# IMPACT OF OIL PRICE ON ECONOMIC GROWTH, REAL EFFECTIVE EXCHANGE RATE AND INFLATION IN SOUTH AFRICA, MOROCCO AND COTE D' IVOIRE

By

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Thesis submitted to the School of Graduate Studies, University Putra Malaysia, in Fulfilment of the Requirement for the Degree of Doctor of Philosophy

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Abstract of the thesis presented to the senate of University Putra Malaysia in fulfillment of the requirement for the Degree of Doctor of Philosophy

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**Chairman** : **Mohd Naseem bin Niaz Ahmad, PhD**
**School** : **Business and Economics**

The research study aims to investigates the impact of oil price dynamics on Economic Growth, Real Effective Exchange Rate and CPI net oil importing Countries of South Africa, Morocco and Côte d'Ivoire. Using linear and Nonlinear Autoregressive Distributed Lag (ARDL and NARDL) bound testing framework. It shows that the variables are cointegrated of both order I (0) and I (1) which makes it deem applicable to employ autoregressive model that allowed for the combination of different order. Short run and long run nonlinearities are employed by partial sum decomposition to obtains positive and negative partial sum of oil price using a quarterly data over the period between 1983Q2 to 2020Q4 in the present of Structural. Same techniques are applied for all the objectives.

Findings from South Africa and Morocco indicates higher oil price leads to a decline in real GDP. Whereas lower oil price leads to an increase in real GDP with asymmetric and symmetric effect, while insignificant in Côte d'Ivoire. However, lower oil price is insignificant. This is because the price increase is absorbs through subsidy provision by government and at the same time Côte d'Ivoire is crude oil exporter, which mean higher oil price increases oil revenue earning from crude oil export.

In the second objective, oil price increase leads to currency depreciation in South Africa (Rand) and Cote d'ivoire francs (XOF) in the long and short run. While an appreciation of Dirham (Dirham) for both NARDL and ARDL. Whereas, lower oil price shows appreciation of Rand (ZAR) and francs (XOF), with insignificant in Morocco having a long run symmetry

For the third objective, higher oil price is associated to a higher CPI in South Africa and Morocco, but insignificant in NARDL. Similarly, lower oil price led to a positive

i

increase in CPI. This explains a situation of increase in economic activities couples with increased consumption of oil leading to higher CPI. In Cote d'Ivoire higher oil price leads to a decline in CPI due to earning from crude oil sales which could triggered increase in economic output upsetting effect of price increase. Moreover, lower oil price cause an increase in CPI in the long run with a long run symmetry.

The government should implement policies in stabilizing prices and measures to curve CPI stemming from oil price increase associated with currency depreciation. This would involve fiscal and monetary policy approach to keep price within a stable limit and removal of energy subsidy to allows the pass-through to consumer.

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

## KESAN HARGA MINYAK TERHADAP PERTUMBUHAN EKONOMI, KADAR PERTUKARAN BERKESAN SEBENAR DAN INFLASI DI AFRIKA SELATAN, MOROCCO DAN COTE D'IVOIRE

Oleh

**MOHAMMAD TUKUR SAIDU**

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Tujuan kajian ini adalah untuk mengkaji kesan harga minyak dinamik terhadap Pertumbuhan Ekonomi, Kadar Pertukaran Berkesan dan CPI dalam untung bersih negara-negara pengimport minyak di Afrika Selatan, Morocco dan Cote d'Ivoire dengan menggunakan kerangka ujian Susulan Teragih Autoregresif Tak Linear (ARDL dan NARDL). Model tersebut menunjukkan gabungan pemboleh ubah I(0) dan I(1) sesuai dalam menggunakan model autoregresif yang membolehkan gabungan berlainan kelas. Ketaklinearan jangka pendek dan jangka panjang digunakan oleh penguraian jumlah separa untuk mendapatkan jumlah separa negatif dan positif harga minyak berdasarkan kepada data suku tahunan di antara 1983Q2 hingga 2020Q4 dalam tempoh terkini berstruktur. Teknik serupa digunakan bagi kesemua objektif kajian. Selanjutnya, kajian ini menggunakan kuantil bagi keteguhan semakan.

Dapatan dari Afrika Selatan dan Morocco menunjukkan harga minyak yang lebih tinggi menyebabkan penurunan sebenar GDP, manakala harga minyak lebih rendah menyebabkan peningkatan GDP sebenar dengan kesan simetri dan asimetri. Sementara itu, ia didapati tidak signifikan di Côte d'Ivoire. Namun, harga minyak yang lebih rendah didapati tidak signifikan kerana kenaikan harga diserap melalui pemberian subsidi oleh kerajaan dan Côte d'Ivoire merupakan pengeksport minyak mentah. Ini bermakna harga minyak yang lebih tinggi meningkatkan pendapatan hasil minyak dari eksport minyak mentah.

Dalam objektif kedua, kenaikan harga minyak menyebabkan penyusutan nilai mata wang Rand Afrika Selatan (ZAR) dan Francs Côte d'Ivoire (XOF) bagi jangka masa panjang dan pendek. Sementara itu, mata wang Morroco (Dirham) mengalami kenaikan bagi kedua-dua NARDL dan ARDL. Manakala, harga minyak yang lebih rendah mengakibatkan kenaikan Rand (ZAR) dan Franc (XOF), tetapi tidak siginfikan di Morocco dengan simetri jangka panjang.

Bagi objektif ketiga pula, harga minyak yang lebih tinggi dan rendah menyebabkan peningkatan CPI di Afrika Selatan dan Morocco, tetapi tidak signifikan di NARDL. Ini menjelaskan situasi peningkatan aktiviti ekonomi digabungkan dengan peningkatan penggunaan minyak yang membawa kepada CPI yang lebih tinggi. Di Côte d'Ivoire, harga minyak yang lebih tinggi menyebabkan penurunan ICP disebabkan oleh pendapatan hasil dari penjualan minyak mentah yang boleh mencetuskan peningkatan hasil ekonomi yang menganggu kenaikan harga. Tambahan lagi, harga minyak yang lebih rendah menyebabkan peningkatan CPI dalam jangka panjang dengan simetri jangka panjang.

Kerajaan perlu melaksanakan dasar untuk menstabilkan harga dan langkah-langkah untuk melengkungkan CPI yang berpunca daripada kenaikan harga minyak yang berkait dengan penyusutan nilai mata wang. Ini akan melibatkan pendekatan dasar fiskal dan monetari untuk mengekalkan harga dalam had dan penghapusan subsidi tenaga untuk membolehkan peralihan kepada pengguna.

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This thesis was submitted to the senate of the university Putra Malaysia and has been accepted as fulfilment of the requirement for the award of the degree of Doctor of Philosophy. The members of the supervisory Committee were as follows:

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**Declaration by Member of The Supervisory Committee**

This is to confirm that:
- The research conducted and the writing of this thesis was under our Supervision;
- Supervisor responsibilities as stated in the Universiti Putra Malaysia (Graduate Studies) Rules 2003 (Revision 2012-2013) were adhered to.

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# TABLE OF CONTENTS

xii

# LIST OF TABLES

xiii

xiv

# LIST OF FIGURES

xv

xvii

# LIST OF ABBREVIATIONS

| | |
|---|---|
| ADF | Augmented Dickey Fuller |
| ARDL | Autoregressive Distributed Lag |
| CCE | Common Correlated Effects |
| CCEMG | Common Correlated Effects Mean Group |
| CSD | Cross Section Dependence |
| CEMAC | Central African Economic and Monetary Community |
| CPI | Consumer Price Index |
| DOTS | Direction of Trade Statistics |
| DSGE | Dynamic Stochastic General Equilibrium |
| EIA | Energy Information Agency |
| EU | European Union |
| FDI | Foreign Direct Investment |
| GARCH | Generalized Autoregressive Conditional Heteroscedasticity |
| GDP | Gross Domestic Product |
| GIRF | Generalized Impulse Response Function |
| GMM | Generalized Method of Moment |
| IFS | International Financial Statistics |
| IIP | Index of Industrial Production |
| IMF | International Monetary Fund |
| IRF | Impulse Response Function |
| KPSS | Kwiatkowski, Phillips, Schmidt and Shin |
| MG | Mean Group |
| ML | Marshall-Lerner |
| MTVAR | Multivariate Threshold Autoregressive Model |

| NAFTAR | North American Free Trade Agreement |
| NARDL | Nonlinear Autoregressive Distributed Lag |
| NER | Nominal Exchange Rate |
| OECD | Organization for Economic Co-operation and Development |
| OPEC | Organization of Petroleum Exporting Countries |
| OPM | Oil-Price Macroeconomy |
| PSTR | Panel-Smooth Transition Regression |
| PTR | Panel Threshold |
| REER | Real and Effective Exchange Rate |
| RER | Real Exchange Rate |
| ROP | Real Oil Price |
| SD | Standard Deviation |
| SSA | Sub-Saharan Africa |
| SWF | Sovereign Wealth Fund |
| TB | Trade Balance |
| TVAR | Threshold Vector Autoregressive Model |
| UN | United Nations |
| UNTCAD | United Nation Conference on Trade and Development |
| US | United State |
| VAR | Vector Autoregressive Model |
| WDI | World Development Indicators |
| WEO | World Economic Outlook |
| ZA | Zivot- Andrews |

# CHAPTER 1

# INTRODUCTION

## 1.1    Research Background

Oil prices for over a decade have had a profound effect on GDP growth, exchange rate and consumer price index (CPI) prospect of oil-importing countries considering the ever-growing need for it in the near future to satisfy production needs. Oil-importing countries became and still are highly dependent in sourcing their energy input from countries with available petroleum resources (Exporting Countries) and are more sensitive to economic performance fluctuations as a result of value attached to variation in international trade and its consequences.

Oil has for long served as most significant energy source becoming a bloodstream to almost all economies in the world.  The share of world energy consumption from crude oil is the largest compared to other energy sources. Consequently, the world energy consumption of crude oil stands at 34%, Coal 27%, Natural Gas 24%, Hydro 7%, Nuclear 4% and  renewable energy as outlined by International Energy Agency (International Energy and Administration, 2020). This is an indication that petroleum energy source is believed to be the largest source of energy so far consumed by the global economy and also taken to be an essential engine of economic growth and development.

Oil importing countries are the major consumers of oil in the world today, which roughly amounted to 98.2 million barrels per day in 2017 from 59,522.50 million barrel per day in 1980,  recording  39.39%  increase forecasted to reach 195 million barrel per day through 2040 with 77% increase  (British Petroleum Report, 2019). Recently, a report by International Energy Agency projected a drop in oil consumption by 8 million barrels per day due to the global pandemic of COVID-19 crisis but still a sign of comparable growth recovery in demand of oil is signalling with increasing importance (IEA 2020). The global oil demand is expected to grow by 5.7 mb/d over the 2019-2025 period keeping a phase at an average annual rate of 950 mb/d  International Energy and Administration, (IEA, 2020).

This has further signifies its increasing importance and its relevance despite the development of various alternative sources of energy to reduce dependence on oil.  In spite, these oil remain the major energy input in driving performance of world economy relative to other energy sources. Therefore, oil-importing countries may possibly experience negative effect whenever fluctuation occur in the world oil market due to fluctuation in supply or demand channels and relevance of oil politics in price determination. Most of these problems are directly linked to the performance of economic indicators such as Exchange rate, CPI and GDP growth of the various countries pausing a serious challenge to them.

1

Previous work of Hudson and Jorgenson, (1974) was the early attempt to addressed the challenge paused due to the changes in oil price by including energy price in economic growth model as a factor of production in production function equation of Solow (1956) and endogenous growth model including other factors as an endogenous variable (Lucas, 1988 and Romer, 1990). Brown and Yücel, (2002a) explains that oil price increase is a typical change in supply reducing potential on production describing that higher oil prices decrease production and drive up price level. As well, Kilian and Park, (2009) had argue that with, increase in the prices of oil, another different effect may have occurred on the real price of oil depending on the underlying causes of the price increase.

Various strand of empirical literatures indicates possible effect of oil price fluctuation on economic indicators of oil-importing countries. Where by larger part of the studies report negative relationship between oil price and economic growth indicating an increase in the price of oil will lead to deterioration of the economy especially in net oil importing economies (Khan, Khalid and Ali, 2017; Artami and Hara, 2018 and Eyden, Gupta, and Wohar, 2019).

In contrast, studies by Prasad and Narayan, (2007), Gbatu,Wesseh and Tutdel, (2017a), Song, and Yang, (2018) and Mo et al. (2019) found positive relationship between oil price and economic growth. Different from positive or negative result, other studies have also found insignificant relationship between oil price and economic growth in oil importing countries i.e (Jawad and Niazi, 2019).

Similarly, oil price and exchange rate are seen to have mutual relationship with each other because of the dominant role played by country's currency in the process of transaction where the United States (US) dollar ($) remain an invoice currency in the international crude oil market as a common attractive variables in the financial market in settling volumes of crude oil transaction. Exchange rate plays a valuable role in determining the direction of trade flows and its effects on consumption of energy input, where the proceeds in buying crude oil entail together transfer of inflationary price factor to oil-importing countries when oil price inch as higher as a result of the co-movement between the economic indicators. Fluctuation of exchange rate intensively influences the process of international financial transactions and the economies around the globe due to variation in values of countries' currencies. Investigation confirms that fluctuation in the Dollar exchange rate is considered as the basis for crude oil price volatility. The impact of oil price shift on the exchange rate depends on the short-term investment preference of oil-importing countries. Meanwhile, the long-run impact of the exchange rate depends on the import preference of the countries.

A theoretical approach by Bénassy, Mignon, and Penot, (2007) indicates the relevance of the Law of one price by explaining that the effect of real oil price on the real exchange rate which depend on the oil intensity of both the tradable and non-tradable sectors of the economy. An increase in oil price leads to an increase in demand for exchange rate in net oil importing countries which result in buying crude oil at a higher rate. Law of One Price is regarded as a useful first approximation by Corbo, Melo, and Tybout, (1986) because the model assumes to admit causation between exchange rate and prices. Blomberg and Harris (1995), have further explain thus, crude oil is seen as a globally

traded commodity and is mostly priced in US dollars, when US dollars weaken relative to other currencies it reduces oil prices measure in other currencies, which may increase the oil demand and thus, increase its price.

Furthermore, empirical evidence shows that, foreign exchange rate intervention as well as other monetary policies have been used by countries to influence the behaviour of their exchange rate. In view of that, studies such as Bahmani-Oskooee and Mohammadian (2017), Hussain et al., (2017), Yang, Cai and Hamori, (2018) and Anjum and Malik, (2019) indicates negative relationship between oil price and exchange rate. However, other studies (inter alia: Chen and Chen (2007), Narayan and Prasad (2008), Pershin Molero and Gracia, (2016) and Nusair and Olson (2019) have largely found positive correlation between oil prices and exchange rate, stressing that impact of oil price fluctuation on exchange rate depends on the direction in which a country truly determines its wealth. While others indicate asymmetric relationship between oil price and exchange rate, like the discovery by Bacon, (1990) which indicates that movement in oil price fluctuation is observed to have different effect, that is positive oil price increase is perceived to have larger effects than falling oil price fluctuation or vice versa, known as "Rocket and Feather" phenomenon. Similarly, studies of Jiang *et al.* (2020), Saidi *et al.* (2020), and Tasasr (2018) have all indicated the existence of asymmetric relationship.

In another dimension, inflation is seen as global issue affecting all sectors of economic activities. Crude oil import comes along with imported inflation resulting in a general price increase to all the product attached to oil energy input. Price stability remains the major challenge across countries. In fact the relevance of inflationary effect of oil price on economy depends on many determining factors and susceptibility to external influence on aggregate consumption as oil price fluctuations is linked to global oil demand and supply as attached to many factors i.e. a dispute between America and Iraq, a decline in consumption demand affecting oil price. Fluctuation in oil rig count and oil stock build-up by shale companies in America and many global issues. It is deems and as crucial phenomenon to contemporary researchers and still generating debate while considering several factors in justifying the scenario. The reason is that oil is a major commodity that is linked to a lot of other commodities and it is an intermediate commodity used in the manufacturing of many consumer products therefore, changes in prices effect inflation. Theoretical literature establish a direct and strong relationship between oil price and CPI in the early 1970s.

Celik and Akgul (2011) explains that, inflation is a product of market pressure in an economy known as demand-pull inflation triggered by excess demand to increase production prices. Inflation is about too much spending chasing too few goods. Liqudis (2021) explains that energy from crude oil is used in the provision of public and private transport, heating homes that affect the majority of input costs and contribute to a rise in final product costs. An increase in oil prices would cause short-term aggregate supply to decline placing pressure on the price level, especially if a nation is a net oil importer and has large number of industries using oil as an energy input in the production process. When fluctuation in economic activity emanate from the demand side, price and real output growth rapidly increases since rapid growth mean more jobs, and unemployment and inflation will be inversely related (Phillips, 1958) .

The Phillips curves uses output gap to measure the differences between actual growth increase and potential rate of growth in the economy as determining factor between natural rate of employment and full employment. The IS-LM curve is fitted in Phillips curve outlining the relationship in real output (GDP). An increase in the average rate of inflation cause firms to adjust prices more frequently to keep up with the rising price level.

In view of this, various strands of empirical literature exists with different outcomes of positive, negative, weak and asymmetric relationship between oil price and consumer price index. Studies by Salisu, Isah, Oyewole, and Akanni, (2017) and Varghese (2017), reported positive relationship, while Loungani (2018), and Adekoya and Adebiyi (2019), indicated asymmetric relationship. However, in another strand, insignificant relationship is observed  (Adayleh, 2018,  and  Muthalib et al., 2019).

Asymmetric relationship of oil price fluctuation on economic growth, real effective exchange rate and CPI nexus requires further investigation especially in the context of South Africa, Morocco and Cote d'Ivoire that are African net oil-importing countries where few research studies were carried out.

## 1.2    Global Crude Oil Price Trend and Events

Oil price fluctuation of 1973 affected the whole world economy because of the price increase by OPEC countries, which almost tripled prices for crude oil. Since then, the impact of oil price increase on the world economy became significant, majority of oil-importing countries were faced with the decline in economic growth, output and exportation of many countries decrease significantly accompanied by exchange rates fluctuation and rising CPI. Beginning from 1973, seven outstanding price fluctuations were highlighted that heavily disrupted the global economic activities.

The first volatility of oil price experienced as a result of the embargo imposed by the Organisation of Petroleum Exporting Countries (OPEC). This has resulted in an increase in the oil price from $3.4 to $13.4 per barrel. It was then followed by the outbreak of the Iran-Iraq war of 1978-80. This led to another increase of the oil price to a new high from $20 to $30 per barrel as a result of a decline in supply from two of the giant oil exporters. Moreover, Kuwait invasion of Iraq marked the third oil price increase to $26 per barrel from $16 per barrel in 1990-91. In 1999, OPEC cut down oil production that pushed the oil price from $12 to $24 per barrel in the same year as a fourth price shock.

The fifth one was also during the Gulf war III in 2003, when oil price increased sharply from $25 to $36 per barrel. Another large upward in prices occurs in 2007-08 which is the sixth oil price fluctuation when the price was sent to $147 per barrel in June 2008 from as low as $71 per barrel in 2007. In another dramatic turn, a rapid collapse of the price was then experienced, where the price crashed by about 75% less of the actual price

to $33 from $147 due to global recession. Hence, after taking some sustained movement in the downside a recovery period is observed to some extent.

This was followed by another historic increase in the oil price to a new high of $108.4 in the third quarter of 2013 as against $71 in June 2009. The seventh -oil price increase was observed after mid-2014 when oil price collapsed from $114 per barrel to $36 per barrel by the end of 2016, by about 68% in June, 2014. Oil demand in 2017 continued to be driven by oil importers with a benefit from the unexpected low prices, compared to an average decline over the previous 10 years. Prices fall lower during the first half of 2017 as stock remained reasonably high. But as the OPEC and Vienna Group Production cut started to grip the market and inventories began to fall then, oil price began to rise. Consequently, the changes in the price of oil also manifest in causing economic contraction in most of African oil importing countries through risen general price level, increase level of unemployment and instabilities among economic indicators especially in energy input supply chain.
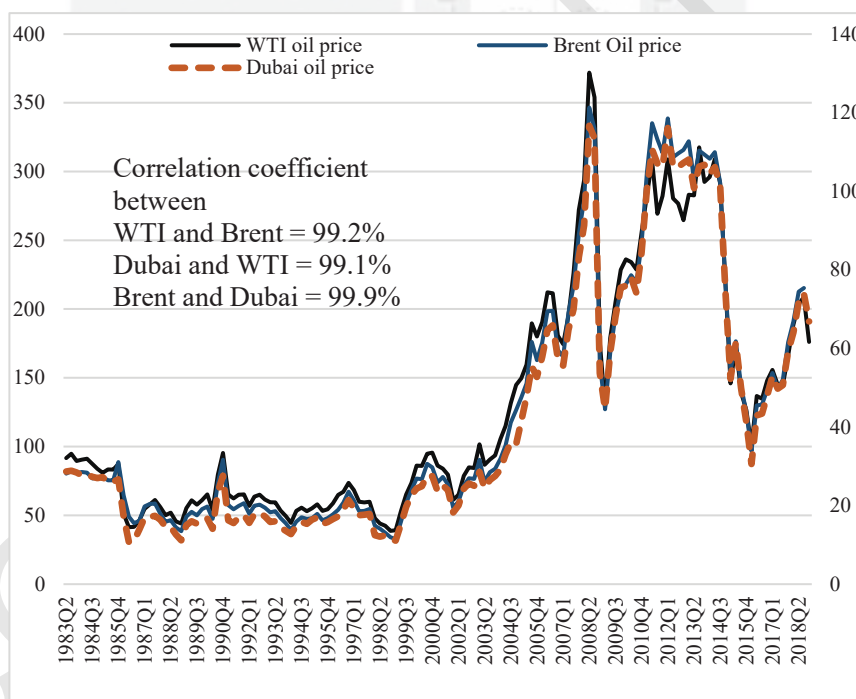


**Figure 1.1: Nominal Oil Price Movement, period between 1983Q2 to 2020Q4**
[Source: New York Mercantile Exchange (NYMEX) for Quarterly Oil price (2020)]

Figure 1.1 describes horizontal movement showing a continuous trends of 3 basket of oil prices traded in international market between 1983q2 to 2020q4. Co-movement between the 3 basket of West Texas Intermediate (WTI), Brent and Dubai oil prices showed movement in tandem with close correlation above 99%. In this regard, the study selected WTI as the relevant and commonest oil basket in the market usually consumed in Africa.

Maximum oil price peak value is attained in 2008Q2 followed by a sharp decline in 2009Q2 below 140 dollars with a rebound in 2010Q2 also followed by a sustained level increase reaching a new peak in 2014Q2 or there about. However, in 2015Q2 a sudden decline in the price of oil re-emerged to as low of $35 per barrel with a slight rise again. The major volatility became more apparent with WTI where this phenomena of oil price fluctuation significantly affect output, exchange rate and CPI and possibly led to economic recession in many economies across the globe.
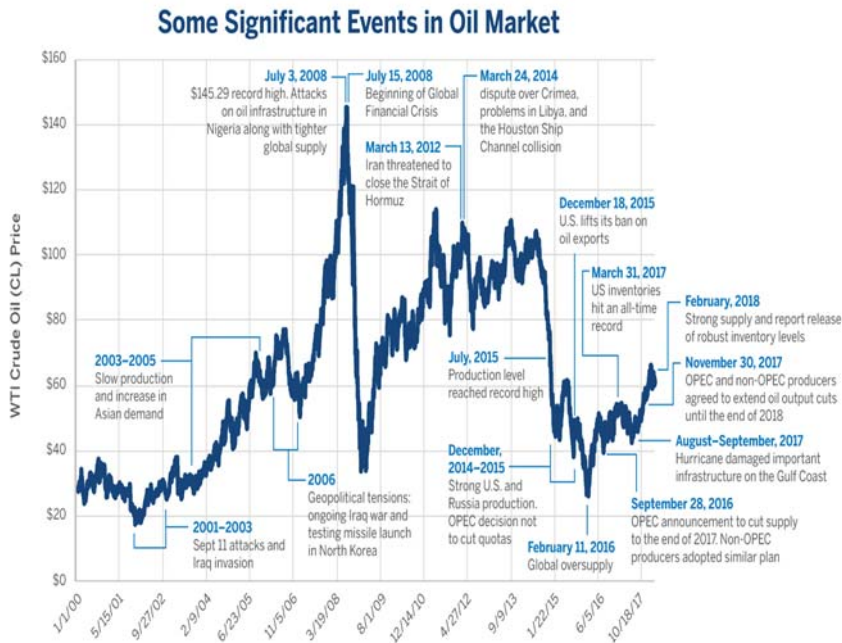


**Figure 1.2: Plots showing important event affecting crude oil price**
[Source: International Energy Agency (IEA, 2018)]

Figure 1.2 highlights some of the important events affecting crude oil price as explained in the discussion outlining a remarkable change affecting both the demand and supply of oil in the global market. Oil price fluctuation is seen to have a direct link with those stated issues of oil politics affecting economies in the world.

## 1.3 Overview of African Oil Importing Economy

African economy consists of various sectors, dominated by agricultural activities, human resource, industry and trade. The continent has 54 number of countries as of 2019 with an approximate total of 1.3 billion people living across the continent. The continent is blessed with a large deposit of natural resources as a resource-rich continent distributed across nations. Most of the countries heavily relied on the exportation of raw materials to the Western economies and Asia such as US, Europe, China, Japan and India for their

foreign exchange earnings. The industries are mainly extractive industries of natural resources extraction that requires a large amount of energy input. Role of extractive industries in promoting growth is eminent in these countries playing a dominant role in driving growth. The natural resource available has the potential to drive growth and development in developing countries in these countries. The extractive industries sector in South Africa, Morocco and Cote d'Ivoire play a dominant economic, social and political roles in the lives of the people. However, with extraction comes the risk of fluctuation in economic growth, exchange rate and inflationary effect.

South Africa has the largest coal deposit in Africa produced in excess of 255 million tonnes of coal (BP, 2018). Morocco has the largest Sulphate deposit, believe to account for 75% of all the phosphate reserve globally and the world largest phosphate producers (Taib, 2015). Similarly, Cote d'Ivoire is among the largest exporter of Cocoa and Coffee, as well as mineral deposit such as diamond, cobalt, copper, iron ore and deposit of crude oil (Zambe, 2014). The services sectors are not highly developed compared to advance countries.

Despite that, emerging market of Africa comprised of under developed and developing economies that offered largest opportunity of potential growth in different horizon, which helps in accelerating productivity growth, sustainable and a broader economic prosperity. Consequently, much of those potentials lie in improving infrastructure, creating jobs for young people and enhancing a value chain for extractive industries and agriculture especially in South Africa, Morocco and Cote d'Ivoire from which crude oil played a vital and fundamental role because its effect key indicators of economic activities. However, in recent times with some form of diversification and trade liberalisation these countries are progressing with an improved economic growth rate ranked as one of the world fastest-growing with a growth rate average of 5.6% a year, an expected rise by an average of over 6% a year between 2013 and 2023 (IMF Annual Report, 2017).

African Development Bank report AfDB (2020) that, Africa will became the world's second-fastest-growing economy as over one-third of the countries are performing well above average reporting more than 6% or higher growth rate and another 40% of the country's growing at an average of 4% to 6% a year reflecting a period of boom similar to the one experienced in the Chinese economic boom that emerges in Asia in the late 1970s because the opportunities are high. South Africa, Morocco and Cote d'Ivoire are among the countries with highest GDP per capita in Africa as indicated by world economic outlook (WEO, 2020).

Recently, seven countries of the world's fastest-growing economy are from Africa, an indication of increasing energy consumption of oil. In view of that, the growth opportunities in these countries may be attached to potentials in output gap through measuring positive/negative efficiency to indicate excess demand of goods and service or otherwise (Hodrick & Prescott, 1997). In 2017, the output gap estimates in South Africa ranges between 1.9% to 2.5% ( Mengisteab, 2017). While in Morocco and Cote d'Ivoire is expected to rise between 4% and 6% after contraction in 2020 due to effect of COVID-19 pandemic ( World Bank, 2020).

7

**Table 1.1: Net oil import for selected African countries**

| No | Country | Net Volume of oil Import ($/bbl) | Percentage |
|----|---------|----------------------------------|------------|
| 1 | South Africa | 11507.034 | 59.00% |
| 2 | Morocco | 3915.165 | 20.00% |
| 3 | Cote d'Ivoire | 1739.238 | 6.90% |
| 4 | Kenya | 1164.744 | 6.00% |
| 5 | Ghana | 795.371 | 1.30% |
| 6 | Senegal | 487.07 | 2.35% |
| 7 | Zambia | 358.85 | 1.87% |
| 8 | Ethiopia | 236.16 | 1.23% |
| 9 | Tanzania | 187.44 | 0.98% |
| 10 | Madagascar | 101.75 | 0.53% |
| 11 | Gambia, The | 1.12 | 0.01% |
| 12 | Guinea-Bissau | 0.78 | 0.00% |
| 13 | Swaziland | 0.23 | 0.00% |
| 14 | Mali | 0.05 | 0.00% |
| 15 | Botswana | 0.03 | 0.00% |
| 16 | Malawi | 0.01 | 0.00% |

Data from Energy Information and Administration (EIA, 2020)
[Source: Authors calculation]

Fluctuation in crude oil import indicate changes in consumption demand of crude oil due to volatility in price which will definitely effect importation of the oil commodity. Most of these countries heavily relied on oil importation from other countries, spending huge amount of exchange earnings to settle for trade balances of oil import. Table 1.1 shows percentage of the net oil import in African net importers within the period. As indicated in the table the cumulative percentage of oil import for the selected 3 countries is 85.9%. Figure 1.2 below shows the volume of oil import between the study period of 1983-2020. The diagram shows 16 countries with available data downloaded from EIA, (2020) as the African net oil importers and countries like Cote d'Ivoire, Morocco, and South Africa, are the top ranked oil consumers. Countries were selected based on import volumes and the GDP growth rate comparing oil export and import for each country as indicated in the Table 1.1 and Figure 1.2 having 11507, 3915 and 1739 (b/d) barrels per day for South Africa, Morocco and Côte d'Ivoire with a cumulative sum of 85% of all the crude oil import to Africa.
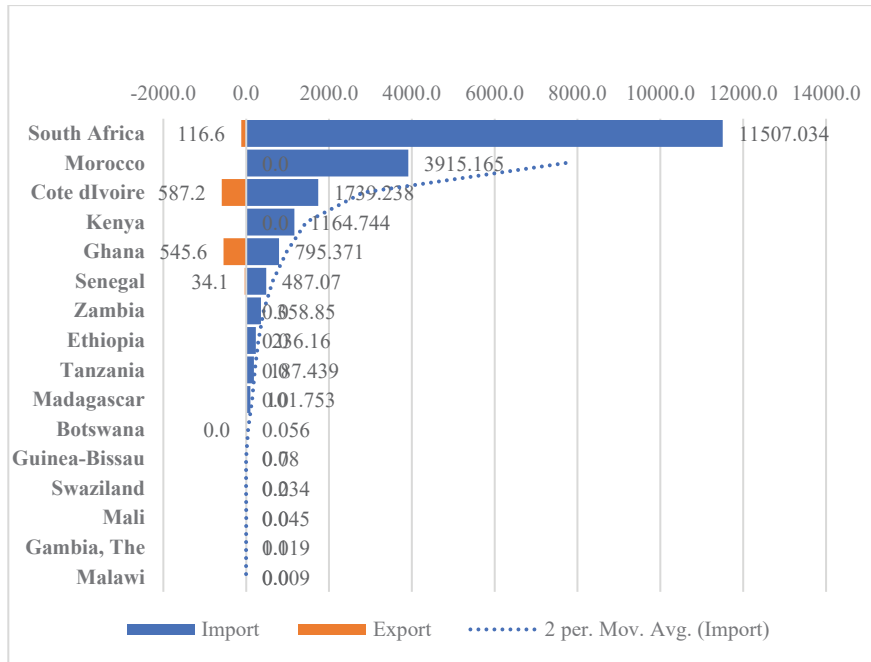
**Figure 1.3: Oil Import/Export for Africa's net oil-importing countries between 1983Q2-20204**

[Source: Energy Information and Administration (EIA), Factbook and Author's calculation (2020)]

**South Africa ($/bbl)**

**Morocco ($/bbl)**
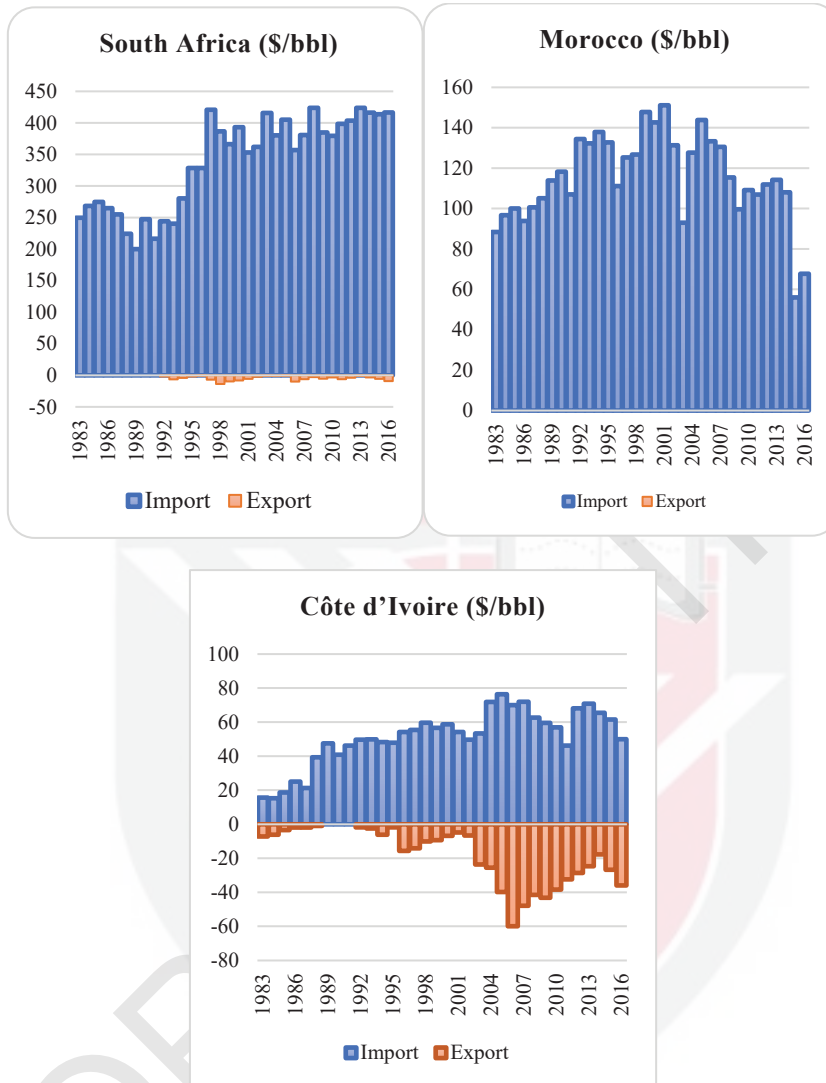
**Côte d'Ivoire ($/bbl)**

**Figure 1.4: Fluctuation in Import/Export of Oil for South Africa, Morocco and Côte d'Ivoire between 1983Q2-2020Q4**

[Source: Energy Information and Administration (EIA), Factbook and Author's calculation (2020)]

Figure 1.4 explains the fluctuation of import and export for the selected countries where Morocco has no level of crude oil export as indicated in Côte d'Ivoire and South Africa. Meanwhile, expenditure on crude oil import involves exchange rate conversion between transacting countries leading to an increase/decrease in the value of the exchange rate currency of the countries involved. Therefore, when a barrel of crude oil is purchased, it carries along inflationary factor imported to the consumer country effecting the general price level which will further causes an increase/decrease to the economic growth of a country both having different implication to the economy. Evidence of oil price

fluctuation on economic growth in the selected countries using historical data between the period is established to indicate cointegrating relationship in the following diagrams using trend movement and scatter plots to visualise the data and as well dig well about the nature of the relationship between the variables of oil price, economic growth, exchange rate and inflation.
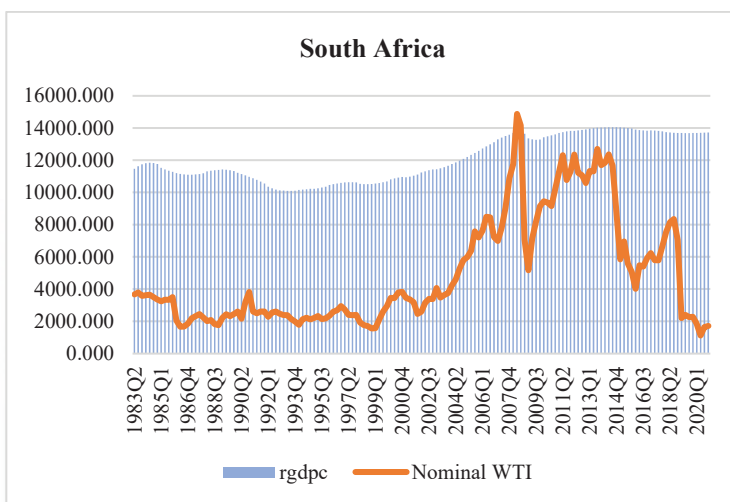


**South Africa**

**Figure 1.5: Oil price (WTI) and GDP South Africa for sample period of 1983Q2 to 2020Q4**
[Source: New York Mercantile Exchange (NYMEX) and International Monetary Fund Database (IMF) for Quarterly Oil Price (WTI) and Real GDP (2020).]
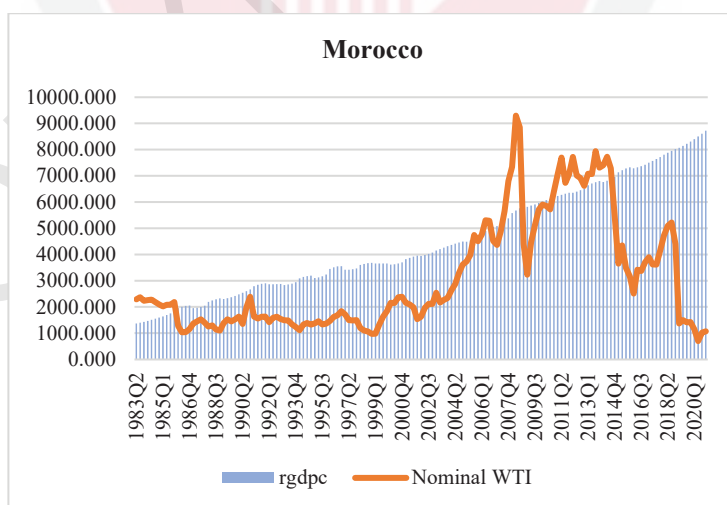


**Morocco**

**Figure 1.6: Oil Price (WTI) and GDP Morocco for sample period of 1983Q2 to 2020Q4**
[Source: New York Mercantile Exchange (NYMEX) and World Economic Outlook of International Monetary Fund Database (IMF) for Quarterly Oil Price (WTI) and Real GDP.]

11
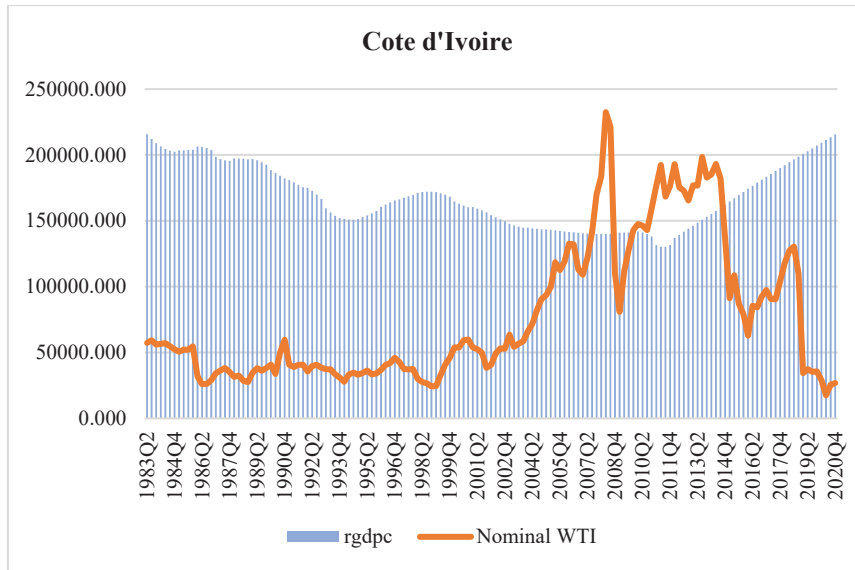
**Figure 1.7: Oil Price (WTI) and GDP Cote d'Ivoire for a sample period of 1983Q2 to 2020Q4**
[Source: New York Mercantile Exchange (NYMEX) and World Economic Outlook of International Monetary Fund Database (IMF) for Quarterly Oil price (WTI) and real GDP (2020).]

The trend in Figure 1.7 mirrored the co-movement between nominal oil price and real GDP in South Africa with sustained up trend in real GDP despite the changes in oil price indicating positive relationship. Similarly, in Morocco the real GDP keeps moving up despite the changes in oil price, while in Cote d'Ivoire some point of downward movement is observe responding to changes in oil price. Remarkably during the 2014Q4 real GDP declined in respond to oil price increased, but since then the GDP moved upward indicating a positive relationship.

For example, despite the oil price increase between the 2008Q2 to 2009Q1 relatively GDP maintained its upward trend, resulting in improving economic growth and oil price decreased of 2014Q1 to 2016Q2 has also had a positive impact to GDP contributing to impressive economic performance. For instance, oil import for the selected countries of Africa i.e. South Africa, Morocco and Côte d'Ivoire, have reach a peak of 625.554 barrel per day in the year over the period between 2005 to 2007. Compared to 589.76 barrel per day in a year over the period between 2008 to 2009, and the real GDP growth rate averaged 3.5 per cent per year over the period between 2004Q1 to 2008Q1 compared with 5.4 per cent per year over the period 2012Q2 – 2013Q3.

With the falling oil price between 2014Q2 to 2018Q3, the GDP maintained an upward trend as oil price rapidly declined. For example, oil import average 601.95 barrel per day in the year over the period between 2013Q1 to 2018Q3 and real GDP growth rate averaged 5.4 per cent over the same period.

12

**Figure 1.8: A scatter plot for South Africa**
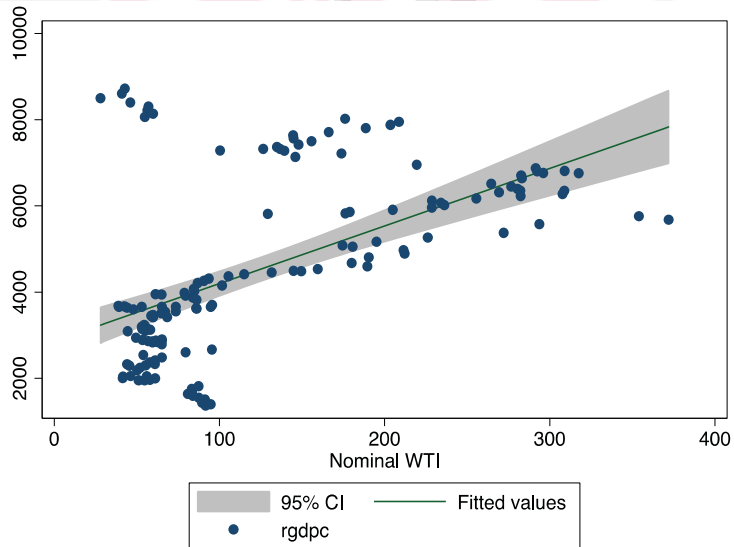


**Figure 1.9: A scatter plot for Morocco**

13
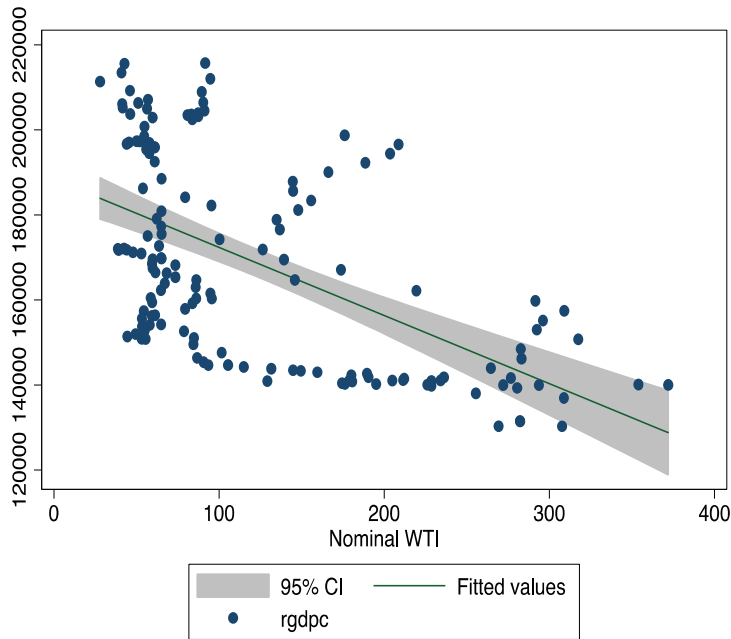
**Figure 1.10: A scatter plot for Cote d'Ivoire**

The scatter plots help in visualising the data and assessing its nature. It also allows us to have a deeper understanding of the data and the direction in movement between the oil price and remaining variables. In figure 1.10 for South Africa, it is observed that, the data are correlated with coefficient of 0.752% having positive relationship, the data are closely concentrated together with few outliers when the oil price became extremely high. In Morocco the relationship between oil price and real GDP is positive with correlation coefficient of 0.56% with much concentration around the time when oil price is at $50 and real GDP is around 400. But as oil price increased the co-movement becomes a bit diverse with sparsely populated data around the mean, also few outliers are observed.

Whereas, in Cote d'ivoire it indicates negative relationship of -0.57% between oil price and real GDP indicating that higher oil price led to a decline in real GDP, having a diverse effect to economic growth leading to an increase in the investment cost, import bills, a general increase in the price level in Cote d'Ivoire. The scatter plots further demonstrates the strength and direction of the relationship for the countries sampled in the study.

14
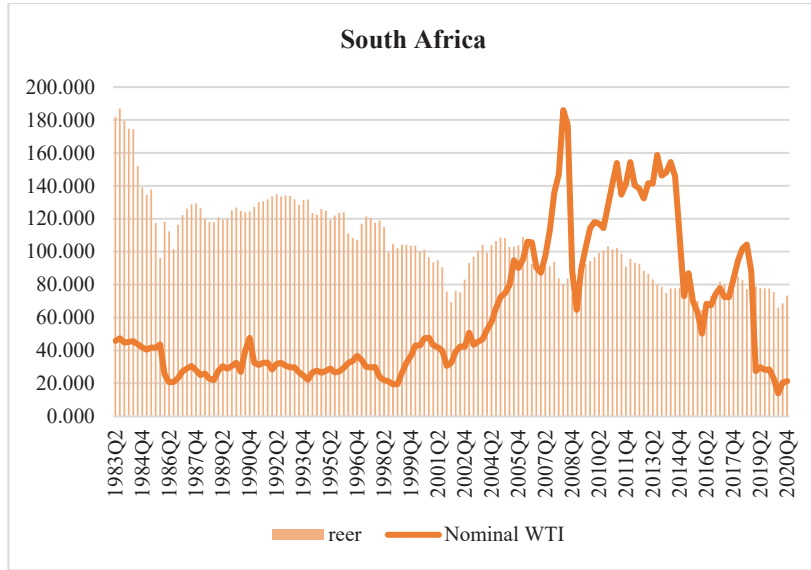
**Figure 1.11: A scatter plot for Cote d'Ivoire**
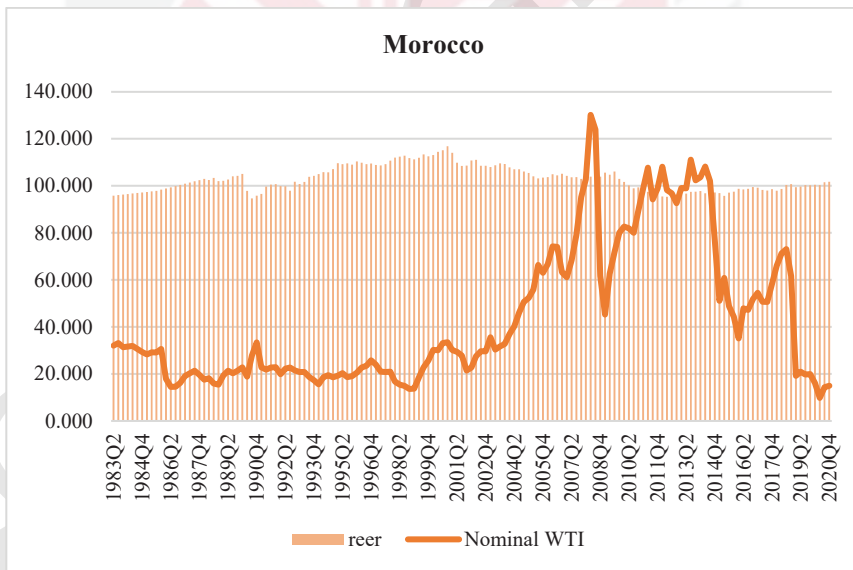


**Figure 1.12: Oil price (WTI) and Exchange rate of Morocco a period between 1983Q2 to 2020Q4**

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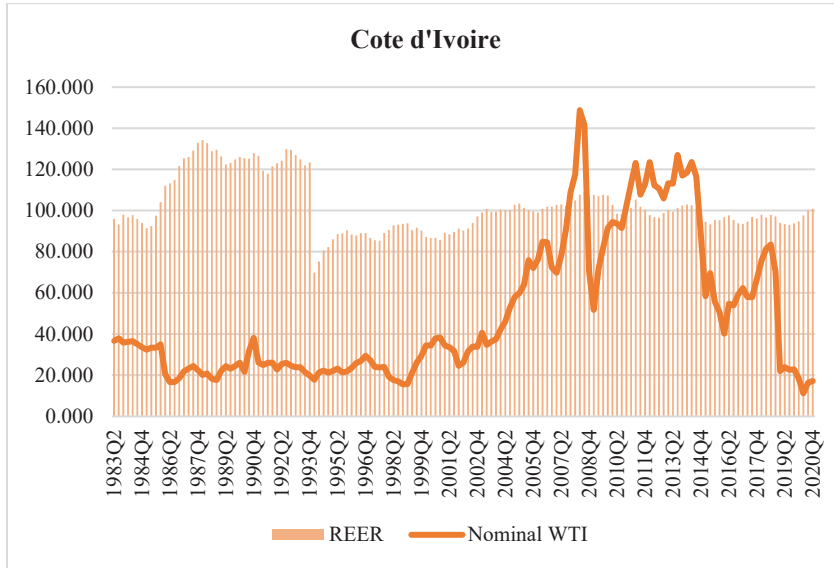
**Figure 1.13: Oil price (WTI) and Exchange rate of Cote d'Ivoire a period between 1983Q2 to 2020Q4**

A country's currency is used to visualise the real effect peculiar to each country with adjustment for inflation that varied between countries. The figures show a trend of the oil price on three different currencies as Rand of South Africa (ZAR); Dirham of Morocco (DH) and Francs of Côte d'Ivoire (XOF) between 1983Q2 to 2020Q4. Movement between the 2 variables varied according to countries.

The presented figure 1.13 for South Africa shows movement of oil price and exchange rate currency (RAND) with negative relationship, as that oil price increased the exchange rate moved downward to indicate negative relationship as a possible situation of currency appreciation. In Morocco, the trend movement indicated a weak response of Dirham (DHA) to the fluctuation of oil price. Higher oil price increased in 2008Q3 and 2014Q4 have impact on the currency, so also lower oil price in 2019Q1 to 2020Q4 changed in exchange rate. While in Cote d'Ivoire the exchange rate currency is francs (XOF), the movement between oil price and francs indicated that, an increase led to changes in Francs. The trend movement indicated a decline of exchange rate as oil price increased.
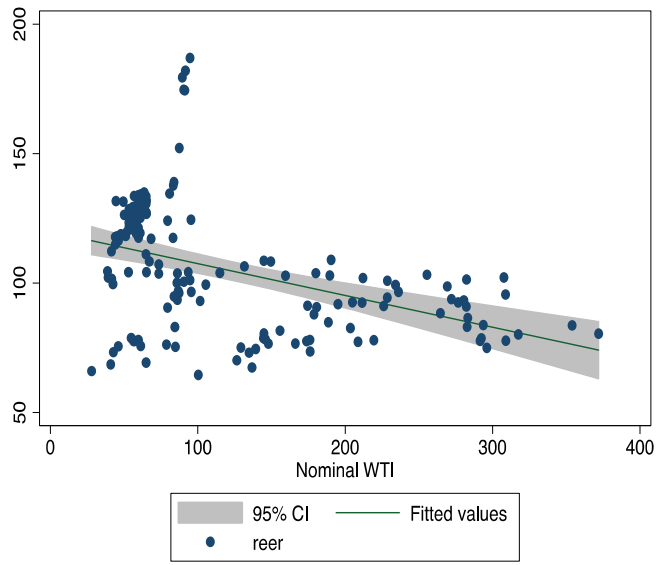
**Figure 1.14: A scatter plot for South Africa**
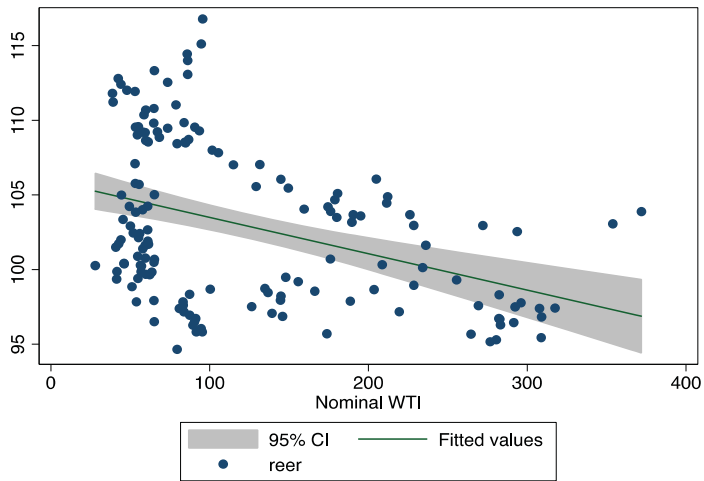


**Figure 1.15: A scatter plot for Morocco**
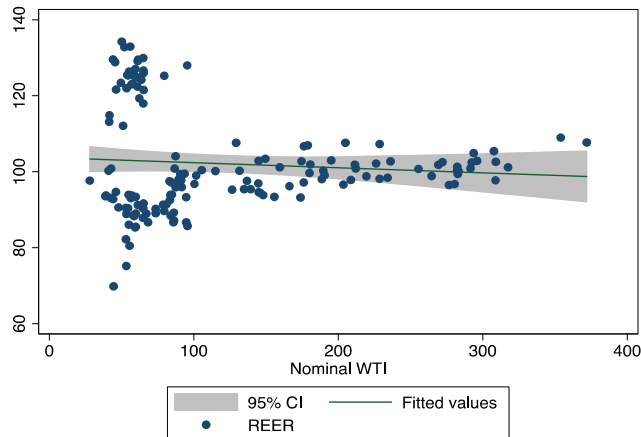
**Figure 1.16: A scatter plot for Cote d'Ivoire**

The scatter plot figure 1.16 from South Africa shows that movement in exchange rate is correlated with oil price movement at -0.43%, suggesting a negative relationship. This implies a situation whereby an increase in oil price led to a decrease in exchange rate. It further shows concentration of the data pointed around $50 and a disperse region above $150 of oil price.

Similarly, in Morocco, higher oil price led to a negative decrease as indicated by coefficient value of -0.08% though the impact is minimal. Most of the data concentrated around the region of $50 oil price indicating stable price level of Francs against oil price fluctuation.
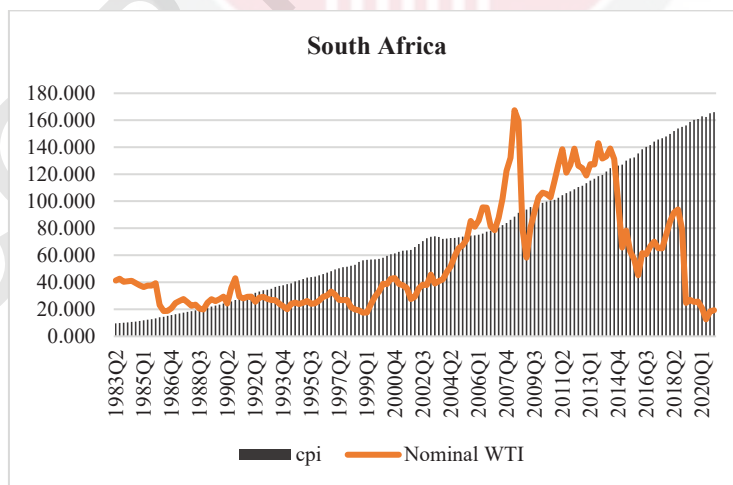


**Figure 1.17: Oil price (WTI) and CPI of South Africa a period between 1983Q2 to 2020Q4**
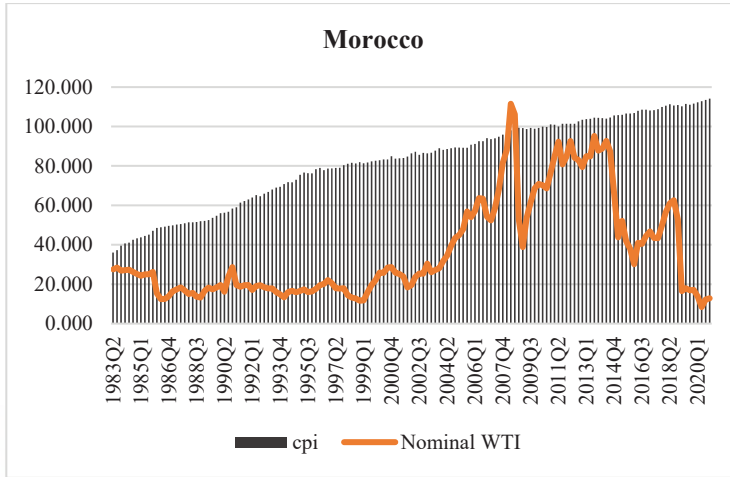
**Figure 1.18: Oil price (WTI) and CPI of Morocco for the period between 1983Q2 to 2020Q4**
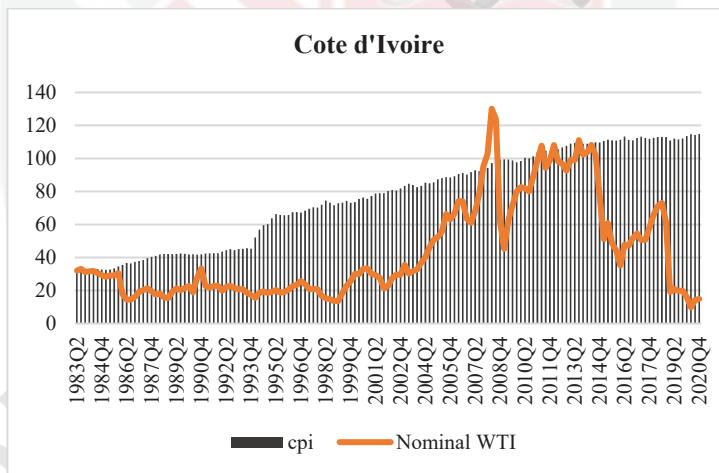


**Figure 1.19: Oil price (WTI) and CPI of Cote d'Ivoire for the period between 1983Q2 to 2020Q4**

Figure 1.19 is the trend movement of quarterly oil price from 1983Q2-2020Q4 of CPI for South Africa. The diagram showed despite that oil price fluctuation the CPI keeps moving upward indicating a positive relationship between oil price and CPI between the period. The trend in Morocco also depict similar movement having positive relationship as well, indicating upward trend despite fluctuation in oil price. Moreover, Cote d'ivoire revealed similar trend movement with positive relationship. Generally, CPI and oil price moves in the same direction in all the countries with positive relationship, suggesting that, as oil price increases, CPI follows the same trend.
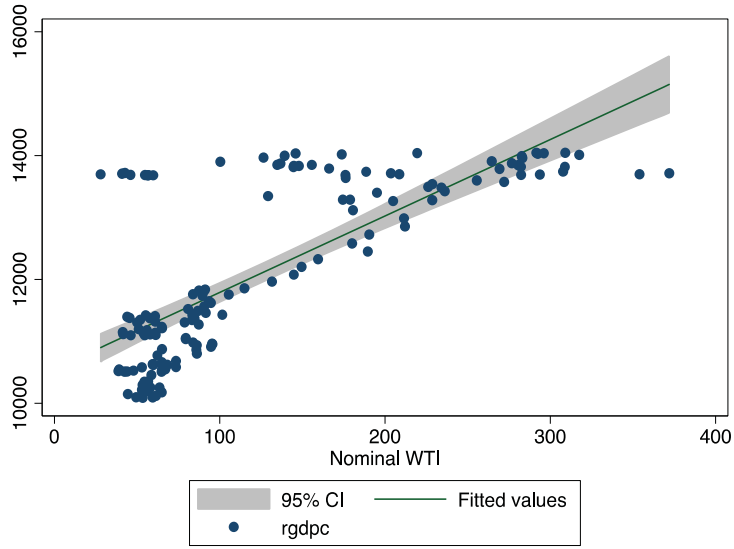
19
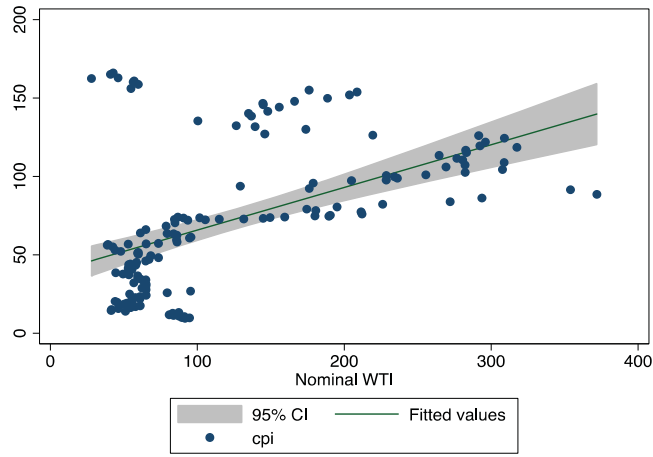
**Figure 1.20: A scatter plot for South Africa**
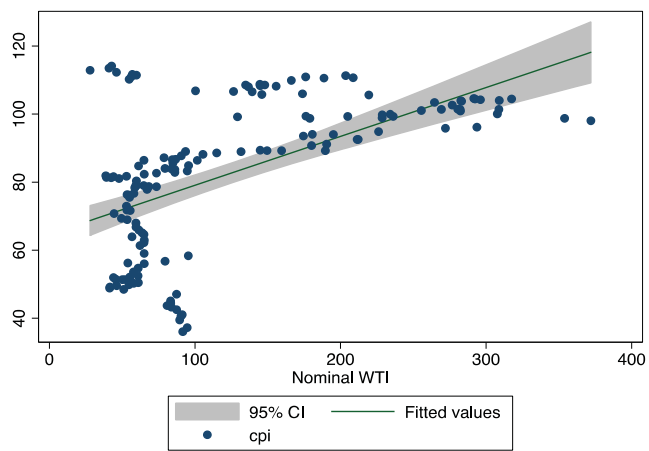


**Figure 1.21: A scatter plot for Morocco**
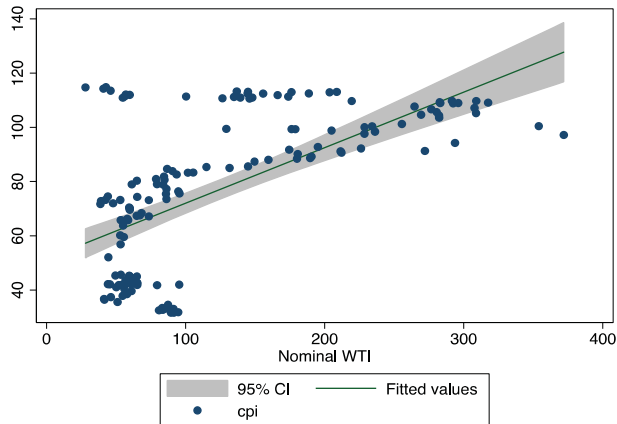
**Figure 1.22: A scatter plot for Cote d'ivoire**

The scatter plot depicted in figure 1.22 for South Africa shows a correlation coefficient of 0.51% indicating positive relationship as oil price moved CPI also increased. The scatter point are concentrated around $50 and $100 as CPI increases to indicate additional economic activities around this period with some point loosely disperse or away from mean. In Morocco, the relationship is positive as well and concentration of the data around $40, $80 and above $100 price to indicate improved economic activities during this period. The correlation coefficient is 0.56%, with most of the data point around 95% confidence interval. In Cote d'ivoire, the data point are concentrated mostly around $40, $70 and $100 as CPI increased having positive relationship with correlation coefficient of 0.62%. It is observed that all the countries in the study sample have strong positive relationship with CPI defining a positive correlation signifying an increase in the price of oil leads to a positive increase in CPI for all the three countries.

In general, while looking at the perspective of oil price, exchange rate, CPI and economic growth all together, various strands of literature have examined the effect with different outcomes and no generalised conclusion. Some of the research studies believed to have a positive relationship, while others have examined a negative relationship and few others with no evidence of positive and negative relationship between an oil price fluctuation and the variables of economic indicators. The argument remains a topical issue that requires further investigation. Most of previous studies focused on developed economies with little consideration for African net oil importing countries especially South Africa, Morocco and Cote d'Ivoire.

Oil price increase in South Africa and Morocco in the sample led to increase in economic performance, while it led to a decrease in Cote d'Ivoire. Similarly, changes in oil price resulted in possible improvement in real effective exchange rate of South Africa, Morocco and Cote d'ivoire as indicated by scatter plot. While CPI movement shows that for all the three countries increase oil price led to an increase CPI. This suggests that, the effect of positive and negative oil price fluctuation may not necessarily be the same in the long run suggesting application of asymmetric estimation. Therefore, proposing a

21

linear relationship between fluctuation in oil price and economic growth, real effective exchange rate and inflation may not provide a justified relationship.

## 1.4    Problem Statement

Crude oil is the major and a largely abundant energy source so far consumed globally as an essential factor that drives economic growth in many countries. Development in any part of the world is assumed to bring onboard fundamental economic issues to facilitate possible growth. Africa needs energy for the take up in its quest for development. Crude oil energy consumption has for long remained the source of a primary energy input to industries in Cote d'Ivoire, Morocco and South Africa. Previously, energy market responds mainly to the beat of rising Western and Asian economies alone but today the vibrations of a new driving force are beginning to be experienced throughout Africa, this is because populations are increasing, cities are growing and economies are further advancing and as wealth accumulation and quality of life rise so will be the energy demand.

Predominant economic activities in these countries are fertilizer production, mining, construction and textile industries in Morocco, cocoa industries, diamond and Nickel production in Cote d'Ivoire and South Africa is the most developed country in Africa with the biggest manufacturing sector and a heavy reliant on coal and oil energy sources. Meanwhile, Coal is domestically sourced in the country but volumes of oil import provides substantial amount in energy requirement. As such, primary raw material such as gold, bauxite, coal and manufactured commodities, phosphate, cocoa among other are the major export commodities in these countries and are highly energy intensive. The extractive industries are oil energy intensive and heavily reliant on crude oil import. Therefore, any changes in energy price may possibly effect consumption in energy input which could be channeled to other sectors of the economy, because oil energy is linked to many channels in the production line. The industries may suffers from different forms of increase i.e. production cost increase, increase in wage bills, increase in consumer price index and a decline in economic growth when oil price increases leading to exchange rate fluctuation.

Oil consumption in Africa cannot determine the price of oil in the global market alone but any fluctuation in the prices affect the countries because of the dependency nature of their economy on oil energy sources like emerging countries of Asia and developed Europe/US. African countries suffer various drawbacks from many external forces and crisis in energy price fluctuation is one of those problems. The effect is felt largely in Africa than in advanced countries of the West and Asia due to vulnerability and fragile nature of African economies in absorbing such shocks.

The exchange rate currencies in these countries suffers worse especially in Cote d'Ivoire against the US dollar. Inflation is among the critical issues in Africa because any increase in the price of the international commodity imported to Africa comes along with imported CPI. Oil price increase mostly involves additional increase with CPI which are normally carried along to host countries by causing a general price increase on all the

product attached to oil energy input. Moreover, the price is spread to other commodities in the economy leading to a decrease in consumption and subsequently a decrease in demand.

Though the concept of oil price fluctuation and economic activities i.e. exchange rate, CPI and economic growth are well-known in the trend of the global economy. However, regarding these countries the issue remain topical calling for further investigation as burning researchable issue. The outline factors are considered as the effect of oil price fluctuation in South Africa, Morocco and Cote d'Ivoire that induced structural breaks and asymmetries in the oil price-macroeconomic nexus due to limited opportunities for international risk sharing and little is investigated in the literature. After quite a reasonable number of reviews it is observed that some of the underlying attributes that contributed to the mixed finding are the estimation techniques employed and empirical model used.

Furthermore, previous studies gave more attention to oil-exporting countries in Africa rather than oil-importing one's, usually a combined research studies involving oil importing and exporting countries were undertaken and these that may not provide a clear picture of the problems faced particularly by oil-importing countries. Moreover, the period mostly applied in the previous studies is between 5 to 10 year period which have not capture wider coverage, coinciding with a low frequency data employed that failed to provide the needed information base on the volatility nature of oil price that requires high frequency data.

### 1.4.1 Statement of Research Questions

The study is expected to empirically provide answers to the following questions:

i. What is the impact of oil price fluctuation on GDP growth in oil-importing countries of South Africa, Morocco and Côte d'Ivoire?

ii. Does fluctuation in oil price affect the real effective exchange rate of South Africa, Morocco and Côte d'Ivoire oil-importing countries?

iii. What is the impact of oil price fluctuation on CPI dynamic in South Africa, Morocco and Côte d'Ivoire oil-importing economies?

### 1.5 The objective of the study

The objective of the study is explained as follows:

1. The General objective of the research work is to Investigate the impact of oil price fluctuation on economic growth, exchange rate and CPI in South Africa, Morocco and Côte d'Ivoire.

23

The Specific objective of the study include:

1. To investigate the impact of oil price dynamics on economic growth in South Africa, Morocco, Côte d'Ivoire.

2. To examine the effect of oil price change on real exchange rate in South Africa, Morocco, Côte d'Ivoire

3. To investigate the relationship between oil price fluctuation and CPI in South Africa, Morocco, Côte d'Ivoire

## 1.6 Significance of the study

Through this study it is hope contributes to the existing literature in the area by examining the effect of oil price on the economic growth, exchange rate and CPI of South Africa, Morocco and Cote d'Ivoire as major oil-importing countries in Africa. Besides, the thesis focuses on three issues that are less considered in the empirical literature for South Africa, Morocco and Côte d'Ivoire countries. First, the thesis investigated whether fluctuation in the crude oil price induced nonlinearity in the effect of oil price on economic growth. Secondly, the thesis examined whether the real exchange rate contributed to the responses of the oil prices. Thirdly, the thesis examined the role of oil price in determining the consumer price index. It is hoped that it will address this gap in the literature by examining the nonlinearity in oil price fluctuation. These effects are investigated using an advance techniques of Autoregressive distributed lag (ARDL) and Nonlinear Autoregressive Distributed Lag (NARDL) approach.

The third contribution of the thesis is by examining the role of oil price fluctuation on CPI to assess the impact of possible changes of oil price on consumer price index. Therefore, to this end, the thesis will contribute by further analyzing the scenario considering the dimension of African economies using a different approach. The study constructs an open economy ARDL, NARDL, that has not been the practice with the previous studies to recognise the significance of oil price to African oil-importing economies, vis-a-vis Economic growth, Exchange rate and CPI.

The research will contribute further to the general knowledge of the asymmetric effect of oil price fluctuation on economic activities. This will enable a further research to bring forth important aspect of the relationship that remain un-attended, bringing out avenues for future research. The research result is expected to have important policy implication for the economies of other countries which will provide valuable information to policymakers.

In view of the above, the motivation for choosing the African countries are as follows. First, the limited number of studies examining the asymmetric impact of oil price fluctuation in exchange rates, CPI and economic growth. Secondly, the important role that African countries play in the global economy. Thirdly the period within which the

24

study covered is more comprehensive than in the previous studies. Fourthly, the frequency of the data as high-frequency data used in the study that is capable in examining the effect of positive and negative fluctuation for both in short and long-run dimension.

## 1.7     Outline of the Study

In chapter one, the research introduces and explains the topic of oil price-GDP, exchange rate and CPI relationship. The second section gives a background to both the theoretical and empirical review with emphasis on the important concepts. These are followed by chapter three describing the methodology used. In chapter four discussion of the result is presented to answer all the objectives of the study. Finally, chapter five discusses recommendation and policy implication especially to those countries and the Africa/world at large. This vague relationship is worth investigating thoroughly to explain more and have an in-depth examination about the specific nonlinearity and asymmetric transmission channels as well as the magnitude of fluctuation in the oil price of oil-importing economy.

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