EXCHANGE RATE DYNAMICS: EVIDENCE FROM MAJOR SUB-SAHARAN AFRICA OIL-EXPORTING COUNTRIES

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by

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LIST OF ABBREVIATIONS

AIC	Akaike Information Criterion
ADF	Augmented Dickey Fuller
AEO	African Economic Outlook
ARDL	Autoregressive Distributed Lag
ARIMA	Autoregressive Integrated Moving Average
BLS	Bureau of Labour Statistics
BM	Broad Money
BOP	Balance of Payment
CDF	Congolese Franc Currency
CFA Franc	Central African Currency
CLOSED	Trade Barriers
CPI	Consumer Price Index
CUSUM	Cumulative sum
CUSUMSQ	Cumulative Sum of Squares
DAH	Development Assistance for Health
DC	Domestic Credits
DFE	Dynamic Fixed Effect
DW	Durbin Watson
ECT	Error Correction Term
EIA	Energy Intelligence Agency
ERPT	Exchange Rate Pass-Through
EW	Employees Wage
FE	Fixed Effect
GDPC	Gross Domestic Product Per Capita
GHS	Ghanaian Cedi Currency
GOV	Government Expenditure

GMM	Generalized Method of Moments
IMF	International Monetary Fund
INF	Inflation Rate
IT	Inflation Targets
AOA	Angolan Kz Currency
LCU	Local Currency Unit
LM	Lagrange Multiplier
MWK	Malawian Kwacha Currency
MG	Mean Group
NER	Nominal Exchange Rate
NGN	Nigerian Naira Currency
NARDL	Nonlinear Autoregressive Distributed lag
OECD	Organisation for Economic Co-operation and Development
OLS	Ordinary Least Squared
OPEC	Organisation of the Petroleum Exporting Countries
OPEN	Trade Openness
PMG	Pooled Mean Group
PP	Phillip Peron
PPP	Purchasing Power Parity
QE	Quality Easy
RE	Random Effect
REER	Real Effective Exchange Rate
RER	Real Exchange Rate
SDG	Sudanese Pound
SSA	Sub-Saharan Africa
sqCP	Squared Consumer Prices
sqRER	Squared Real Exchange Rate

SVAR	Structural Vector Autoregressive
TB	Trade Balance
TOT	Term of trade
TR	Threshold Regression
TVP	Time-Varying Parameter
UK	United Kingdom
US	United States of America
USD	United States Dollar
VAR	Vector Autoregressive
VECM	Vector Error Correction Model
WDI	World Development Index
ZAR	South African Rand Currency
ZMK	Zambian Kwacha Currency

DINAMIKA KADAR PERTUKARAN:

BUKTI DARIPADA PENGEKSPORT MINYAK UTAMA DI SUB-SAHARAN AFRIKA

ABSTRAK

Kajian ini menyiasat dinamika kadar pertukaran 15 buah negara pengeksport minyak utama sub-Sahara yang terpilih iaitu Angola, Cameroon, Chad, Republik Congo, Republik Rakyat Demokratik Congo, Côte d'Ivoire, Equatorial Guinea, Gabon, Ghana, Malawi, Niger Republik, Nigeria, Afrika Selatan, Sudan dan Zambia. Takrif kerja dinamik dan kadar pertukaran diambil daripada kadar pertukaran yang berkaitan dengan masalah ekonomi seperti turun naik kadar pertukaran, penurunan nilai tukaran mata wang dan pertukaran kadar pertukaran. Penemuan daripada objektif pertama menunjukkan bukti hubungan jangka panjang antara kadar pertukaran sebenar dan pembolehubah makroekonomi di negara-negara terpilih. Walau bagaimanapun, kajian ini juga meneroka dinamik turun naik kadar pertukaran sebenar dan asas kadar pertukaran menggunakan kumpulan purata gabungan, kumpulan purata dan model kesan dinamik tetap. Hasilnya menunjukkan bukti bahawa turun naik kadar pertukaran sebenar mempunyai pengaruh yang signifikan terhadap asas kadar pertukaran sebenar iaitu; terma perdagangan, keterbukaan perdagangan, pelaburan langsung asing dan perbelanjaan kerajaan. Objektif kedua kajian mengkaji kesan penurunan nilai tukar pada imbangan perdagangan bagi negara-negara pengeksport minyak utama terpilih yang menggunakan ujian pembetulan dan model pembetulan ralat autoregressive linear dan tak linear. Penemuan daripada pelarasan linear bagi ujian pembetulan dan model pembetulan ralat mendedahkan bukti kesan jangka pendek dan penurunan nilai mata wang ke atas imbangan perdagangan di Ghana, Republik Niger, Nigeria dan

Afrika Selatan sementara kesan jangka panjang penurunan nilai di Chad, Gabon, Ghana dan Republik Niger, masing-masing. Walau bagaimanapun, apabila kajian membezakan naik-nilai sebenar daripada susutnilai sebenar menggunakan konsep jumlah separa dan bukan linear yang digunakan dalam proses pelarasan linear, keputusan menunjukkan bukti kukuh kesan asimetrik penurunan nilai pada imbangan perdagangan di sepuluh negara iaitu; Angola, Cameroon, Congo DPR, Congo Republik, Cote d'Ivoire, Guinea Equatorial, Gabon, Ghana, Republik Niger, Nigeria dan Afrika Selatan. Di samping itu, penemuan menunjukkan bukti-bukti yang luar biasa untuk fenomena Keluk-J di sepuluh negara pengeksport minyak utama ini. Objektif ketiga kajian ini menyiasat sasaran inflasi yang optimum untuk rejim kadar pertukaran yang sesuai dalam SSA menggunakan ujian kesan ambang panel, dan regresi ambang dinamik. Hasilnya menunjukkan kesan ambang signifikan sebanyak 14.47% untuk sasaran inflasi yang sesuai. Selain itu, matlamat itu juga meneroka kadar pertukaran melalui harga pengguna. Hasilnya juga menunjukkan kesan ambang signifikan sebanyak 14.47% untuk harga pengguna. Walau bagaimanapun, matlamat itu selanjutnya mengkaji kadar pertukaran pertukaran terus na elalui upah. Hasil kajian menunjukkan kesan ambang signifikan sebanyak 15.12% untuk upah pekerja. Para pembuat dasar di rantau SSA perlu memberi perhatian lebih kepada pembangunan pasaran pertukaran asing dan mempelbagaikan ekonomi mereka daripada terus bergantung kepada minyak.

EXCHANGE RATE DYNAMICS:

EVIDENCE FROM MAJOR SUB-SAHARAN AFRICA OIL EXPORTING COUNTRIES

ABSTRACT

This study investigates the exchange rate dynamics in the selected 15 major oil-exporting sub-Saharan African countries namely, Angola, Cameroon, Chad, Congo Republic, Congo Democratic People Republic, Cote d'Ivoire, Equatorial Guinea, Gabon, Ghana, Malawi, Niger Republic, Nigeria, South Africa, Sudan, and Zambia. The working definition of exchange rate dynamic drawn from exchange rates economic related problems such as exchange rate fluctuations, exchange rate devaluation, and exchange rate pass-through. The findings from the first objective reveal evidence of a long-run relationship between the real exchange rate and macroeconomic variables in the selected countries. Nevertheless, the study also explores the dynamics of real exchange rate fluctuations and exchange rate fundamentals using pooled mean group, mean group, and fixed dynamic effect models. The results revealed evidence that real exchange rate fluctuations have a significant influence on the real exchange rate fundamentals, namely, terms of trade, trade openness, foreign direct investment, and government expenditure. The second objective of the study examined the effects of exchange rate devaluations on trade balances for the selected major oil-exporting countries using linear and nonlinear autoregressive distributed lag bounds testing and ECM. The findings from linear adjustments using the bounds testing and error correction model revealed evidence of the short-run effect of exchange rate devaluation on trade balances in Ghana, Niger Republic, Nigeria, and South Africa while the long-run effect of devaluation in Chad,

Gabon, Ghana, and the Niger Republic, respectively. However, when the analysis differentiated the real appreciation from the real depreciation using partial sum concept and nonlinearity in the linear adjustment process, the results revealed strong evidence of asymmetric effect of devaluation on trade balances in ten countries namely; Angola, Cameroon, Congo DPR, Cote d'Ivoire, Equatorial Guinea, Gabon, Ghana, Niger Republic, Nigeria and South Africa, respectively. Besides, the findings showed overwhelming support for the J-curve phenomenon in these ten major oil-exporting countries. The third objective of the study investigated an optimal inflation target for an appropriate exchange rate regime in SSA using panel threshold-effect test, and dynamic threshold regression. The result revealed a significant threshold-effect of 14.47% for an appropriate inflation target. Furthermore, the objective also explores the exchange rate pass-through on consumer prices. The result also revealed a significant threshold-effect of 14.47% for consumer prices. Nevertheless, the objective further examined the exchange rate pass-through on employees' wages. The findings revealed a significant threshold-effect of 15.12% for an employee's wages. The policymakers in the SSA region should pay more attention to the foreign exchange market developments and diversify their economy from oil dependence.

CHAPTER 1

INTRODUCTION

1.1 Background of the study

The empirical study on exchange rate dynamics been among unprecedented major shock to policymakers and academia alike after the collapsed Bretton Woods system and has become the most challenging in international economics. Macroeconomic models to explain the monetary approach to exchange rate determination have been in the first place established as monetary approached in the 1980s to explain these challenging issues of exchange rate movements[1]. The discovery of monetary approach or technique considered as pioneering studies in modeling macroeconomic explanation to exchange rate dynamics can be traced back to the works in Dornbusch (1976), Mussa (1979, 1982), and Obstfeld (1981). Although Meese and Rogoff (1983) have censured these macroeconomic models because they are providing practical explanations for their poor performance in predicting short-run analysis of exchange rate dynamics[2].

Another strand of researchers had also come in response to the critic hitherto, in the mid-1990s, attempted to predict exchange rate movements in another approach following a dynamic general equilibrium model, as in Obstfeld and Rogoff (1995). They examined exchange rate dynamics from a two countries model of monopolistic competition with sticky prices to predict exchange rates fluctuations. Gregorio and Wolf (1994) examined exchange rate dynamics from a simple model that incorporates

[1] See Hamad and Charfi (2016)

[2] The collapsed of the Bretton Wood in early 1970s had marked the end and the beginning of renewed era in exchange rates through the announcement of halt convertibility of dollar to gold.

the exportable and non-tradable commodity concerning trade movements and productivity differentials to predict the behavior of exchange rate fluctuations. Cheung and Chinn (1998) also examined exchange rate dynamics from time-series properties in regression analysis that consistency requirement embodies a more accurate technique to estimate the exchange rate forecast on structural models.

In the early 2000s, the literature also observed that studies attempted to predict the determinants of exchange rate movements. They are Betts and Devereux (2000), who found weak empirical evidence in support of the law of one price. Cheung and Chinn (2001) who found exchange rate dynamics in the light of electronically brokered transactions viz-a-viz traditional brokers on Dollar/Pound sterling and Dollar/Swizz franc markets. Evans and Lyons (2002) examined exchange rate dynamics from an improved macroeconomic model in which the study presented order flow as another determinant in the field microstructure and claimed to have usefulness in predicting Deutsche mark against dollar exchange rates. Brandt and Santa-Clara (2002) investigated exchange rate dynamics from the viewpoint of maximum likelihood estimator to estimate a continues-time model of joint dynamic interest rates of two countries with two currencies.

Furthermore, Burstein *et al.* (2003) examined exchange rate dynamics from the standard model of real exchange rate behavior during the exchange rate stabilization. Clarida *et al.* (2003) examined exchange rate dynamics from the perspective of corroboration in literature, and they found that a random walk forecast has overwhelming information for forecast exchange rate behavior than the standard exchange rate models. Finally, Kilian and Taylor (2003) examined exchange rate dynamics from the viewpoint of nonlinearity in the exponential smooth transition

autoregression model as having the power toward explaining devaluations in real exchange rates.

Recently, scholars have shown increasing interest in exploring exchange rate fluctuations. Therefore, putting these findings into perspective on the recent development in the exchange rate dynamics literature, which is considered to have several methods like the pooled estimators, linear and nonlinear adjustment process, and threshold regression. However, there is a large body of research in this area; some claimed to have successfully predicted determinants of exchange rate fluctuations. These studies include Kandil and Berument (2007), Rodrik (2007), Naknoi (2008), Naknoi (2017), Bruneau, and Moran (2017) and Mazorodze and Tewari (2018) among many.

Indeed, the recent pattern in the literature has not only provided explanations to the determinants of the exchange rates movement. However, studies have gone further to forecast the effects of exchange rate devaluations as it appears to improve bilateral trade balances given by the Marshall-Lerner conditions. There have being extensive volume empirical studies reporting the effectiveness of currency devaluations and trade balances, among these studies include Magee (1973), Krugman and Taylor (1978), Krueger (1983), Bahmani-Oskooee (1985), Bahmani-Oskooee (1991), Rose (1991), Bahmani-Oskooee and Alse (1994), Halicioglu (2007), Bahmani-Oskooee and Hegerty (2009), Bahmani-Oskooee and Fariditavana (2015) and Bahmani-Oskooee and Halicioglu (2017) among others.

Unlike the previous attempts analyzing models that forecast determinants of exchange rate fluctuations and their devaluations, now there have been growing interest in the effect of exchange rate pass-through, which defined as the degree of

responsiveness of the variation in a variable that resulted from the variation in the exchange rate. This effect can be related to any other quantifiable variable, for instance, import prices, export prices, domestic prices, consumer prices, wages, currency, health procurements, and education expenditure. More so, pass-through into import prices can define as a proportional change in import prices resulting from the variation of the exchange rate. The degree of the pass-through ranges from "zero to unity"; complete pass-through is denoted by "unity," while an incomplete is any degree in-between the "zero to unity."[3] Further studies cited in the previous studies, among which include Hooper and Mann (1989), Taylor (2000), Campa and Goldberg (2002), and Ito and Sato (2007), among others.

Much of the recent literature on the pass-through were studies based on US import market, while later extended to Germany, Italy, Japan and United Kingdom while very scanty studies have so per established to have done in major oil-producing economies in SSA with the exceptions of studies include Omisakin (2009), Razafimahefa (2012), Parsley (2012) and Kabundi and Mbelu (2018), Aron, Macdonald, & Muellbauer, (2014) and Aron *et al.* (2014) among others.

Until recently, there has been little interest in studies that focus on exchange rate dynamics in developing countries, despite peripheral neglect from the literature. Although, the literature had documented findings connecting the exchange rate and oil price delineating a significant source of shocks from the exchange rate via oil exports. Oil production and its' exports have been one of the resource abundances on most developing economies and SSA inclusive (Eregha & Mesagan, 2016).

[3] The definition of exchange rates pass-through; principle sources are; Bishop (1994),Goldberg and Knetter (1996), Yu (2005), Campa and Goldberg (2005b),Gopinath and Rigobon (2008),Berman et al. (2012) and Cook (2014).

The link between exchange rates and crude-oil price have been empirical and theoretically examined in the literature, and the difference among nominal and real measures is also imperative when evaluating the relationship between exchange rates besides the crude oil price. Although the nominal exchange rate is expressed as local currency per US dollar while nominal oil price, on the other hand, is measured in US dollar per barrel. On the other hand, the real oil price is premeditated by regulating nominal oil price for any variations in the US price level, or US consumer price index. However, the two measures expressed as a trade-weighted index between several countries and links within the two have been extensively subject to terms of trade channels in the literature. Theoretically, the tendency of the real exchange rate appreciates may likely cause an increase in the oil price of the oil-importing countries, and the reverse is the case of oil-exporting countries (Brahmasrene *et al.*,2014; Krugman, 1983).

According to Coudert *et al.* (2008) that countries exporting oil in commercial quantity may experience an appreciated real exchange rate when oil prices increase and vise-versa. This appreciation has implications on the macroeconomy of oil-exporting countries as the uncertainty on the exchange rate fluctuations transits to their corporate governance in particular; monetary policy, the balance of payments, gross national investments, national saving, and the GDP. Oil export contributions have viewed as a contingent source of revenue for these oil-exporting countries (Yousefi & Wirjanto, 2004).

1.2 Stylized facts

The facts about global oil productions in 2016 in comparison to a year before, it has risen by 0.35 million barrel per day (m b/d), leading an expansion of approximately 0.5 as percent upsurge of 75.48m b/d, for instantaneous growth within the last one decade[4]. There has been a considerable decline in oil production for mostly non-OPEC member countries compared to their 2015 indices, among which the U.S. declared -0.54m barrels per day representing -5.7 percent, and -0.31m barrels per day representing -7.2 percent for China. The top producers of the year 2016 remain Saudi Arabia with 10.46m, the U.S with 8.88m, and Russia with 10.29m barrels per day[5].

The global demand for crude oil in 2016 averaged 95.12m b/d upsurge by 1.5 percent resulting from various oil-producing countries in Africa, North American, India, China, Asia, and the Pacific. The Middle East story remained the same while Latin America with declined oil production. The OPEC member countries' production declined by 0.20m b/d representing 2.2 percent a dropped since 1999, resulting from falling demand for oil in Ecuador, Venezuela, Iran, and Saudi Arabia.

In Africa, the story is almost the same as there been a tremendous decline in oil output, but this is also due to the mismanagement, corruption, and unrest in the oil exploration region through pipeline vandalism, abductions of oil workers in the case of Nigeria and Angola. The major oil production in Africa happens to be mostly members of OPEC, i.e., Algeria, Angola, Libya, Gabon, and Nigeria, with the recent inclusion of Equatorial Guinea and the Republic of Congo and the fourth non-OPEC

[4] These are the selected countries for the study namely: Angola, Cameroon, Chad, Congo Rep, Congo DPR, Cote diIvoire, Equatorial Guinea, Gabon Ghana, Malawi, Niger, Nigeria, South Africa, Sudan and the Zambia.

[5] The nominal oil price is invoiced in US dollars per barrel "barrel per day [b/d]".

member emerged in the list of top five, Egypt. Table 1.1 provides a recent visual trend in oil production in these major oil-exporting African countries.

Table 1.1

Output of Oil Production in the Major African Countries (1996-2016)1000 barrels p/ day

	Algeria	Angola	Chad	Rep. of Congo	Egypt	Equatorial Guinea	Gabon	Libya	Nigeria	South Sudan	Sudan	Tunisia
1996	1386	716	n/a	200	894	17	365	1452	2145	n/a	5	96
1997	1421	741	n/a	225	873	60	364	1491	2316	n/a	9	91
1998	1461	731	n/a	264	857	83	337	1480	2167	n/a	12	89
1999	1515	745	n/a	266	827	100	340	1425	2066	n/a	63	92
2000	1549	746	n/a	265	779	118	276	1475	2155	n/a	179	84
2001	1534	742	n/a	248	758	194	262	1428	2274	n/a	209	78
2002	1653	905	n/a	238	751	230	256	1375	2103	n/a	236	81
2003	1826	870	24	217	750	266	274	1485	2263	n/a	262	74
2004	1921	1103	168	225	701	351	273	1622	2472	n/a	291	76
2005	1990	1282	173	247	672	358	270	1745	2527	n/a	294	80
2006	1979	1432	153	278	679	342	242	1815	2433	n/a	356	77
2007	1992	1699	144	224	698	350	246	1820	2314	n/a	483	106
2008	1969	1916	127	237	715	347	240	1820	2109	n/a	457	98
2009	1775	1804	118	276	730	307	241	1651	2185	n/a	475	93
2010	1689	1863	122	314	725	274	249	1658	2471	n/a	462	85
2011	1642	1726	114	301	714	252	251	479	2408	n/a	291	78
2012	1537	1784	101	281	715	272	253	1510	2370	31	103	84
2013	1485	1799	83	250	710	267	232	988	2270	100	118	78
2014	1589	1712	82	266	714	281	232	498	2347	155	120	73
2015	1558	1826	73	257	726	289	230	432	2329	148	109	65
2016	1579	1807	73	238	691	280	227	426	2053	118	104	63

Source: BP Statistical Review of World Energy (2017).

From the above Table 1.1 shows periods of crude production from listed African major players in the crude-oil production, where we can see how the distributions of the output as displayed, staring from Algeria the first column to the last, Tunisia. Nigeria is the giant player in SSA in oil production; this placed the country second in the region on oil reserve (see Table 1.2). Second to Nigeria among these countries Angola, which has placed at fourth in oil reserve, Gabon being the sixth producer in Africa while third in the region, seventh in African on oil reserve. From Table 1.1, it can observe that Nigeria still maintains the lead while others followed, i.e., Angola and others[6].

[6] That is second to the fifteen 15 major crude producers in the region respectively.

Table 1.2

Proven Oil Reserves in the Major Oil-producing African Countries (1996-2017)

	1996	**2006**	**2015**	**2016**	**2017**
Algeria	10.80	12.27	12.20	13.74	12.2
Angola	3.69	9.03	11.78	13.13	9.5
Chad	0.00	1.50	1.50	1.72	1.50
Republic of Congo	1.60	1.60	1.60	1.83	1.60
Egypt	3.84	3.72	3.47	3.93	3.30
Equatorial Guinea	0.56	1.75	1.10	1.25	1.10
Gabon	2.80	2.15	2.00	2.27	2.01
Libya	29.50	41.46	48.36	54.66	48.40
Nigeria	20.83	37.20	37.07	42.06	37.5
South Sudan	n/a	n/a	3.50	3.97	3.50
Sudan	0.30	5.00	1.50	1.70	1.50
Tunisia	0.34	0.60	0.43	0.48	0.40
Others Africa	0.67	0.65	3.68	4.19	4.00
Total Africa	74.93	116.94	128.19	144.92	126.50

Source: BP Statistical Review of World Energy (2018)

From the above Table 1.2 shows the proven oil reserves in the major oil-producing African countries. There has been a slide declined in the oil reserves for most major oil-producing countries in the African region. This decline is pronounced vividly from the estimated reserves from countries from SSA: Angola, Chad, Republic of Congo, Equatorial Guinea, Gabon, Nigeria, and Sudan.

In the first fifteenth crude producer in the globe, Nigeria is the thirteenth crude producer given the production quota from OPEC of 2.4 million barrels per day, and tenth in the globe, and second in Africa, when it comes to crude-oil reserve. The state-owned dilapidated petroleum sector against all the odds remained the major source of revenue for the economy.

Table 1.3

OPEC Member Countries in SSA; Facts and Figures 2017

	Angola	Equatorial Guinea	Gabon	Nigeria
Population mill inhabitants	28.36	1.27	1.93	197.70
Land area 1,000 sq km	1,248	28	268	924
GDP per capita $	4,380	8,460	7,894	1,881
GDP at market prices millions $	124,209	10,725	15,206	371,886
GDP growth real ppp%	1.4	-3.0	2.5	0.8
Value of exports millions $	34,471	5,659	5,477	46,680
Value of imports millions $	15,280	3,109	2,823	44,216
Current account balance millions $	-6,501	-1.092	-699	7,924
Value of petroleum exports millions $	31,550	4,689	3,695	38,607
Proven crude oil reserve ml barrels	8,384	1,100	2,000	37,453
Natural gas reserves billion cum	422	145	26	5,627
Crude oil production 1,000b/d	1,632.2	128.6	210.1	1,535.6
Natural gas marketed production millions $	3,111.0	9,600.0	407.0	45,434.1
Refinery capacity 1000b/cd	80	-	24.0	446
Refinery throughput 1000b/d	55	-	20	82
Output of petroleum products 1,000b/d	55	-	22	82
Oil demand 1000b/d	115.5	6.5	25.8	425.9
Crude oil exports 1,000b/d	1,576.7	128.2	188.4	1,811.1
Export of petroleum products 1,000b/d	17.2	-	12.3	19.3
Import of petroleum products 1,000b/d	70.6	6.2	6.2	391.7
Natura gas export millions $	517.3	9,556.0	-	32,511.2

Note: the land areas Figure as per official website while population Figures from live world population survey 2017
Source: OPEC Annual Statistical Bulletin (2018)

Angola is the sixteenth crude producer given its OPEC's production quota of 1.5 million daily output. Though, the country's trading partners are U.S. and China, of which 90 percent of it is export crude-oil goes to these partners. The trade is a critical issue to how the effects of dollar fluctuations will likely have on their economy gave approximately above 7 billion barrels as a proven reserve that the economy often depended as a source of foreign exchange earnings.

The coming of Gabon in the hub of oil exploration has placed the country thirty-seventh global ranking in oil productions with the capacity of above 200 thousand barrels daily output, which places the ninth country exporter in Africa, and third in SSA. The government of Gabon relied on the contributions of approximately 60 percent of these oil receipts.

As we can see from Table 1.3, this OPEC members oil-exporting countries in SSA are; Nigeria, Angola, Equatorial Guinea, and Gabon, although the Republic of Congo has joined the cartel in mid-2018, these are considered among major oil exporters of the world and 4 out of 15 in SSA. It can also observe that the value of the oil-exports from these countries is a continuous inflow of foreign exchange, and these pave ways for future growth as revealed by higher gross domestic output for these selected major oil-exporting economies. The twelve-major oil-exporting countries in Africa as in Table 2 include Algeria, Angola, Chad, Republic of Congo, Egypt, Equatorial Guinea, Gabon, Libya, Nigeria, South Sudan, Sudan and Tunisia, while others are Côte d'Ivoire, South Africa, Malawi, Morocco, Mauritania, Niger, DRC Congo, Ghana, and Cameroon. According to Qureshi (2008), African countries,

particularly the SSA sub-region, there were quite many countries that export crude oil; as Angola, Nigeria, Equatorial Guinea, and Gabon, among fifteen 15 others[7].

The selection of these countries is motivated by; In the SSA region, these countries had uppermost volume in oil-exporting (OPEC, 2016). Secondly, the monetary policy and exchange rate regime in these countries characterized by a managed float. Thirdly, oil has been for decades the major source of foreign exchange earnings for these countries, with crude-oil market transactions invoiced in the US dollar. In the event of fluctuations in the dollar rates, it affects not only the price of oil itself but transits of all sectors of their economies. The oil sector accounts for most of the exports and economic activity of these countries selected (Eregha and Mesagan, 2016).

In the event of abrupt fluctuations in the crude price, the central bank governors from these oil-exporting countries will face a dilemma for financing budget deficits, price stabilization with corresponding financial stabilization. The relative availability of crude oil and the concentration of exports is now the critical agenda for the governments of these economies remain as; Nigeria, Cameroon, Gabon, Equatorial Guinea, Côte d'Ivoire, Republic of Congo, South Africa, Angola, Ghana, and South Sudan. Unlike the new entrant into oil explorations from the region, Nigeria, Angola, and Gabon have been exporting oil in commercial quantity since the 1970s. The major oil producers in Africa now include Egypt, Libya, Algeria, Angola, and Nigeria Duruigbo (2005), Qureshi (2008), and Sahu (2008).

[7] Others are Cameroon, Chad, Congo Rep, Congo DPR, Cote diIvoire, Ghana, Malawi, Niger, South Africa, Sudan and the Zambia.

The oil sector of these emerging major oil-exporting countries supplies 20 percent oil demand for the United States and 33 percent oil demand for China, making a country like Nigeria to have the largest share of 29 percent of GDP (African Development Bank 2017). Oil is widely regarded to be vital strategic resources, and its connections with the exchange rate as a vehicle for international trade has led to the transmission of its behaviors (Fasanya *et al.* 2018). Oil price fluctuates, and its fluctuations have considered as a real source of financial instability and economic fluctuations (Eregha and Mesagan, 2016). There have been several studies that focus on the link between oil prices and exchange rates. Hamilton (1983) indicates from an empirical investigation preceded World War II, macroeconomic downturns revealed evidence of price fluctuations on crude petroleum that all except one of the US macroeconomic downturns since World War II were preceded by the price fluctuations of crude petroleum.

Also, the high volume of oil-exports from these SSA translates to higher revenue from oil, which stands strategically for growth and development of the region unless unanticipated events cause deviations from the growth path, which can be imminent in two folds. First, the institutional factor[8], the impact of the organization of petroleum exporting countries (OPEC) as actors that led to decreases in the supply of oil output, tends to raise the price of that output. Price fixing, limiting supply, and other restrictive practices are predominantly the activity from institutional impacts. Secondly, the foreign exchange market influenced by factors such as economic growth, level of investments of a country, interest rates, and inflation rates.

[8] OPEC as a cartel group; through the control of its members crude exports to influence the behaviour of the world oil price.

1.3 Problem Statement

The implication of exchange rate fluctuations on macroeconomic variables, i.e., GDP, inflation, interest rate, money supply, and employment, cannot be overlooked, as it portrays exposure to systemic risk-on trade and investment. However, the determination of an exchange rate is technically challenging in an economy versus unobserved influenced by numerous fundamental and technical factors. These factors include, among many others, the forces of supply and demand for capital flows, technical support, and resistance level. These factors are moving sequentially in a continuous fluctuation, and the exchange rate fluctuates from one moment to the next.

Macroeconomic indicators have been found to some degree to have a multiplier effect on exchange rate changes, as these positive and negative changes influence trade balance, current account, and investment decisions. However, return on investment characterized by high or low yields also portray uncertainty towards foreign direct investment. Exposure to exchange rate overvaluations or devaluations has been shown to have related effects balance of payments. Meanwhile, the presence of these effects is likely to inspire the ratio between imports and export in an economic environment faced with an appreciating exchange rate, while discourages import and encourages export in an economic environment characterized with depreciating exchange rate, resulting in a shift from purchase foreign commodities to domestic commodities. Hence, resulting in a digression of resources from demand and supply through a shift in terms of trade, and these eventually are likely to affect exports or imports window and economic growth.

The pass-through effect is one of the most frequently stated problems with the exchange rate movement. Domestic and foreign firms are affected by pass-through, via uncertainty on trade balances, import prices, and inflation risk, induced by the

implication of effects for the pass-through exchange rate to consumer prices. More so, the empirical evidence corroborates with this submission and opinion that incomplete effects and its implications mainly when the profit margin is likely to may influence equilibrium under various market structures, employees' wages, or when the domestic or foreign cost of production depends on an exchange rate. Given these problems, this thesis sets out to answer the following research questions.

1.4 Research Questions

1. What is the long-run relationship between exchange rate fluctuation and the fundamental variables in these selected major oil-exporting countries in SSA?
2. What are the effects of exchange rate devaluations on trade balances in these selected major oil-exporting SSA countries?
3. What is an optimal inflation target regime for exchange rate policy in these selected major oil-exporting SSA countries?
4. What is the impact of exchange rate pass-through to consumer prices in these selected major oil-exporting SSA countries?
5. What is the impact of exchange rate pass-through to employees' wages in these selected major oil-exporting SSA countries?

1.5 Research Objectives

This thesis aims to examine exchange rate dynamics from these selected major oil-producing countries in SSA. The specific objectives are to investigate the following objectives empirically.

1. To investigate the long-run relationships between exchange rate fluctuations on fundamental variables in these selected major oil-exporting countries in **SSA**.
2. To examine the short-run and long-run effects of exchange rate devaluations on trade balances in these selected major oil-exporting SSA countries.
3. To explore an optimum inflation-targets for exchange rate policy in the selected major oil-exporting countries in SSA.
4. To evaluate the impact and the degree of exchange rate pass-through into consumer prices.
5. To evaluate the impact and the degree of exchange rate pass-through into employees' wages.

The study will examine the above objectives in a way in which an insight from new development in econometric methods in analyzing the response to the research questions. Although the pooled mean group (PMG) approach used as a tool of estimating objective one, bounds-testing for cointegration and error correction technique utilized in estimating the second objective, while dynamic non-linear threshold technique used for objectives three to five of the study.

Table 1.4

Research Questions and Research Objectives

	Research Questions	Research Objective	Research Methodology
1.	What is the long-run relationship between exchange rate fluctuations and the fundamental variables in these selected major oil-exporting countries in SSA?	To investigate the long-run relationships between exchange rate fluctuations on the fundamental variables in these selected major oil-exporting countries in SSA.	Secondary data ARDL Models RE, FE PMG, MG & DFE
2.	What are the effects of exchange rate devaluations on trade balances in these selected major oil-exporting countries in SSA?	To examine the short-run and long-run effects of exchange rate devaluations on trade balances in these selected major oil-exporting SSA countries?	ARDL and NARDL Models. Bounds Testing/ ECM
3.	What is an optimal inflation target regime for exchange rate policy in these selected major oil-exporting SSA countries? a) What is the impact of exchange rate pass-through to consumer prices in these selected major oil-exporting SSA countries? b) What is the impact of exchange rate pass-through to employees' wages is the above sample?	To explore an optimal inflation target for exchange rate policy in these selected major oil-exporting SSA countries. a) To evaluate the degree and the impact of exchange rate pass-through to consumer prices b) To evaluate the degree and the impact of exchange rate pass-through to employees' wages.	Threshold Models Threshold-effect test. Threshold estimation.

1.6 Significance of the Study

The exposure associated with exchange rate fluctuations to trade can consider as a critical research subject. Exchange rate dynamics form an integral part of international economics and finance in recent times. Therefore, some evaluations into the impact of exchange rate fluctuations on these major oil-exporting countries macroeconomy, besides, to the best of the researcher's knowledge these questions are impressive, and the question also post challenges to the academic and policymakers particularly in this era of globalization, information technology, firms' integration, and individual merchandise. Empirical studies on the exchange rate dynamics on the nature of the study as this, mainly focusing on exchange rates devaluations studies, are very limited and scanty in these economies. Therefore, this study is significant for at least many motives hereafter.

Secondly, from the methodological perspective, although several studies have examined the effect of exchange rate movements on the macroeconomy of advanced economies, for instance, the US, UK, China, and Germany and alike. Their studies anchored via most recent panel time series econometric methodologies as first and second generations panel cointegration tests, mean group (MG), pool mean group (PGM), panel bounds-testing approach for cointegration Autoregressive Distributed Lag (ARDL) and dynamic panel threshold regression (TR). However, studies from Africa, particularly from mainstream SSA, were anchored using autoregressive vector methods to study fluctuations and devaluations, while most macroeconomic and finance issues are dynamic. Therefore, the utilization of a dynamic panel approach will pave the way to adopting a panel data structure to understand these dynamic adjustments — furthermore apparent misspecifications of the methodology. The study attempts to fill the observed shortcoming.

Thirdly, there is a vacuum in the study of exchange rate pass-through in these major oil-producing economies in SSA. To the best of the researcher's knowledge, no study has been so far sought to investigate and analyze how exchange rate pass-through in these selected oil-producing countries, specifically with some entities from OPEC member countries. The contribution of the study to the policymakers and economists can be drawn from the findings. The study attempts to investigate the monetary model of exchange rate dynamics using data from the selected 15 major oil-exporting sub-Saharan African (SSA) Countries. It investigated the relationship between exchange rate fluctuation and macroeconomic variables in the selected major oil-exporting SSA. It explored the asymmetric effects of devaluations on trade balances and the J-curve evidence in the selected sub-Saharan African economies. It investigated optimum inflation targets for appropriate exchange rate policy in the selected sub-Saharan African economies. It examined the effect of exchange rate pass-through on consumer prices in the selected sub-Saharan African economies. It is the first attempt to explore the effect of exchange rate pass-through on employee wages in the literature. However, policymakers should pay attention to the development in foreign exchange market development in one hand and diversify their economy on another hand.

Lastly, the present study fills a gap in the literature by extending the new development in econometric methods like pooled estimators (PMG, MG, and DFE), bounds testing, and threshold regression, which may be critical for improving consistent estimates for the parameters. Given the consequences of this study, policymakers in these countries would have superior knowledge of these issues that are likely to alter price levels and financial instability in the financial sector of their economies. Besides, it gives another clarification on how the price level and financial

stability in the SSA region can be enhanced to accomplish a more substantial amount of financial development. At last, it would likewise open entryways for advance dialogs among analysts to reveal other essential impacts of exchange rate fluctuations on different components identified with economic growth in these countries.

1.7 Scope of the Study

The scope of the study will focus on the exchange rates dynamics on these fifteen oil-producing countries in SSA namely; Angola, Cameroon, Chad, Congo Rep, Congo DPR, Cote d'Ivoire, Equatorial Guinea, Gabon Ghana, Malawi, Niger, Nigeria, South Africa, Sudan, and Zambia. The major oil-exporting countries chosen for many reasons; firstly, to the best of our knowledge, the study will be among the pioneer in using panel data analysis to focus on SSA, concerning the significant oil-exporting economies. Secondly, declining oil revenue at its trough in 2015 portrays exposure to crude product exporters. Thirdly, oil production from Africa in 2014 represents an approximated 9 million barrels outputs daily which represent 9.4 percent global output the same year, making the continent home to five of the top 30 oil-exporting countries[9]. Lastly, the finding from this study will be of enormous standing for those major oil-exporting countries in Africa that falls after these sampled countries from SSA.

The study used panel data analysis to investigate macroeconomic indicators from the fifteen major oil-exporting economies. GDP per capita, real and nominal exchange rates, money supply, consumer price index (CPI), exports and imports, domestic credits, term of trade, trade barriers, trade openness, wages and foreign direct

[9] For further details see Eregha & Mesagan (2016) oil producing countries in Africa.

investments for the period of empirical analysis covering 1996 to 2017 using annual panel time-series data from 15 major oil-exporting SSA countries. The selection of the period 1996 to 2017 also motivated by the fact that methodology requires that there are some medium length time series for relatively few countries[10]. Although the period represents the reoccurrence of these price level movements and financial sector instability in these selected major oil-producing economies in SSA.

1.8 Organization of the Study

The study organized into six chapters. Chapter 1 begins with the background and the introduction of the underlying problems in exchange rate economics. Further, the chapter also presented sub-sections such as problem statements, research questions, research objectives, significance, and organization of the study.

Chapter 2 presented the background information around the study area. The chapter also highlighted the trend of crucial macroeconomic variables such as GDP, trade, exchange rate, broad money, FDI, and inflation rate. Notwithstanding, the chapter presented the sample of 15 major oil-exporting sub-Saharan African countries sequentially on the criteria of the rank in oil-exports across the SSA region.

Chapter 3 focused on the literature review, which is primarily the dynamics of exchange rate fluctuations, devaluations, and how exchange rates pass-through into consumer prices. The chapter also presented each of the three identified research problems separately in such a way that the theoretical literature and empirical literature with the literature gap is emphasized, from each according to its framework.

[10] The study will be focus on fifteen countries (i.e. N cross-sectional unit, $i = 1,...N,$) and twenty-two years (T time periods, $t = 1,...,T$) $T > N$, while N = 15 countries and T= 22 years period see Pesaran, Shin, & Smith, (1999, p 622).

Chapter 4 presented the methodology and data analysis of the study. The chapter is also divided into four sub-sections, starting from the research design, model specifications, estimation techniques, and data analysis.

Chapter 5 deliberates on empirical findings of the study. The chapter is divided into two sub-sections, first starting from the preliminary data analysis, which involved the statistical diagnostic tests and the panel unit-root tests. Secondly, the sub-section presented the empirical results of the study.

Lastly, chapter 6 concluded the study. The chapter is organized into seven sub-sections, starting with the introduction of the chapter. The second sub-section presented a summary of the thesis. The third sub-section presented a summary of the significant findings of the study. The fourth sub-section presented policy implications and recommendations of the study. The fifth sub-section presented the limitations of the study, while the sixth sub-section presented the recommendations for future studies. The seventh sub-section presented the conclusion of the study.

CHAPTER 2

OVERVIEW OF THE SELECTED COUNTRIES

2.1 Overview of the economy for 15 major oil-exporting SSA countries

This chapter focuses on presentations of the data on the fifteen 15 major oil-exporting economies in SSA, which incorporates the geography, demography, and a review of the economy of sectoral commitments to the growth, to each of its structures and areas of the economy. What is more, the section will likewise look at macroeconomic indicators of these fifteen major oil-producing countries in SSA. Notwithstanding, the exchange rate framework in these economies and its connections to the macroeconomic policy will diligently be discussed.

Figure 2.1. Map of Sub-Saharan Africa

Source: U.S Energy Information Administration (2013) EIA

Table 2-1 Ranking of crude-oil export across the 15 SSA countries

S/N		Crude oil-export (US$)	BB/day	Position
1	Nigeria	$35.6 billion	1.9 million	1st
2	Angola	$26.8 billion	1.5 million	2nd
3	Congo Republic	$3.91 billion	0.32 million	3th
4	Equatorial Guinea	$3.14 billion	0.23 million	4th
5	Gabon	$2.98 billion	0.21 million	5th
6	Ghana	$2.97 billion	59000	6th
7	Cameroon	$1.34 billion	81000	7th
8	South Africa	$1.16 billion	160000	8th
9	Chad	$0.98 billion	115000	9th
10	Sudan	$0.72 billion	97000	10th
11	Cote d'Ivoire	$0.50 billion	37000	11th
12	Congo Democratic Republic	$0.12 billion	20000	12th
13	Niger Republic	$0.096 billion	20000	13th
14	Malawi	$0.05 billion	200	14th
15	Zambia	$0.00 billion	174	15th

Sources: Author's compilation