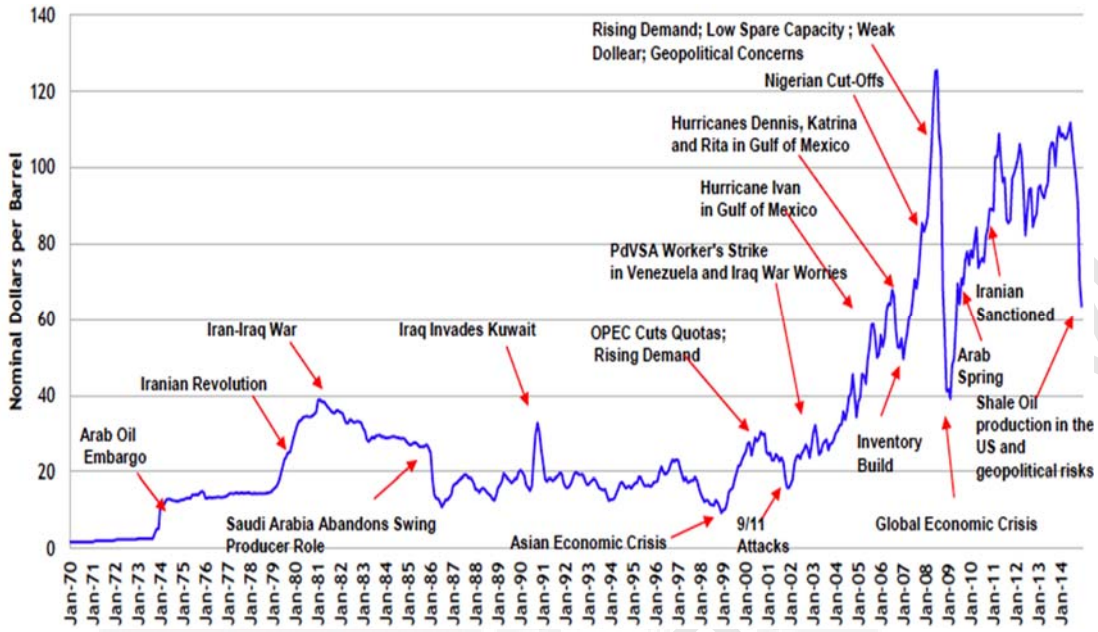

Figure 1.7 : World Crude Oil Price Movements
(Source: OPEC Annual Statistical Report)

1.1.5 Financial Development of African OPEC Members

Development of financial sector has been considered as a precondition for sustainable growth in most economies (Ibrahim and Bala, 2015). Financial development is an intermediary's regulatory policy and bodies that lead to the effective and efficient financial services. An effective financial service provides a low-risk environment and proper allocation of the fund. The advanced financial development leads to the advancement in the mobilization of savings and investments. There are many factors that financial development can measure such as the reliability, depth, access, performance, activities, size, banks, bond markets and financial institutions (Adnan, 2009).

Barsky and Kilian (2004) highlighted that in the developing countries that are weak in financial development are most likely to suffer when oil price changes. The theoretical framework of financial development and economic growth were well established by Schumpeter (1911); Goldsmith (1969) Habibullah and Eng (2006). They claimed that economic growth in less developed countries (LDCs) is associated with the low-level financial services. Empirical evidence recommended that financial development has actually supported sustainable economic growth and helped to reduce its instability. The positive interest rate supports financial development by encouraging people to save and generate investment (Law and Habibullah, 2009). The appropriate allocation of financial resources and supports of other economic policies improve economic growth and stabilize the economy. Levine (1997) provided the explanation of the possible passage that oil dependency and financial development influence economic growth.

In developing countries, the operation of financial services is inefficient and consist a lot of setbacks that fails to perform effectively. They are facing the challenges of how to mobilize financial services in a smooth way (Boularedj and Faouzi, 2015). In Algeria, the central government adopted to transition its economy and started the privatization the in 1990, along with the financial services reform (Elhannani et al., 2016). The financial services in Angola were relatively weak as domestic investors were relying on self-finance or pursue funds from foreign banks for investment when the foreign investors were unable to access financial credit (Aguemon et al., 2011). The level of financial services in Libya was relatively low, a majority depended on banks and insurance company (Husien and Havard, 2000). In 1986 the Nigerian government adopted the program called Structural Adjustment Program (SAP) and the financial services were reformed.

From the literature, the common proxy for financial development is a domestic credit to the private sector by banks. Figure 1.8 shows the domestic credit to the private sector by banks of four African OPEC members. In 1995 Libya had the highest domestic credit to the private sector by banks, followed by Nigeria, Algeria and Angola. Along the trend, Libya's credit by banks started reducing from 1999 to 2010 and had the lowest credit. Nigeria had improved the credit service from 2006 to 2009, afterward, the credit had dropped due to the reduction in oil price from 100.6 to 63 per barrel. In 2014 Libya had the highest provider of financial credit by banks, followed by Angola, Algeria and Nigeria.

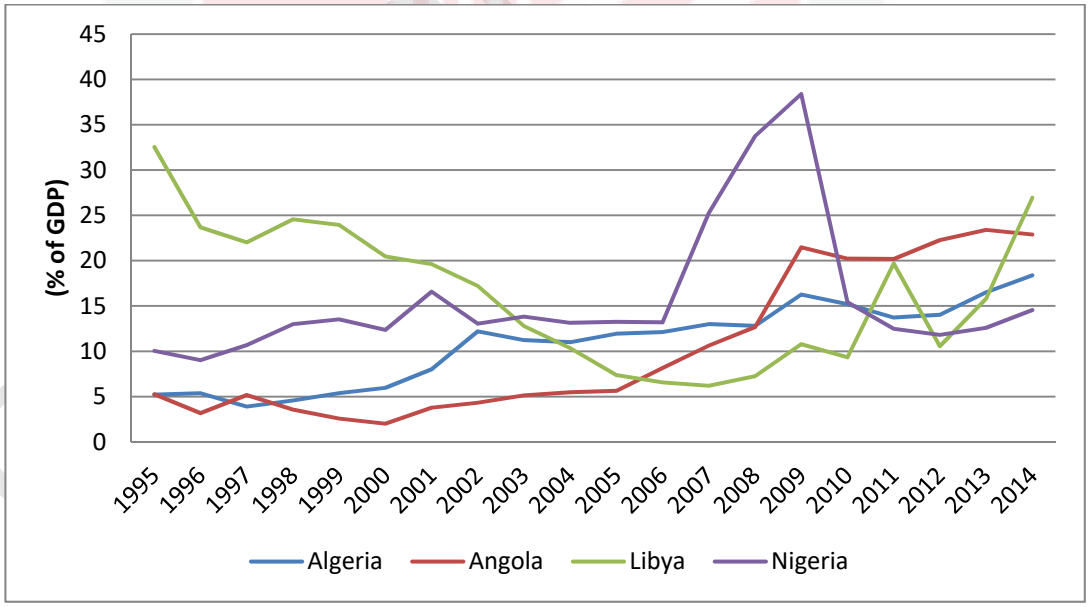

Figure 1.8 : Domestic Credit to Private Sector by Banks (% of GDP)
(Source: World Bank Online Database)

1.1.6 Monetary Policy of African OPEC members

Monetary policy is a highly effective measure for normalizing an economic condition which is affected by undesired shock. Therefore, there is a need to understand the efficiency and significant way the monetary tools are working in an economy. The effective use of monetary policy action differs between countries usually by the dissimilarities in the nature of economies such as structural economic condition, the autonomy of the central bank, capital market and financial stability. There is a theoretical and an empirical channel of monetary policy instrument influencing economic variables in oil producing countries and well-functioning financial regulation. In the absent of strong policy action, the economy will be damaged from undesirable economic growth. This is one of the binding targets of monetary policy to ensure that the inflation rate remains at a certain level and the domestic price is stable.

This theory signifies that an increase in the money supply leads to an increasing price level and may potentially increase real output. The process follows through a multi-channels including the interest rate, credit, exchange rate, and asset price (Mishkin, 2006). Another possible direct channel that affects trade balance is through the changes in exchange rate. Depreciation in domestic currency directly discourages import and boosts export. This indirectly affects producers and consumers price through the cost of external inputs and products. Monetary policy instruments through changes of money supply influence short-term nominal indicators like prices (Blanchard, 1990). Monetary policy instruments through the interest rate affect the liquidity of aggregate demand and supply of consumption and investment in a small open economy which influences the movement of output (Taylor, 1995; Mishkin, 1996). In a small open economy, the exchange rate transmission mechanism performs a highly significant role with flexible exchange rates whereby the interest rate channel is relatively weak. The exchange rate channel passes through depends on the degree of openness of capital inflow and outflow (Taylor, 1995).

Although monetary transmission channels have distinctive effects on the economy, there are also possible inter-linkages between the channels through which they may magnify or counteract the influence of other channels. Empirical evidence has shown that interest rate under flexible exchange rate regime depreciation in domestic currency is likely to lead to an increase in import price. On the other hand, albeit imported inflation could be less of a problem than it is in countries with pegged exchange rate regimes. The channel is usually the most important transmission mechanism in advanced economies with developed financial markets, while the bank lending and exchange rate are generally the dominant channels of monetary transmission in emerging market economies. The central bank under its monetary policy framework has the ability to set target inflation with a certain percentage range for the medium-term. This monetary policy is anticipated to promote price stability and long-term economic growth. The central bank independence and its freedom to control external shock use interest rate have a short-term monetary policy. The minimum requirement for implementing inflation target is precisely difficult in developing countries (Masson et al., 1997)

Table 1.3 shows various monetary policy tools in four African oil producers that used in this study. Within the period of study, the African countries such as Algeria, Angola, Libya and Nigerian experience depreciated exchange rate. In 1995, the official exchange rate of Algeria was 47.66/USD, Angola 0.001/USD, Libya 0.42/USD and Nigeria 21.90/USD while in 2014 Algeria was 80.58/USD, Angola 98.30/USD, Libya 1.29/USD and Nigeria 158.55/USD. The interest rate in Angola in 1995 was 206.25 percent due to the hyperinflation around that time after the interest rate decreases to 16.38 percent in 2014. Nigeria was somehow stable in 1995 with 20.23 percent and in 2014 was 16.55 percent. In Algeria the interest rate was 18.42 percent in 1995 and 8 percent in 2014. The interest rate in Libya was lower compared to others at 7 percent in 1995 and 5.6 percent in 2014. The money supply of the African OPEC Members from 1995 to 2014 is shown in Table 1.3. In 1995 Libya has the highest in terms of the money supply of 79.62, followed by Angola 40.10, Algeria 37.16 and Nigeria 15.87. The main causes of changes in the money supply in Libya were the civil war and political instability that affected the crude oil production.

Table 1.3 : African OPEC Countries Monetary Policy Instruments

Years	1995	2000	2005	2010	2014
Exchange Rate/$)					
Algeria	47.66	75.26	73.28	74.39	80.58
Angola	0.0027	10.04	87.16	91.91	98.30
Libya	0.42	0.51	1.31	1.27	1.29
Nigeria	21.90	101.70	131.27	150.30	158.55
Interest Rate					
Algeria	18.42	10	8	8	8
Angola	206.25	103.16	67.72	22.54	16.38
Libya	7	6.13	6	6	5.6
Nigeria	20.23	21.27	17.95	17.59	16.55
Money Supply(M2)					
Algeria	37.17	37.83	53.83	69.05	79.42
Angola	40.10	17.28	15.90	35.33	41.00
Libya	79.62	48.51	26.56	47.64	127.47
Nigeria	15.87	21.96	17.73	21.03	20.16

Source: OPEC Annual Statistical Report

1.1.7 Exchange Rate of African OPEC Members

The exchange rate is the intermediary measure to the value of a nation's currency against other nation's currency. The changes in the exchange rate might induce changes in the external economic sector, capital flow and financial stability, which may affect the relative prices of goods and services and the level of spending by individuals and firms. An appreciation in the value of the exchange rate makes the imported goods and services relatively cheaper, while depreciation makes export become cheaper for foreign buyers. Figure 1.9 presents the exchange rate movement of African OPEC Members from 1960 to 2015. It can be seen that these four currencies

had started to depreciate against US dollar since late 80s. Since the transformations of their policies especially in the financial and exchange rate management through the open economy. They are also affected by the United State deep economic recession and a sharp downturn in housing activity in 1989 to 1991. The origin of the exchange rate crisis in most of the oil exporting countries started from 1990 to 1991. The official exchange rate to USD for Algeria depreciates from 8.95 to 18.47, Angola depreciates from 2.99 to 5.51, Libya remains 0.28 and Nigeria depreciates from 8.03 to 9.90.

According to World Bank, Algeria is practicing managed floating exchange rate which is the central bank intervention in the exchange rate markets to stabilize the rate by buying and selling of foreign currencies when it fluctuates. Angola is practicing stabilized arrangement in which the central bank is stabilizing the exchange rate market price. The official exchange rate of Libya is a composite conventional peg to the SDR that is the value of the domestic currency which is managed within a specific range. Nigerian had adopted the arrangement for its exchange rate against the US dollar. In addition, the Nigerian government also implemented an account whereby the excess crude oil fund which was saved during the oil price hike. However, the amount of foreign currency saved in the dollar during oil boom was insufficient to replace the deficit gap of recent global oil price fall (Budina et al. 2008). The central bank used monetary policy to defend the domestic currency value, the external reserve, which depleted faster than the oil revenues. This suggests a way shore up revenue which is to allow the domestic currency to depreciate.

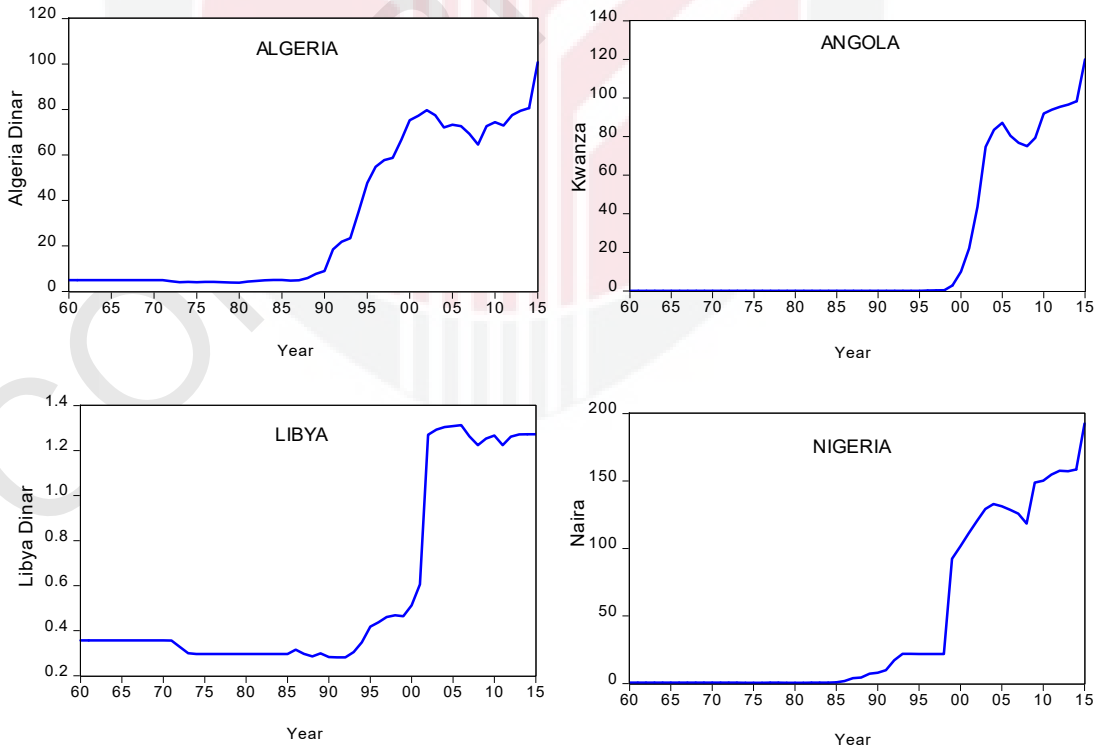

Figure 1.9 : Official Exchange Rate / U.S. Dollar
(Source: World Bank Online Database)

1.1.8 Oil Price Changes and Inflation

There is a discussion whether oil price shock is a crucial factor in causing an economy recession (Bohi, 1991). It is generally recognized that oil price shock will partially delve into inflation (Chen, 2009; Ibrahim and Said, 2012; Nazarian and Amiri, 2014). The domestic inflation is the key factor that changes the overall price of goods and services bought by a typical consumer in an economy. These goods and services comprise those that are originally manufactured from abroad and imported into the domestic market and those goods that are manufactured locally. Price changes of those kinds of goods and services are in response to the fluctuation of crude oil price in international market.

The countries that are practicing a pegged exchange rate regime is supported by appropriate macroeconomic policies which are generally continued in experiencing inflation rates lower than those with more flexible regimes. The stability of the peg has been supported by the adoption of a convergence program introduced following the devaluation of the 1990s. Countries that have historically relatively high inflation rates reflect a general lack of monetary restraint. Figure 1.10 presents the inflation rate movement for African OPEC members from 1995 to 2014. In the past decade, Algeria, Angola and Nigeria experienced the inflation rate at about 7 to 8 percent, except in 1990 to 1998 due to the changes in monetary policy. Angola experienced hyper-inflation of 4146 percent in 1996 due to the war, reformation of market policies, printing money to finance the budget deficit. The inflation rate of Angola, Libya and Nigeria exceeded the central bank's participation (World Bank Group, 2016).

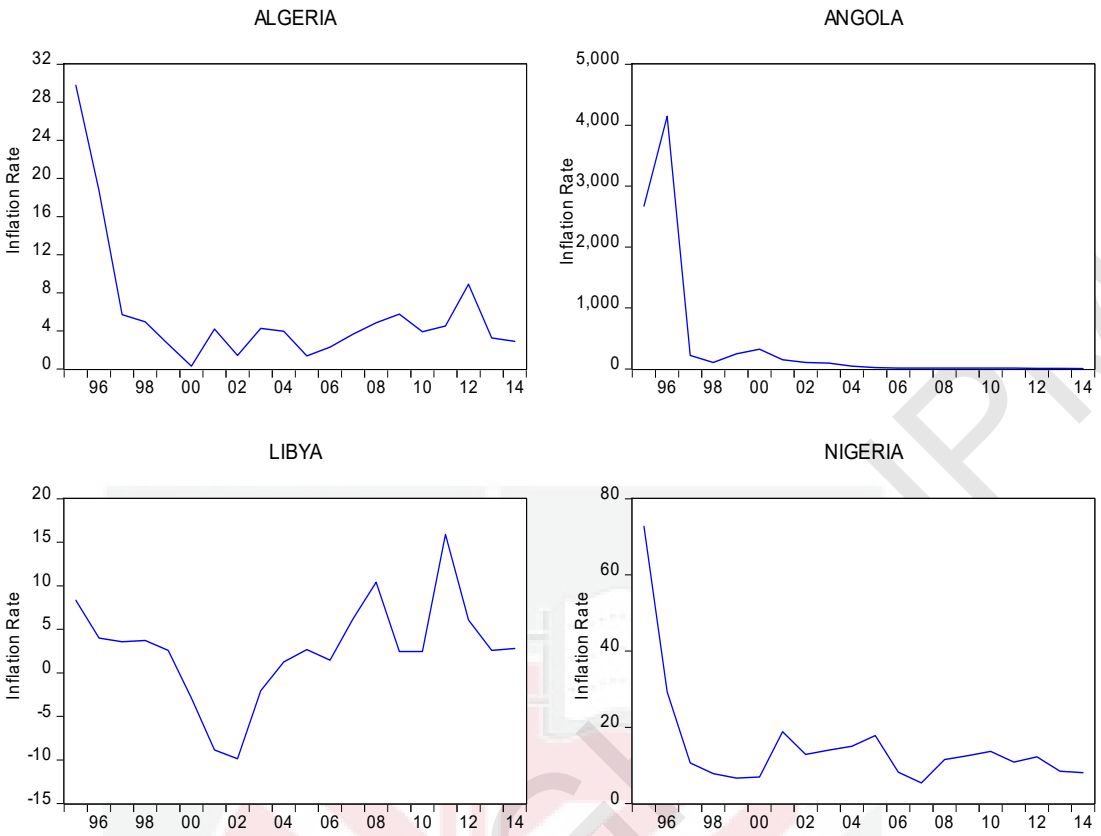

Figure 1.10 : Inflation Rates in African OPEC Members
(Source: World Bank Online Database)

Figure 1.11 plots the oil price and inflation rates for African OPEC members from 1995 to 2015. It can be observed that the oil price and inflation rate relationship of those countries is ambiguous and asymmetric in nature. Most of the changes in inflation were not followed by the changes of oil price especially when the oil price increased. However, when oil price decrease is highly significant in increases the price level of these countries that rely on imported non-oil products, even though the domestic prices of those economies are regulated by policy makers to ensure price stability.

The inflation reached a peak during 1995 to 1997 in Algeria, Angola and Nigeria, while the oil price did not portray large variations. In 2006 when the oil price increased, inflation showed larger respond than when oil price decreased in 2008 particularly in Algeria, Libya and Nigeria. In the middle of 2014 to 2016 oil price dropped from $115 per barrel to $32 per barrel and inflation rose. It did not track its previous pattern during an oil price hike in 2006 to 2008. Inflation which increased sluggishness mainly attributed to a slowdown in economic activity which has adversely impacted by the inadequate supply of foreign exchange.

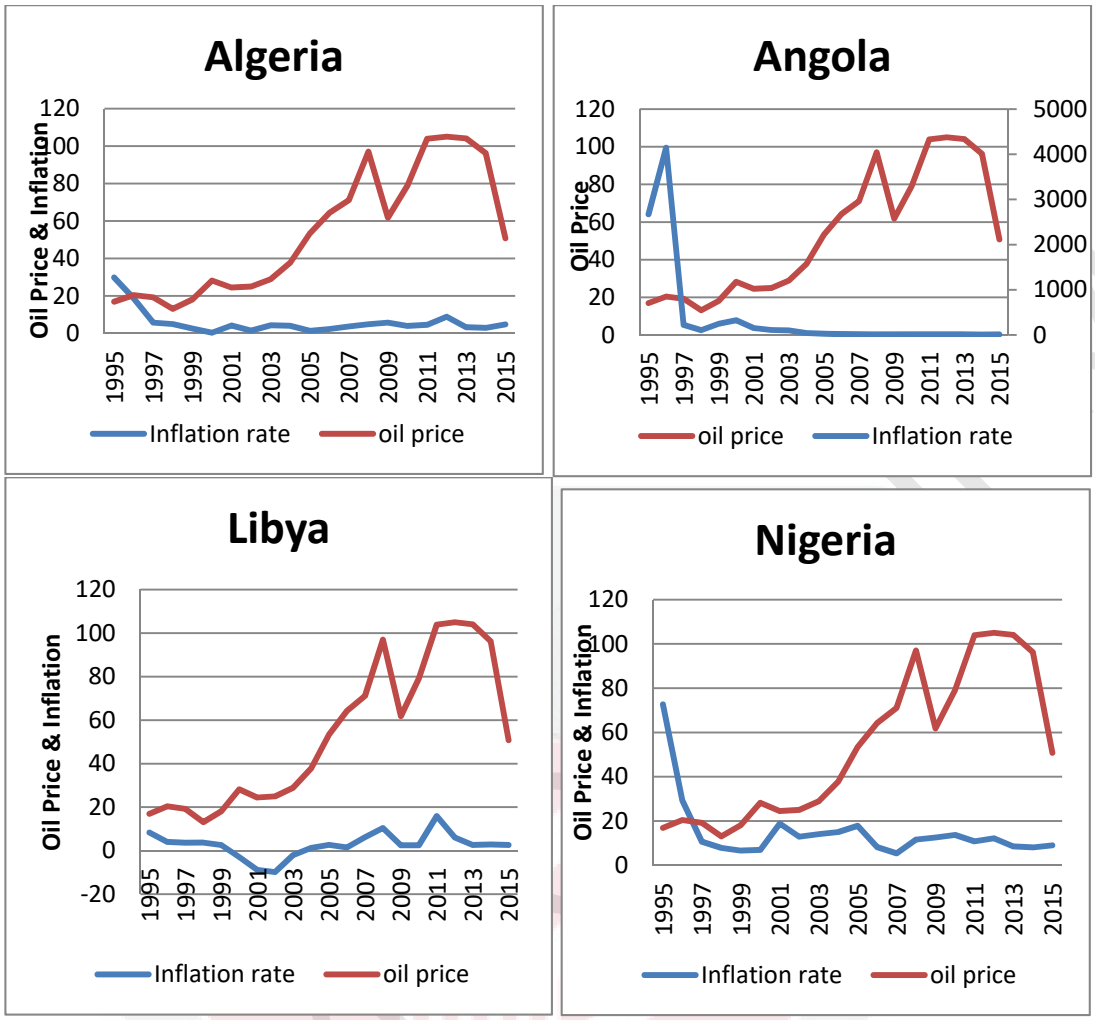

Figure 1.11 : Oil Price and Inflation rate
(Source: World Bank Online Database)

Figure 1.12 shows the relationship between oil price and inflation rate in oil exporting countries in a nonlinearity scatter plot. The graph reveals that in the initial stage the relationship was positive with low oil price however when the oil price increase to a certain point the relationship became negative. This shows that there is a possibility of a nonlinear relationship between the oil price increase and oil price decrease. The increase and decreases in oil price have a different impact on inflation. Figure 1.13 shows the relationship between food production and inflation of oil exporting countries. It can be seen that when the food production in oil exporting countries is low it increase the inflation rate while the production in food items reduces the inflation rate and vice-versa.

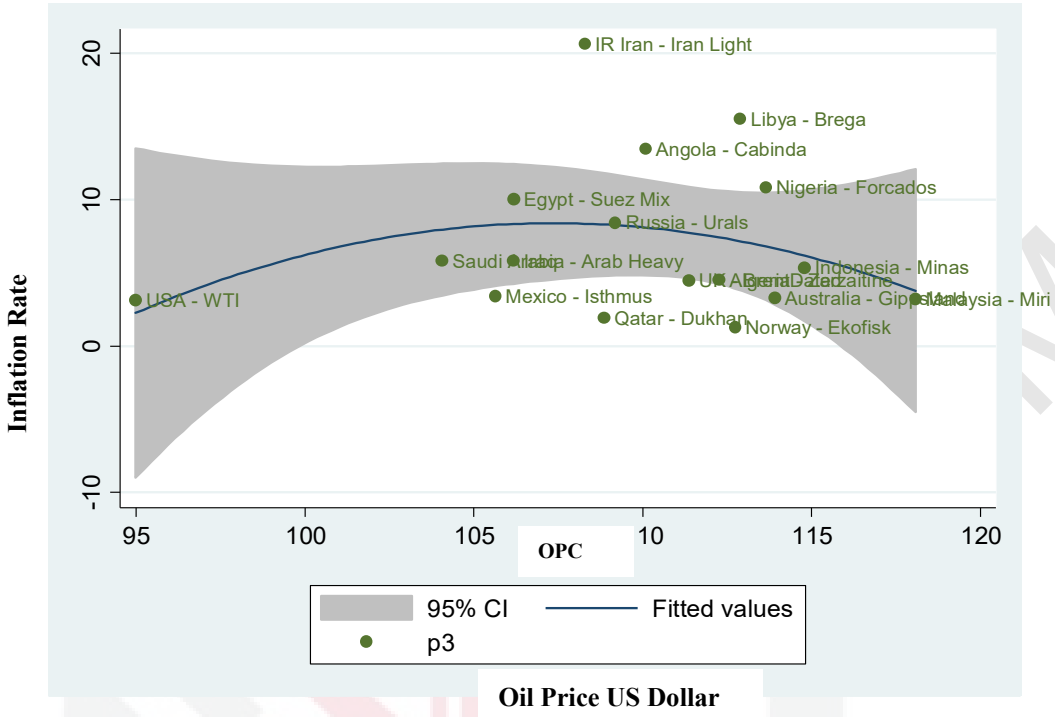

Figure 1.12 : Oil Price and Inflation Rate in Oil Exporting Countries

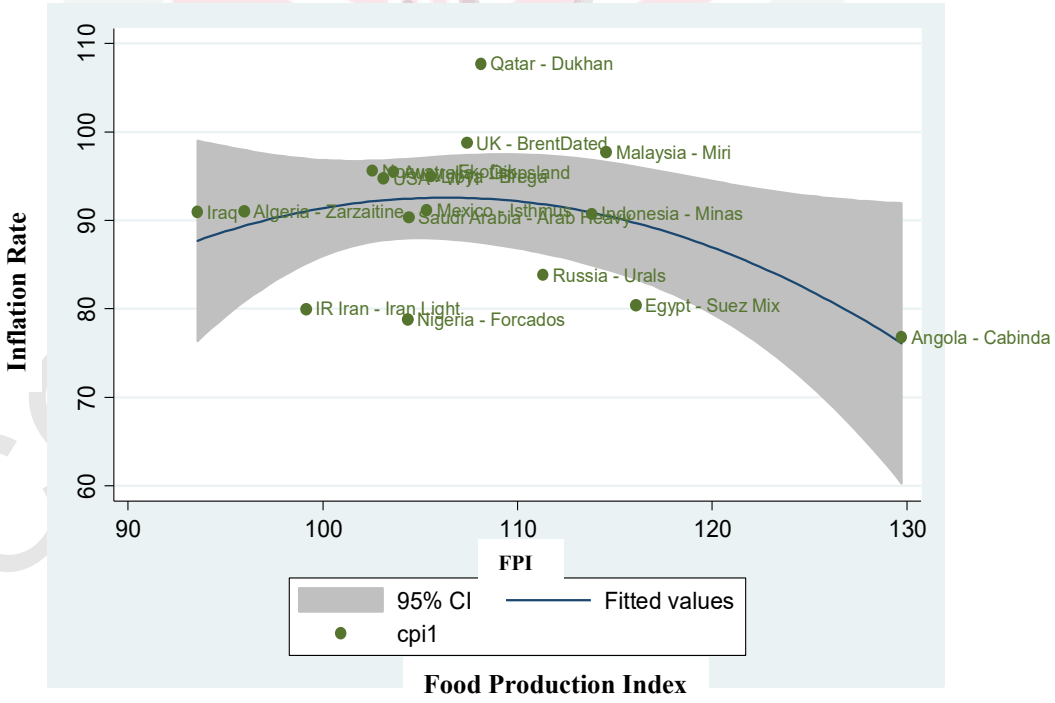

Figure 1.13 : Food Production and Inflation rate in Oil Exporting Countries

1.1.9 Oil Price and Trade Balance

Figure 1.14 shows the relationship between import, export and trade balance for the African OPEC Members from 1970 - 2013. Generally, the total export and total import of these countries increased over the years.Periodically, these countries are experienced balance in trade whereby the trade balances fluctuated around zero. However, these countries experienced a trade surplus since 2000. This can be observed that oil price increased from the year 2000 to 2008 in which the trade surplus of these countries increased substantially. This can be observed during the falling of oil price in 2008 to 2009 all these countries experienced a decrease in trade balance, but with different severity. Nigeria has the smallest drop as compared to other countries. Later, the oil price increased in 2009 to 2011 in which the trade balance gradually increased for Algeria, Angola and Nigeria, except Libya. Again, Nigeria has the largest improvement in trade balance as compared to other countries. Libya and Algeria have a different pattern. The trade balance of Nigeria dropped in 2014 due to the falling of oil price. However, Algeria had a sharp decrease in the trade balance in 2014. These asymmetric responses of trade balance may be caused by different policy response towards oil price shock.

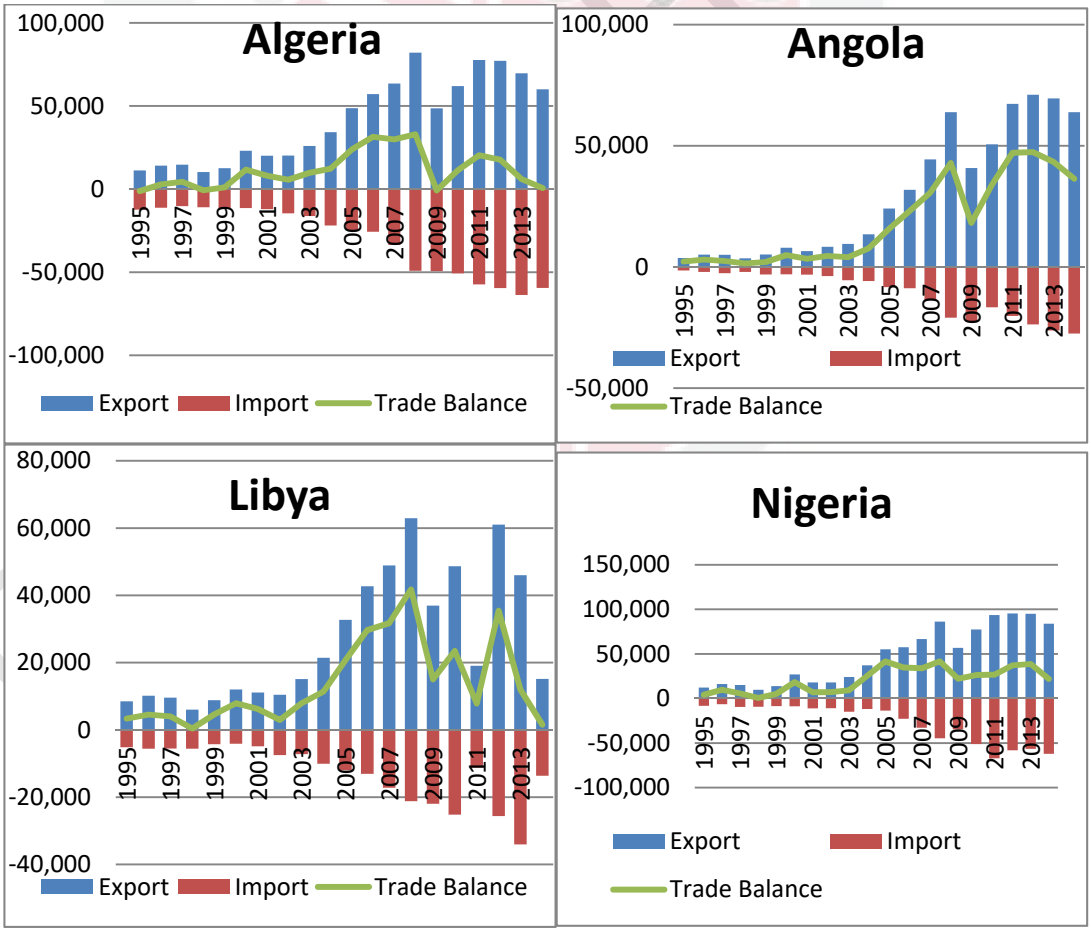

Figure 1.14 : Imports, Exports and Trade Balance for African OPEC Members
(Source: Annual Statistical Bulletin 2016)

The response of exchange rate policy towards oil price shock depends on the changes in oil price.A decrease in oil price may push the policymakers to devaluate their currency in order to discourage import and encourage export. In order to allow the nominal exchange rate to depreciate, the aim is to lessen the demand for foreign products and reduce pressure on the current reserves. As oil price dropped, the oil exporting countries' economies that are depending on the importing of finish goods for their domestic consumption are distorted due to the short supply of foreign currency. The excess demand for foreign currency pushes to devalue the domestic currency, while the oil prices were at the peak, the currency was devalued. These declarations clearly showed the possibility of non-linearity effects of oil price. These oil exporting countries normally depend on importing finish goods for their domestic consumption. These countries would be inferior when their currencies were devalued (Jibrilla, 2010) especially those that are in the cartel, which has required production quota. As it can be witnessed Algeria, Angola, Libya and Nigerian currencies were depreciated around 1990, and those that improvement was not shown in the trade balance.

Figure 1.15 illustrates how the oil price changes influence exchange rate and trade balance in Algeria, Angola, Libya and Nigerian. These countries had a different response to the exchange rate and trade balance when oil price changes. The trade balance followed the movement of oil price changes, especially in Libya except during civil war than other countries. The more complex relationship occurred during 2008 when the trade balance of those countries dropped more than the proportional changes in oil price particularly in Algeria, Libya, Angola and Nigeria. Based on the response of the exchange rate of those countries during the period, Libya had a more stable exchange rate than other countries, followed by Angola, Algeria and Nigeria. In general, from the period of investigation, the exchange rate showed more depreciated than appreciation even when the oil price increased.

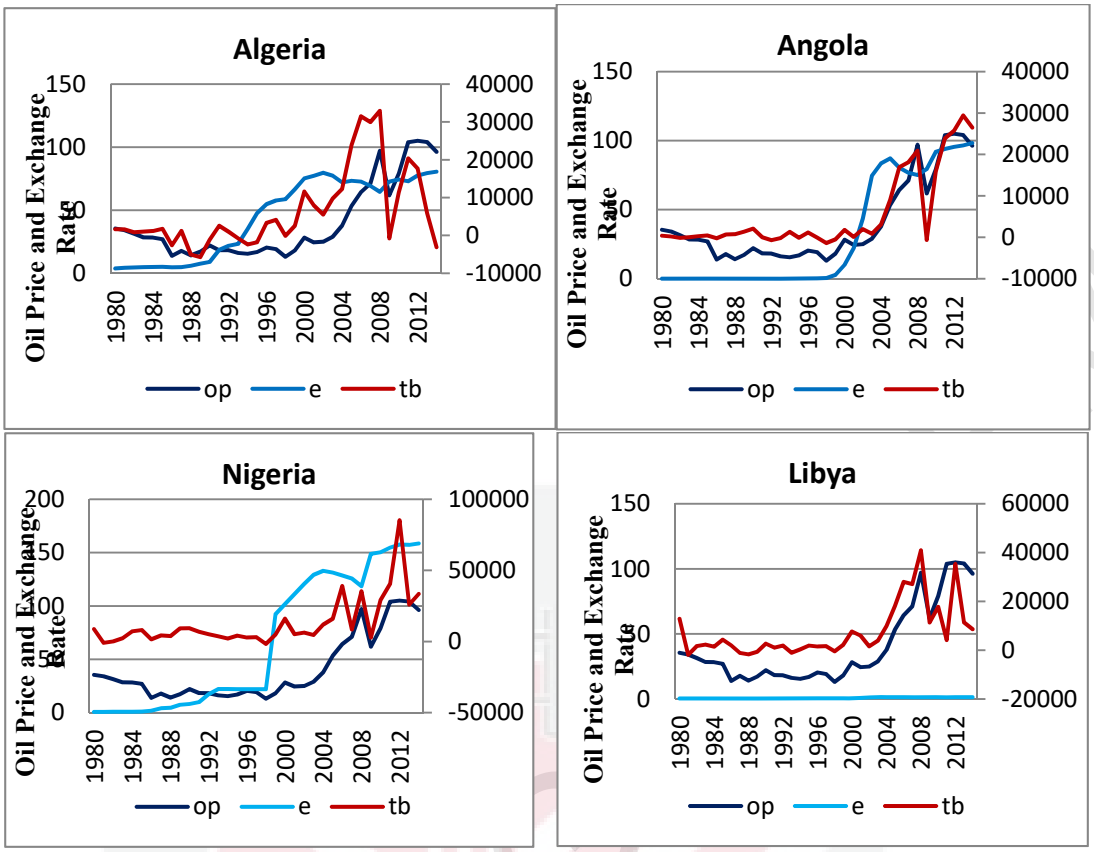

Figure 1.15 : Oil Price, Exchange Rate and Trade Balance
(Source: Annual Statistical Bulletin 2016)

Figure 1.16 shows the relationship between trade balance and oil price for oil exporting countries indicate there is a positive relation between them. Figure 1.17 the relationship between trade balance and of oil price before the currencies was devalued show lesser positive relation. Figure 1.18 is after the currencies were devalued show that there is an improvement in trade balance compare with before devaluation. The relationship becomes ambiguous since the positive impact in trade balance was not really detected is deriving from the devaluation the other factor may be the reason for the improvement.

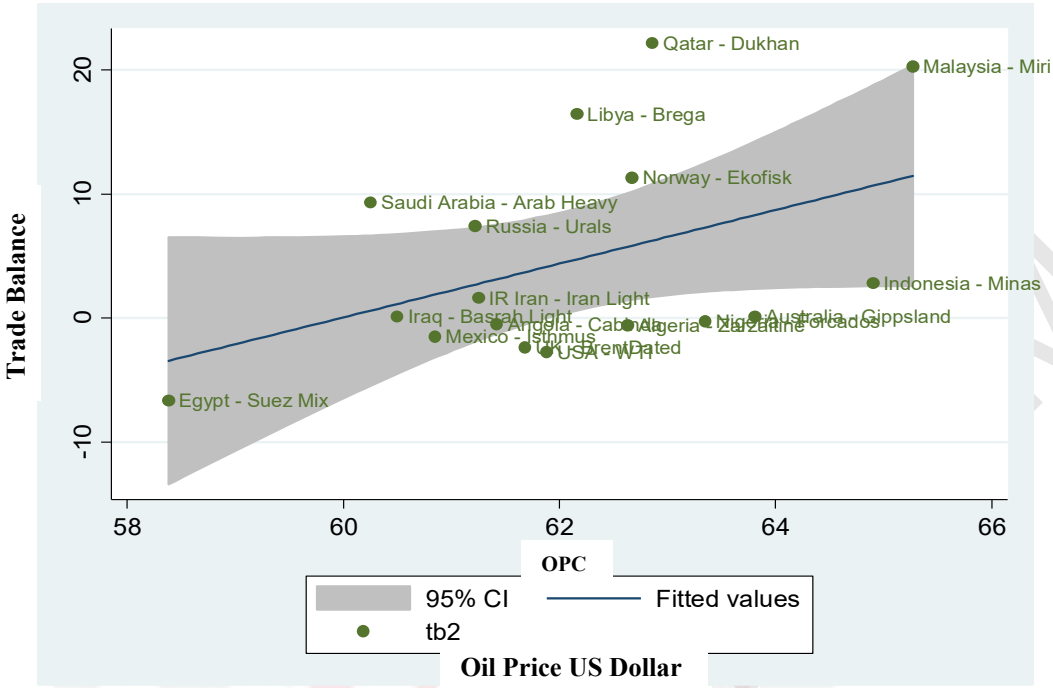

Figure 1.16 : Oil Price and Trade Balance of Oil Exporting Countries

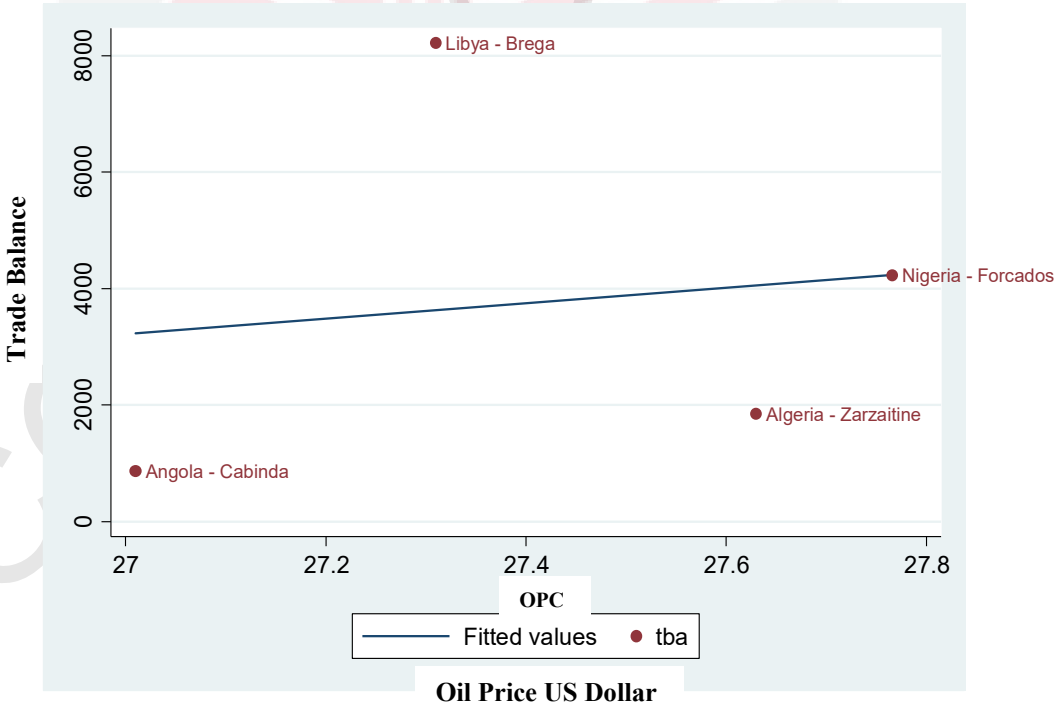

Figure 1.17 : Oil Price and Trade Balance before Devaluation

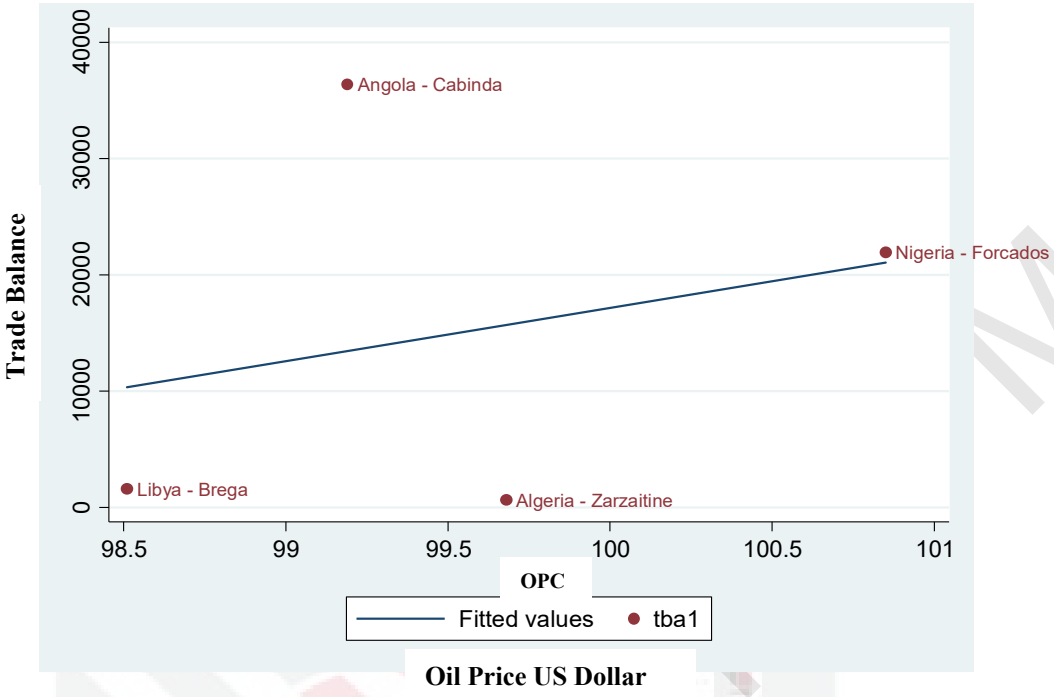

Figure 1.18 : Oil Price and Trade Balance after Devaluation

1.1.10 Oil Price and Economic Growth

The economy in African oil exporting countries Algeria, Angola, Libya and Nigeria has been adversely affected by external shocks. Their average annual growth decreased from 5.165 percent in 2014 to a valued 1.5 percent in 2015 (World Bank Report, 2016). The graphic representation of the oil price and GDP specifies the two variables which have been in mutual association with their movements indicating that they have long-run the association. Moreover, the graphical representation of oil price indicated that there is a persistence up and down the movement specifically in the Iraq–Iran war which affected the oil price in the 1980s corresponding to the collapse of oil prices in 1986, the Iraqi invasion of Kuwait in 1990 to 1991 and the Gulf war, the 1997 to 98 Asian financial crisis, the 2001 terrorist attacks on the US, the Iraqi war in 2003, and the recent US mortgage crisis in 2008. In general, the trend in oil price appears to be more volatile than the GDP of both countries. Nigeria's GDP has followed the movement of the oil price changes in the 1980s than other countries. Angola followed the negative in 1994s, while Libya in 2001.

The improvement of the economic growth of those countries has significant benefit from oil price increase from 2000 to 2008 whereby the nominal oil price per barrel shot up while the GDP growth had little positive impact. Algeria had relatively stable growth, Angola even oil price increases, GDP growth turn to negative -6.94 percent in 2002 and highest positive growth of 22.59 in 2007, Libya -1.76 percent in 2001 and highest growth of 11.87 percent in 2005 and Nigeria showed the highest growth of 33.73 percent in 2004. When oil price dropped during 2008 to 2009, Angola and Libya GDP growth were negatively affected while Algeria and Nigerian GDP were not much affected. The longest negative GDP growth in Libya's economy was due to the civil

war in 2000, for other countries, the rate of growth was relatively stable that did not show improvement even though the oil price were increased from 2009 to 2012.

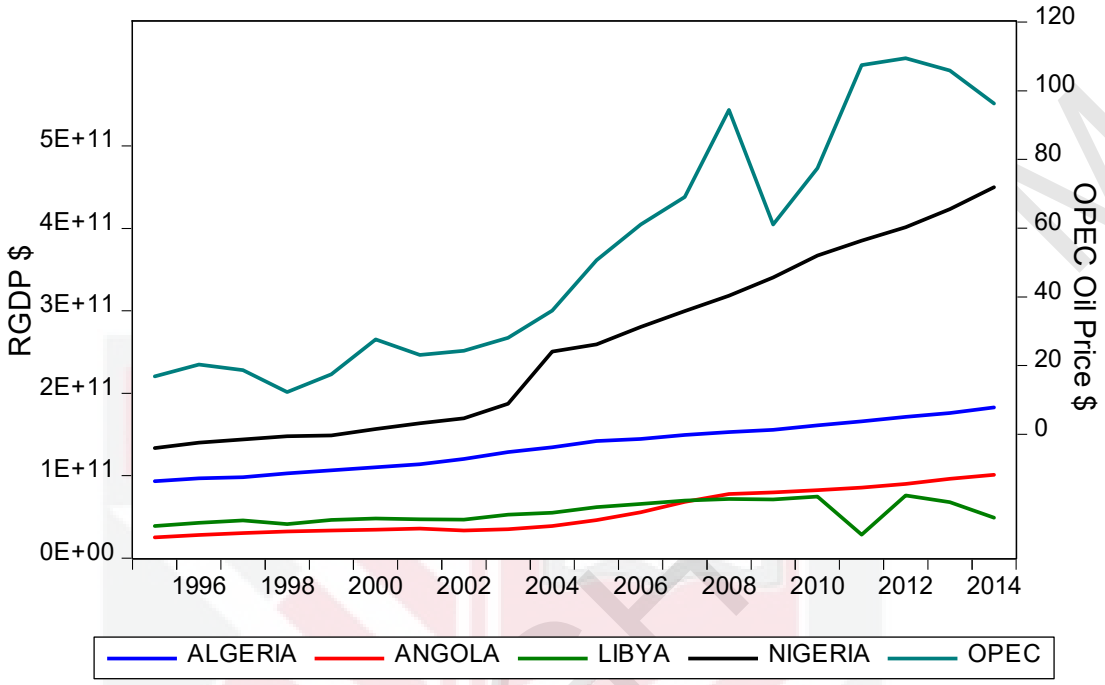

Figure 1.19 : Oil Price and GDP of African OPEC Members
(Source: Annual Statistical Bulletin 2016)

Figure 1.20 shows the correlation between oil price and GDP in oil exporting countries, the correlation is positive. Figure 1.21 and 1.22 portrays the disaggregation of the African OPEC members from the oil exporting countries financial development and economic growth. The Non-African oil exporting countries shows that the relationship between oil price and GDP is steeper. The scatter plots show that the relationship of African OPEC members is flatter than for the aggregate oil exporting countries. This shows the relationship between oil price and GDP is better with the strong financial development.

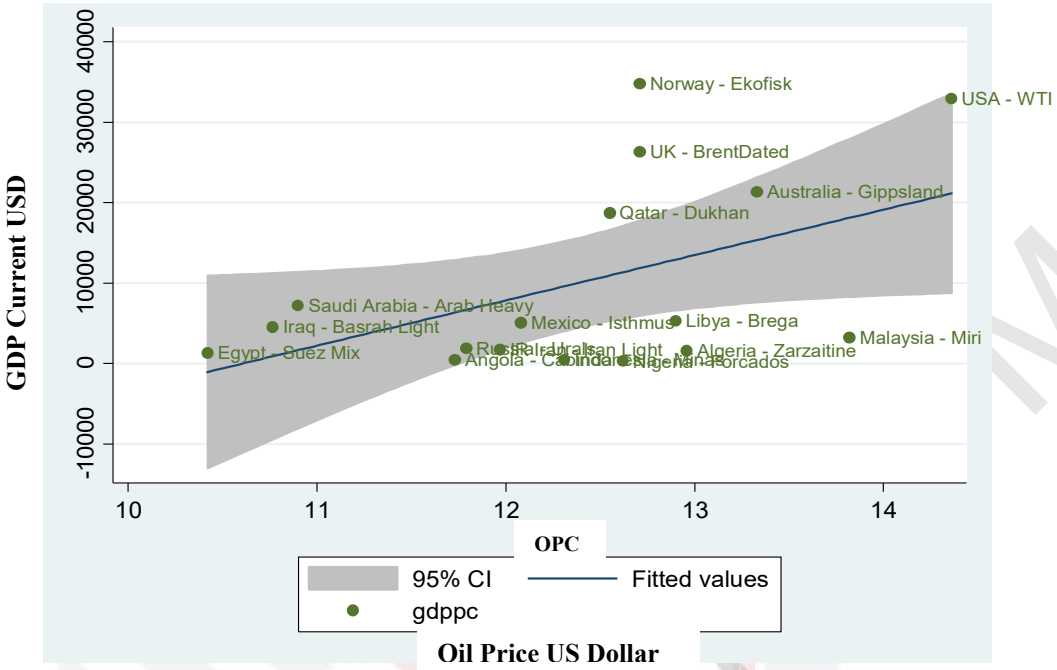

Figure 1.20 : Oil Price and GDP of Oil Exporting Countries

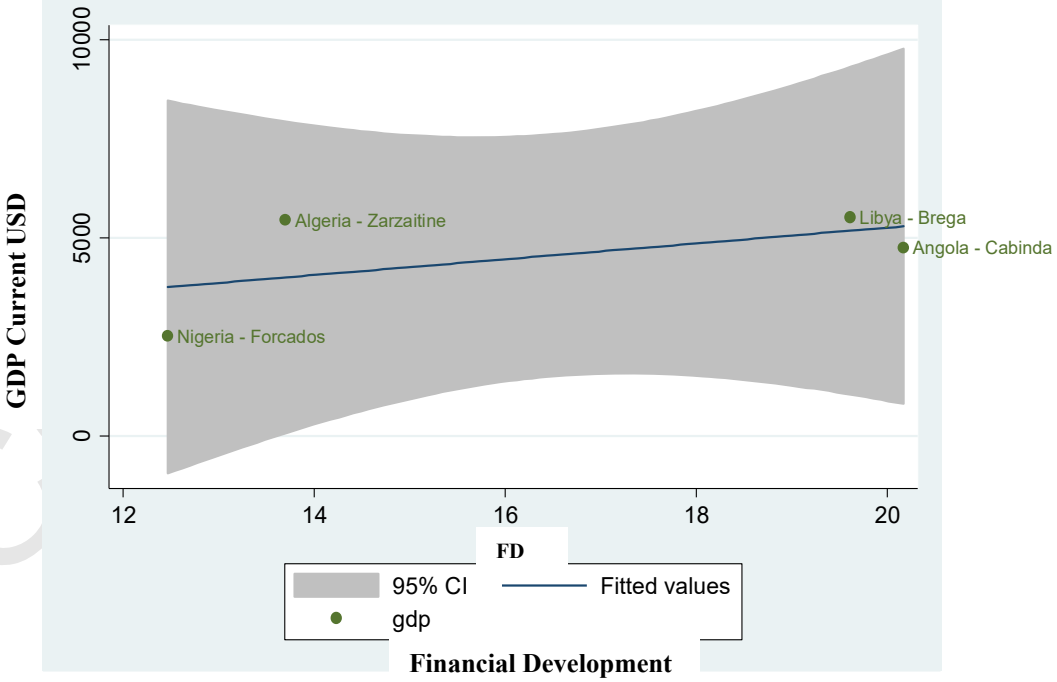

Figure 1.21 : Oil Price and GDP of African OPEC Members

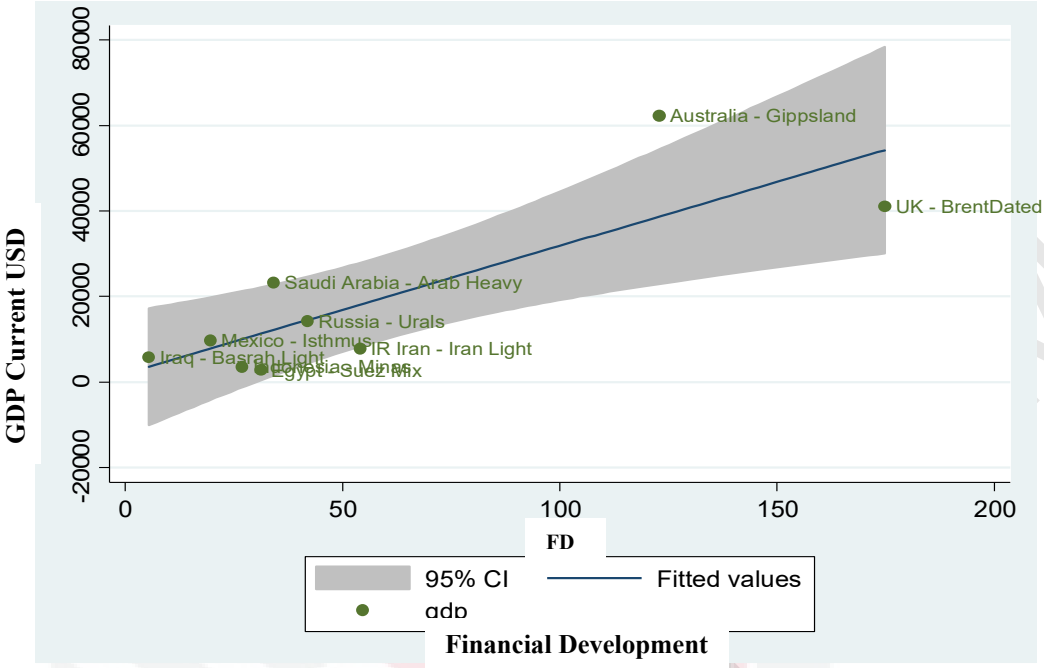

Figure 1.22 : Oil Price and GDP in Non-African Oil Exporters

To examine the impact of oil price on GDP, this study argued that the strong financial development is one of the factors that contributed to the growth. This study disaggregates the countries based on the countries that provided high and low financial services. Figure 1.23 the scatter plots of countries that provided better financial credit demonstrated a positive relationship. Figure 1.24 shows the scatter plot of countries with low financial credit that demonstrated positivity but lesser than countries that have high credit.

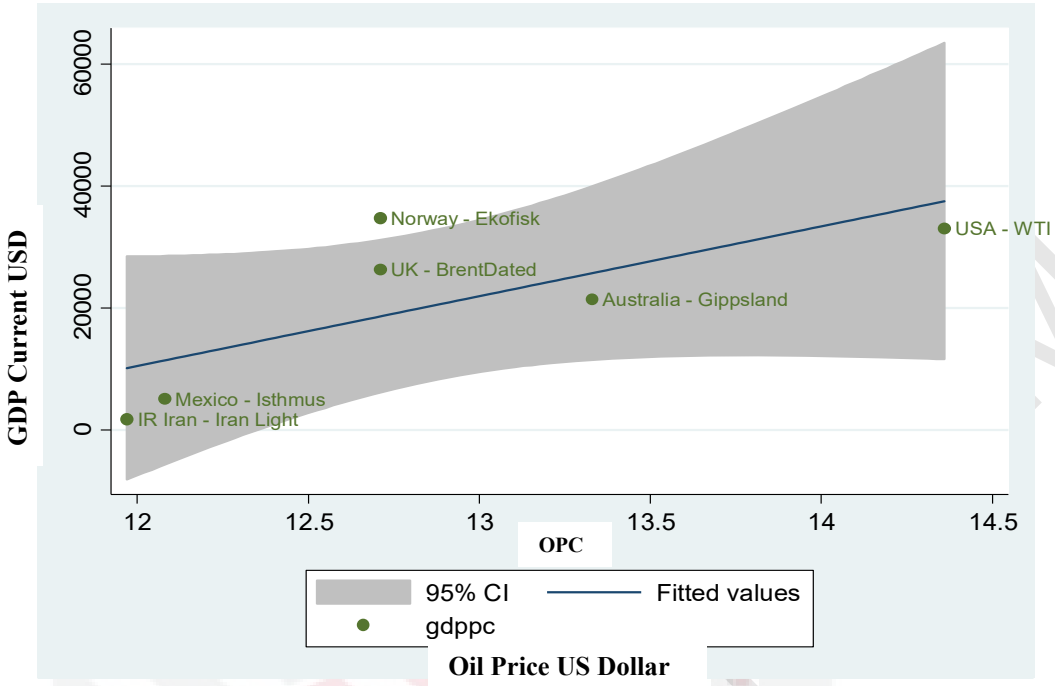

Figure 1.23 : Oil Price and GDP for High Financial Development Countries

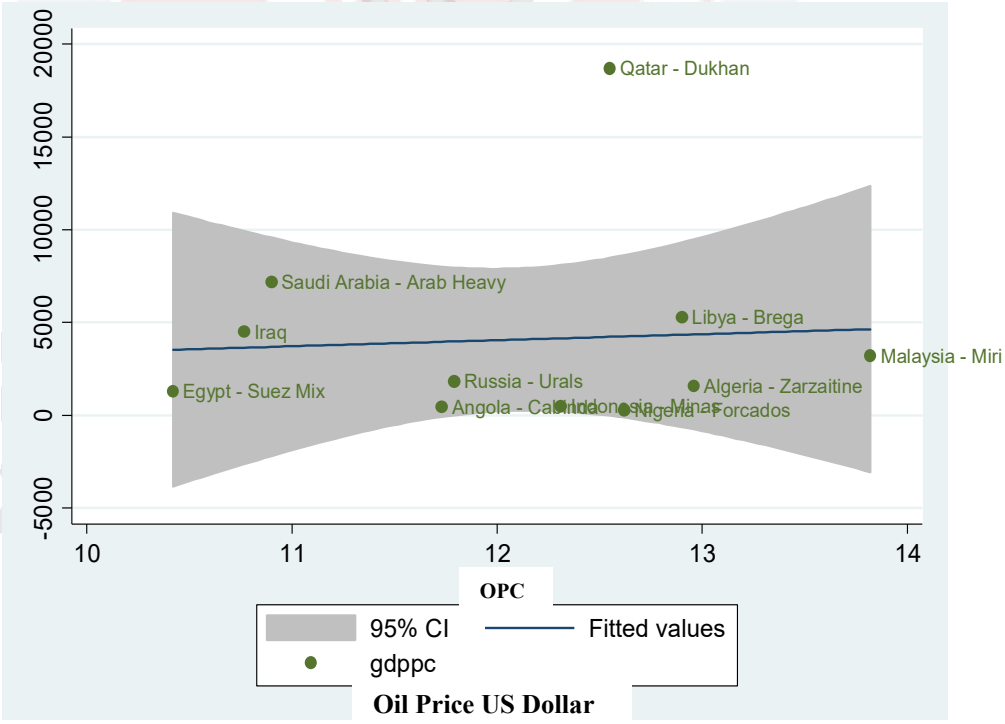

Figure 1.24 : Oil Price and GDP for Low Financial Development Countries

1.1.11 Nonlinear Impact of Oil Price Shock on Economic Activity

There are several kinds of empirical literature that have been conducted on the impact of fluctuations of oil price on how macroeconomics are responded. The earliest studies assumed the symmetric relation among the variables. This means the positive and negative shock affecting macroeconomic variables in the appropriate manner or it is always a proportional response to the positive or negative shock (Hooker, 2002; Aizenman and Pinto, 2004; Olomola et al., 2006; Olomola, 2006; Budina and Wijnbergen, 2008; Aliyu, 2009; Milani, 2009; Madueme, 2010; Iwayemi and Fowowe, 2011; Aguiar-Conraria and Soares, 2011; Iwayemi and Fowowe, 2011; Alley et al., 2014; Yinka, 2014; Ekong and Effiong, 2015).

However, there are findings that do not support the symmetric relationship. This study by Mork (1989) examined the asymmetric responses of macroeconomic variables when oil prices fluctuated. The result revealed that when oil price increased indicators were all negatively affected and this became significant but when oil price decreased all the variables were insignificant. Mork et al. (1994) indicated that the effects of oil price fluctuation can be separated between the positive and negative changes. Hamilton (1996) argued that since 1985 most of the increased oil price witnessed larger adjustment than the decreased oil price. Hamilton (2003) proclaimed that increases in oil price are found much more important than the decrease in oil price. In line with previous literature, Jiménez-Rodríguez and Sánchez (2005) also found the increase in oil price are much more important than the deteriorating oil price. (Hamilton, 2009; Mendoza and Vera, 2010; Rahman and Serletis, 2010; Chou and Lin, 2013; Sotoudeh and Worthington, 2014; Sotoudeh and Worthington, 2014; Aliyu and Mohammed, 2015; Yusoff, 2015) claimed that the positive and negative shock in the same proportion has different effects on macroeconomics variables.

Then several thoughts emerged as to why the relationship between oil price and economic activities were nonlinear. When oil price increase, consumers may delay the purchase of energy intensive goods as there is uncertainty about future energy cost until they are better known (Sharma et al., 1998). Delaying the purchase of energy-intensive goods will create a decline in demand for goods (output drop). The capital and labor frictions in those industries that supply them may decrease. Similarly, unused capital is either to be sold or left idle. However, the reverse process of oil price fall and the output response is asymmetric through redistribution effects (Edelstein and Kilian, 2009). Hamilton (1996) noted that if the price of energy causes people to postpone investments, then a decrease in oil prices would not equalize the contradicting consequences when the oil price increases.

Another source of asymmetric effects of oil price changes was due to the response of policy makers (Bernanke et al., 1997). The volatile nature of crude oil price in the world market influences a large portion of the fluctuations during inflation which forces the state of the economy to face a dilemma and create uncertainty. Monetary policy is the appropriate measure that supports the stabilization of an economy when a shock occurs. The available major adopting a contractionary monetary policy to tackle high price is by applying this measure the real GDP will reduce the effects of

low productivity that will increase the rate of unemployment or expansionary measures to support the level of output growth and employment as the inflation rate will increase in a persistent manner.

Should the central banks tighten monetary policy to counteract the effects of oil price increase and prevent general inflation? Instead, should they accommodate oil price increase with monetary policy, in order to maintain the initial growth of output and employment? The policy makers can also decide to take no action, the consequences will be a combination of the first two decisions in which the economy will experience some drop in output, the rise in inflation and unemployment. In a nutshell, the oil price hike or fall has different effects on economic activities. Oil price spikes convey more ambiguity about the future price, firms and households as this will definitely change their spending and investment decision. But a decrease in oil prices would not equalize the contradicting consequences when the oil price increases.

1.2 Problem Statements

The price of oil in the past decades noticed a high level of fluctuations and also in recent time showed frequent changes. The falling of oil price in 2014 has affected the global economy, especially in the oil exporting countries. Most of the oil exporting countries have entered a critical situation on how to manage the shock especially the countries that heavily depend on oil exports to facilitate their economic activities like OPEC members. More than 80 percent of their exports depends on crude oil and about 90 percent of their foreign earnings derived from oil as mono products. Any changes in the oil price in the world market have a significant impact on their various economies, particularly revenue, inflationary pressure, exchange rate movements, trade balance and economic growth.

In African OPEC members, the growth has slowed down from 5.165 percent in 2014 to 1.5 percent in 2015. The policy makers implemented several measures including increased money supply, rising interest rate and currency devaluation to stabilize the economy. The implication of government intervention may affect inflation, trade balance and economic growth. The changes of interest rate may affect the investment and output, the reduction of money supply in circulation may cause an inflationary pressure and the devaluation of currency may affect trade balance. According to the theory, the devaluation of currency will promote export and improve trade balance in the long-run. However, the devaluation of currency did not bring fruitful results since the depreciation cannot make their oil price cheaper and they are bonded by OPEC quota, hence the trade balance did not improve as predicted by the theory.

1.2.1 Oil Price Changes and Inflation

The fluctuation in oil price creates ambiguity in general price level which adversely effects on inflation rate in oil exporting countries. The increases in oil price have created more revenue and increase the amount of money in circulation while falling oil prices weakened the overall foreign earning of African oil producing countries,

which resulted in an increase in the inflation rate as the demand for foreign products did not fall specifically on food items. In 2014, when oil price dropped, an inflation rate of African oil producers exceeded the central bank's anticipation. Angola, Libya and Nigerian inflation rate hit double-digits in consumer price in 2016 on a year-to-year basis. The policy makers made necessary policies to actualize inflation rate into single digit which was unsuccessful. The price of goods and services continued to increase as the oil price dropped while during high oil price the inflation still augmented. This provided the indication of a non-linearity behavior of oil price changes on domestic prices.

The inflation rate is usually volatile as it changes according to the different reason, in the middle of 1970s in which during oil boom the rate of inflation rate was positively affected. It has been observed that the positive and negative changes in oil price in the same proportion have a different impact on inflation. Figure 1.10 shows that in 2008 when oil price increases the inflation showed larger response than when the oil price decreased in 2006. In the middle of 2014, oil price dropped from $115 per barrel to $52 per barrel and the inflation rose. This did not follow its previous pattern during an oil price hike in 2006 to 2008. The impact of oil price changes on inflation are ambiguous in oil exporting countries as increases in oil price will increase the money supply in the economy and create inflation. In those economies, oil price decrease still causes the inflation rate to increase. Figure 1.12 and 1.13 shows the possibility of the nonlinear impact of oil price and food production on inflation.

1.2.2 Oil Price, Oil Export and Trade Balance

The global falling in oil price witnessed in the middle of 2014 brought severe issues to the African oil production to maintain favorable trade balance especially in oil production and oil export. In annual meeting, OPEC members are discussing on the quantity of oil production/export of each member. In the earlier years, most of the African OPEC members are trying to maximize their oil production by getting higher quota. Moreover, the increase of oil export do improve their trade balance, but recently its seem to be changed. An increase in oil production/export was unsuccessful in improving the trade balance, and this has caused a drop in oil price. The oil exporting countries voluntarily agreed to reduce the oil production/export in order to have higher oil price. The African OPEC members are uncertain about whether they will benefit from an increase in oil price or an increase in oil export. Which strategy will successfully improve the overall trade balance?

Figure 1.16 shows that the relationship between oil price and the trade balance positive before devaluation but when the countries devalued their currencies the relationship become lesser. The response of exchange rate policy towards oil price shock depends on how the economy relies on oil export. If the economy heavily relies on oil export, a decrease in oil price will lead to a reduce the trade balance. Hence, the policy-makers may devaluate currency to make export attractive and dampen the import. However, the outcome on trade balance will be ambiguous because going by the theory of devaluation. But in the oil-dependent economy, devaluation of currency seems to be

insignificant for export as the devaluation cannot influence the oil price or makes the domestic crude oil cheaper.

1.2.3 Oil Price, Financial Development and Economic Growth

The economic activities are well pronounced in African OPEC member countries following the dropping in oil prices in the mid of 2014. The financial services are tighter which has adverse effects on growth, GDP growth has slow down. Judging from the historical trend of oil price in Figure 1.19 GDP showed evidence of larger adjustment during the fall of oil price compared to the hike in oil price. the trend in oil price appears to be more volatile than the GDP of both countries in 2000 to 2008 whereby the nominal oil price per barrel shot up while the GDP growth had little positive impact. The policy makers usually delay responding when the oil price increases, thinking that they are benefiting, while oil price drop that is caused by the undesired situation and created uncertainty on the shock. Figure 1.21 shows the impact of oil price on GDP is higher in oil exporting countries than the African OPEC members in Figure 1.22.

Developing countries that are weak in financial development are most likely to suffer when oil price changes. In 1990 the domestic credit provided by financial sector was higher than in the 2000s, especially in Libya. However, persistence changes in oil prices increase the financial instability. Specifically, banks experience a higher credit, liquidity and interest rate risk which rises from linkages. These linkages could increase the vulnerability of the banking sector. The effect of oil price on economic growth depends on the ability of the financial sector to absorb the risk. When oil price fall, economic activities in oil exporting countries will be sluggish and the banks may experience higher default on loan repayment, hence become more vulnerable. It is generally believed that strong financial sector will be able to absorb this risk. Hence, reduce the negative impact of oil price on economic growth.

1.3 Objective of the Study

The main purpose of this research is to empirically explore the asymmetric impact of oil price that may disturb the macroeconomic indicators such as inflation, trade balance and economic growth in African OPEC member countries.

The specific objectives are:

1. To estimate the non-linear impact of oil price changes on inflation in African OPEC members.
2. To examine the threshold effects of oil price and oil export on trade balance in African OPEC members.
3. To investigate the threshold effects of oil price and financial development on economic growth in African OPEC members.

1.4 Significance of the Study

The research will contribute significantly towards a deeper understanding of how macroeconomic variables are affected when crude oil price changes. Based on the available literature so far, this research is the earliest study contributing towards assessing the short-run and the long-run differential oil price changes on inflation, trade balance and economic growth in African OPEC member countries, on the contrary to the previous researches on oil price which used different proxies of crude oil price, for example, Brent price, West Texas Intermediate (WTI), and Dubai Brent. Without considering the country's original crude oil price of each country. This study used the actual countries' crude oil prices Algeria (Zarzatine), Angola (Cabinda), Libya (Brega) and Nigeria (Bonny Light). This study will give insight to the monetary authority to the respective central banks to understand which instrument of monetary policy tools are effective to stabilize the economic activities especially when external shocks in oil price changes or oil export occurred.

In the first objective, there is limited research consideration on the impact of oil price changes on consumer price index considering the domestic food production as a role to play in the phenomena. This study included domestic food production in the model because the oil exporting countries like Algeria, Angola, Libya and Nigeria are food scarce countries. This is the recent empirical research that contributes to whether there is the non-linear impact of oil price positive and negative changes, food production on inflation in African oil OPEC members. This considers the changes in positive and negative oil price inflation in Algeria, Angola, Libya and Nigeria, which is ambiguous.

In the second objective, the research used recent data to capture the profound impact of oil price and exchange rate changes in the trade balance. Based on the number of empirical research on oil price and trade balance there are limited studies on African oil exporters. These countries highly depend on oil revenue when oil price or oil export changes are significantly affected by the exchange rate and the exchange rate also affects the foreign transaction. Besides the total trade balance, this study disaggregates the trade balance into import and export and to examine whether exchange rate has an impact on import, export and trade balance in oil price and oil export models. This is motivated by the asymmetric response of exchange rate policy during the falling of oil price. The policy makers devaluate their currency, but it seem is not effective to improve the trade balance. This study used threshold effect to find out whether there are different impacts of oil price and oil export on trade balance.

The third objective of this study is to examine the impacts of oil price on economic growth via the role of financial developments. The condition is that when a country has a strong financial development it's easier to stabilize the economy when shocks occur. This study used domestic financial credit as a proxy for financial development in both oil price and oil export models. This study also used two different proxy of economic growth indicator as GDP and investment. This study argued that the effect of oil price changes on economic growth depends on the ability of the financial sector to absorb the risk. The stronger the financial sector, the lesser the negative impact of

oil price fall on economic growth, this study used threshold effect to back the argument.

Based on the previous literature of oil price in African OPEC members' a majority used linear time-series model specifications. It has been found that simple linear models usually leave certain aspects of economic and financial data behavior, especially the indicators which fluctuates, shocks and volatility in nature that are unexplained (Tsai et al., 2012). The research will be beneficial to researchers, students, monetary policymakers authorities in delivering sound policies to understand the effects of oil price and oil export changes.

1.5 Organization of the Study

The remaining of the research will be organized as follows: Chapter two is about the theoretical framework, theoretical and empirical literature review, Chapter three presents the model specifications, methodologies and data descriptions. Chapter four discusses the results and Chapter 5 presents the conclusion and policy implications.

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