

# Crude Oil Market Stocks and Dynamics of Exchange Rate Pass through Exporting African Countries

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## ABSTRACT

This paper investigated crude oil market shocks and dynamics of exchange rate pass through exporting Africa countries. Panel data of ten oil producing and exporting countries were collected from the world bank database and statistica.org websites. The data spanned between the period of 2011-2020. The variable of crude oil prices and exchange rate dynamics were tested for stationarity and equilibrium test using unit root and co integration techniques. Standard ARDL model estimation was used to estimate the short and long run effects of crude oil market shocks and dynamics of exchange rate pass through exporting Africa countries. The outcome showed that exchange rate-EXCR and the volatility of the crude oil price volatility-COP of the ten Sub Sahara crude oil producing Africa countries has short run effects and the long run relationship indicated the speed of adjustments of -0.8473 with statistical significance at 5% level. The model of ARDL is better at ARDL (2,2) for estimation. In addition, log exchange rates-DEXCR (-1), and log of oil price volatility-DCOP (-1) have positive impact on oil price volatility-COP. Log of exchange rates-DEXCR at raw value that is at level affected crude oil prices (COP) negatively. The paper concluded that exchange rates of crude oil exporting countries in Sub Sahara Africa countries reveals that log exchange rates-DEXCR (-1), and log of oil price volatility-DCOP (-1) have positive impact on oil price volatility-COP. Log of exchange rates-DEXCR at raw value that is at level affected crude oil prices (COP) negatively. Change in log exchange rates-DEXCR (-1), and log of oil price volatility-DCOP (-1) account for positive crude oil prices (COP) by 44.46% and 33.46% across the ten oil exporting African countries. Change in Log of exchange rates-DEXCR result in 32.95% decrease in crude oil prices (COP) of crude oil exporting countries Africa. Therefore, recommended that, monetary policy on exchange rate must be designed by the oil producing countries in Africa to enable better microeconomic performance for sustainable growth and development. Diversification of economy to tame the level of dependence on for ex to ensure development in Africa.

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**KEYWORDS:** Crude oil prices, exchange rate dynamics, shocks, volatility

## 1.1. Background of the Study

Crude oil is an important strategic energy for all countries in the world. It is an essential commodity that stimulate the development of modern industry and economy as it serves as an input into the production of goods and services in an economy. Moreover, movement in the price of crude oil has been regarded as the basis for a country's revenue structure and its balance of payment. Crude oil price is adjudged as the barometer of worldwide economy,

whose change has a direct impact on the health of an importing or exporting economy. Oil price shocks play a vital role in the macroeconomic performance of oil exporting developing countries, and exchange rate is one of the prominent macroeconomic indicators worthy of analysis in the oil price-effects framework. It is a stylized fact that the real exchange rate can be affected by oil prices through the term of trade and the terms of trade is affected through a

spending and a resource shift effects. This study focuses on crude oil market shocks and dynamics of exchange rate pass\_through exporting African countries.

### 1.2. Problem of the Study

Several empirical studies have examined the relationship between crude oil price shocks and economic growth in Africa. More so, there are only a handful of studies that investigate whether exchange rate regime and interest rate policy have a significant explanatory power of oil price implications on African oil producing economies. Meanwhile, economic theory reveals that in the presence of price stickiness, exchange rate regime and interest rate policy play a crucial role in the movement of international relative prices following global oil price shocks. As a result, this research work therefore contributes to the literatures by providing a more detailed assessment on crude oil market shocks and dynamics of exchange rate pass\_through exporting African countries.

### 1.3. Research Questions

To achieve the main objective of this paper, the following research questions are to be answered by the study:

1. What are the pattern of crude oil market prices and exchange rate of exporting Africa countries?
2. To what extent are crude oil prices and exchange rate dynamics of exporting African countries stationarity?
3. Is there order of co integration effect of dynamics of exchange rate and crude oil prices in exporting Africa countries?
4. Does the dynamics of exchange rate pass\_through has short run and long run effects on crude oil market shocks of exporting African countries?

### 1.4. Objectives of the Study

The objective of this study is to crude oil market shocks and dynamics of exchange rate pass\_through exporting African countries. The specific objectives are to:

1. examine the pattern of crude oil market shocks among exporting Africa countries
2. investigate the pattern of exchange rate among exporting Africa countries
3. find out the stationarity of crude oil prices and exchange rate dynamics of exporting African countries
4. evaluate the co integrating effect of dynamics of exchange rate on crude oil prices in exporting Africa countries
5. carry out short run and long run effects of crude oil market shocks and dynamics of exchange rate pass\_through exporting African countries

### 1.5. Statement of Hypotheses

To provide answer to the questions raise by the study, the following hypothetical statements are made in line with the specific objectives of the study:

1. Ho: there is no unit root in crude oil market shocks and dynamics of exchange rate among exporting Africa countries
2. Ho: there is no co integration between crude oil market shocks and exchange rate dynamics of exporting African countries
3. Ho: there is no significant effect of exchange rate dynamics on crude oil prices in exporting Africa countries
4. Ho: there is no short run and long run effects of dynamics of exchange rate on crude oil market shocks exporting African countries

### 1.6. Significant of the Study

The study is useful to policy makers in the oil dominated economies to find a stable financial policy that can encourage oil price and exchange rate stability of exporting countries in Africa. The study is expected to serve as policy direction to global realities of diversification of economy rather than mono-economy dependence in Africa.

### 1.7. Organisation of the Study

The paper is divided into five sections. Section one focuses on the background of the study. Section two deals with the review of related literatures. Section three discusses the methodology of objective of this study is to investigate the effects of exchange rate of oil exporting countries in Africa on crude oil price shocks. Section four present the relevant data and analysis and section five summarises findings, conclusion and states the policy implication of the study.

## 2. LITERATURE REVIEW

### 2.1. Conceptual Review

It is common knowledge that Nigeria is Africa's largest economy and a major exporter of crude oil. In addition, there are other oil exporting countries like Ghana, Equatorial Guinea, Chad, Sudan, Egypt, Libya, Algeria, Congo among top ten oil producing countries in Africa. Irrespective of the shifting trend to other alternative sources of energy, she is still highly dependent on crude oil export and exposed to the world trade cycle which has attendant consequences on exchange rate passing through exporting capacity and gross domestic product outlooks of the countries in the global competitive market. The emergence of COVID-19 and its increasing incidence in Africa continent and the rest of the world have made different economies implement recommended measures such as social distancing, staying and working from home; tighter

border controls; reduction in international flights and so on to curtail the spread of the disease. The lockdown of economies worldwide has generally created a low demand for aviation fuel, transport fuels and other oil related products. These have invariably affected crude oil prices negatively in oil exporting countries in Africa. Nations especially the oil producing and exporting countries in Africa including Nigeria are still grappling with the pandemic and the challenges posed by the scourge.

## 2.2. Theoretical literature

Changes in oil prices are due to two factors. The demand-pull and the supply-push factors. The changes in oil prices due to increase in demand are said to bring about wealth transfer effect in oil exporting economies and inflation effect in oil importing economies. Whereas, changes in oil prices due to positive changes in supply of the commodity translate to supply side shock effects. Tang et al. (2010) classified all the transmission channels into six: output effect; wealth transfer effect; inflation effect; real balance effect; sector adjustment effect and unexpected effect. These channels have been the centre of attraction in modern times and this study focused on the inflation effect. The macroeconomic performance of Africa's oil-producing countries has been strongly associated with the oil sector, connoting that the continent's economy is vulnerable to crude oil price shocks. The price of oil, for instance, fell from a peak of \$105 per barrel in 2014 to as low as \$37 per barrel in 2016, primarily as a result of the lifting of international sanctions against Iran. Theoretically, changes in oil prices in an oil importing country, is bound to affect consumer prices. This will have a ripple effect on consumption and thus, affect aggregate demand. From an oil exporting country, this effect will lead to changes in government revenue and the Pass-Through of Crude-oil Price Shocks to Consumer Prices in Nigeria: Pre and Post 2008 Global Financial Crisis. Otoakhia appreciation/depreciation of exchange rate via changes in external reserves. In addition, oil prices are indeed very volatile. A further effect of this volatility is the increase in uncertainties ascribed to frequent changes in oil prices in the international market. This hampers both foreign and domestic investor confidence. Adetona and Mojeed (2020) investigated exchange rate regimes and interest rate policy as a significant explanatory power of oil price implications on African oil producing economies.

## 2.3. Empirical Review

Bhattacharya and Bhattacharyya (2001) dissect the impact of oil price on inflation two phases. In the first phase, oil price shock automatically creates inflation effects due to hoarding of commodities. This phase

holds when oil price shock creates inflation uncertainty. In phase two, the oil price increases the Mathew and Harold (2017) applied Panel Structural Vector Autoregressives (P-SVAR) estimating technique to investigate the processes of oil price shocks transmission and its impacts on economic performance based on monetary framework of the Africa's net oil exporting economies. In examining the objective of the study (Mathew and Harold, 2017) used inflation, money supply, bank rate, exchange rate, gross domestic product, unemployment and oil price shocks variables as exogenous and endogenous variables. Longitudinal span period of 1980-2015 data sets was used and the results indicated significant responses to oil price shocks during this period was recorded on the large scale. Oil price shocks impacted greatly on the Africa's oil exporting countries economic performance and transmission of oil price supervenes monetary medium. Mathew and Harold (2017) recommended strong monetary control measures to encourage positive shocks in oil to be experienced in Africa. In Hakan, Nildag, and Nukhet (2010) research papers on the impact of oil price shocks on the Economic Growth of Selected MENA Countries published in The Energy journal suggested the the possibility of exporters and importers of oil commodity has small effect on oil prices rather than individual country. The findings showed that, there is significant and positive increase oil prices on the output of exporting countries such as Algeria, Iran, Iraq, Kuwait, Libya, Oman, Qatar, Syria and United Arab Emirates. However, no significant impact of oil price increase was felt on output among exporting countries of Egypt, Israel, Bahrain, Jordan and Tunisia. Hakan, Nildag, and Nukhet (2010) confirmed that oil supply shocks indicated lower output growth but impacted positively on the positive output of oil demand shocks.

World Development Indicators data based on the World Bank and International Monetary Fund (World Economic Outlook) was used for the data analysis. Adetona and Mojeed (2020) adopted four interacting variables and the estimation was carried out using Structural Vector Autoregressive (SVAR) model. The results of SVAR impulse response functions confirmed that exchange rate regime was not better or worse for African oil producing countries in line with the costs and benefits analysis associated with the major three exchange rate regimes considered in the study. The study further revealed that insulation against and compensating for the significant negative shocks effect of the global oil price in the selected oil producing countries in Africa suggested more effective in evaluation of expansionary monetary policy in Africa. Studies of Hamilton (2008), Kilian

(2009) and Kim and Roubini (2000) further pointed out that output may necessarily not decline following negative oil price shock if the oil-producing country experienced economic diversification with efficient local refining capacity to reduce pressure on importation capable of averting the oil producing African countries' currencies from depreciating which further encourages inflation and underdevelopments present in Africa today.

Obi, Awujola and Ogwuche (2016) studies were based on Nigeria as a mono-product economy having crude oil as exporting commodity such that changes in oil prices has implications for the growth of the economy and exchange rate movements. The study examined the effects of oil price shock on macroeconomic performance in Nigeria using yearly data from the year 1979 to 2014. Unrestricted Vector Auto Regression model by Sims (1980) was adopted to models the variables and estimates the relationship between oil price changes, inflation rate, Gross Domestic Product and real exchange rate. The findings revealed that Unit root tests, Johansen co-integration technique, variance decomposition test, gran variables have both short run to long run dynamics. Change in oil price resulted in proportionate increase in real exchange rate, interest rate and Gross Domestic Product in Nigeria. The authors recommended that Nigeria government should key into diversify from the Oil sector to other sectors of the economy as oil prices do not significantly influence economic growth in Nigeria.

Eric Otoakhia (2020) investigates the responses of consumer price index (CPI) to crude oil price shocks in the pre and post-2008 global financial crisis. The study applied estimation technique of Structural Vector Autoregressive model to analyse monthly data from 2000M01 to 2019M12. Results showed that for pre and post-crisis periods, oil price shocks have a positive impact on CPI but insignificant to direct momentary increase in pre-crisis CPI before disintegrating. Post crisis CPI response tends experienced more stable and long-lasting starting from the third month. In addition, post crisis oil price shock did not inform significant channel price instability creation in Nigeria after the crisis and this study recommend partial energy price deregulation and must be maintained. Finally, Eric Otoakhia (2020) advocates implementation of oil price–inflation pass-through, external shocks like financial crisis that the findings accounted for.

Adeleke, Harold and Adebayo (2019) investigates the influence of crude oil price shocks on the macroeconomic performance of Africa's oil-producing countries. Adeleke et al (2019) used oil

producing and exporting countries in Africa like Nigeria, Egypt, Angola, Algeria, Gabon, Equatorial Guinea and Congo Republic to analyse the anticipated impact between 1980 and 2016 spanning through most boom and bust movements in crude oil prices globally. Adeleke et al (2019) compared price of oil in each quarter with the maximum value observed during the preceding four quarters to evaluate the sharp increases and declines in oil prices to monitor oil price shocks. Popular Panel Structural Vector Auto-Regression (P-SVAR) model results showed the reaction of output to sharp increases and declines in oil prices differ significantly at 5% level. Significant structural inflation complements sharp declines in oil prices more than monetary inflation as investment and outputs in crude oil production decreased significantly.

Simeon and Stephen (2013) examined the macroeconomic implications of symmetric and asymmetric oil price and oil revenue shocks in Nigeria based on the Vector Autoregressive (VAR) estimation technique. The results indicated that, both positive and negative oil price shocks have impact on real government expenditure in the long run but not significant in the short run. External reserves reveal positive and negative oil price and oil revenue shocks in Nigeria therefore revealing stronger implications for expenditure in the long run, and therefore triggering inflationary pressure and domestic currency depreciation as importation rises. This implies that the country exhibits the Dutch disease syndrome in the short and long run. The study suggested need for proper coordination of fiscal and monetary policy for sustainable macroeconomic stability in Nigeria to be achieved.

Ama (2019) study oil price shocks effects on interest rate, real GDP and real effective exchange rate in Nigeria using a vector autoregressive (VAR) model. The findings showed that positive oil price shocks have no effect on the interest rate (monetary policy), real exchange rate and real GDP using impulse response function. The finding of Ama (2019) revealed that monetary policy in Nigeria does not respond to oil price shocks in the long run. In addition, the study confirmed that oil price shocks explain a small percentage of the forecast error variance of the variables under consideration using impulse response functions and variance decomposition analysis. This study reviews findings of empirical research works with varying methodological approaches and discussion of different findings. It differs from those in the existing literature by shifting focus from the microeconomic variables on crude oil prices from oil exporting

countries to crude oil market shocks and the dynamics of exchange rates pass through African oil exporting countries to examine the relationship between oil price shocks and economic performance within the framework of the monetary policy transmission process. The study also provides another view point in oil price shocks-economic performance relationship through the methodology employed in the study which to the best of our knowledge it has not been employed in any study relating to oil price shocks. In addition, our study deviates from the study of Kutu and Ngalawa (2016) by differencing its variables. In view of this, the study aims to contribute to energy literature in such a way as to emphasize the relationship between oil price shocks and economic performance within the context of the oil exporting developing economies in Africa.

### Gap in Literature

There has not been any study that attempts to isolate the study of crude oil market shocks on exchange rate dynamics in exporting African countries. Therefore, this study improves the existing literatures on crude oil prices and other microeconomic variables by investigating the crude oil market shocks pass through dynamics of exchange rate among ten exporting Africa countries.

## 3. METHODOLOGY

### 3.1. Theoretical Framework

This study is based on the modification and adoption of Kutu and Ngalawa (2016) who employed econometric approaches of non-linear panel data analysis-combine cross-sectional data. Eric Otoakhia (2020) investigates the responses of consumer price index (CPI) to crude oil price shocks in the pre and post-2008 global financial crisis. Hsiao and Yanan (2006) identified several merits of panel data analysis over cross-section or time series analysis. Adeleke, Harold and Adebayo (2019) investigates the influence of crude oil price shocks on the macroeconomic performance of Africa's oil-producing countries. Based on the data collection, panel data was obtained on crude oil price volatility and exchange rates of oil

## 4. DATA PRESENTATION AND ANALYSIS

### 4.1. Data analysis

The data collection across ten Sub Sahara African countries-Ghana, Equatorial Guinea, Gabon, Sudan, Egypt, Chad, Libya, Algeria, Congo and Nigeria were test based on stationarity, panel co integration test, fail in nonlinear panel ARDL despite the add in NARDL on the E-views package because of singularity problem of the data set cannot be applied. The results were shown in table

### 4.2. Descriptive Statistics Results

The table 4.2 summarises the descriptive analysis of crude oil market shocks and dynamics of exchange rate in exporting Africa countries -Ghana, Equatorial Guinea, Gabon, Sudan, Egypt, Chad, Libya, Algeria, Congo and Nigeria.

exporting countries with export and GDP of the ten countries under review. Considering the nature of Non-linear ARDL model to perform Monte Carlos Simulation, panel quarterly data set is appropriate. However, in this available data set for estimating external reserves holding is annual panel data set, non-linear panel data (ARDL) cannot be applied because of singularity problem and no threshold.

### 3.2. Model Specification

Model for examining the crude oil prices shocks in ten Sub Sahara Africa countries was developed as functions of exchange rates, GDP and export. Therefore, the model for this study is specified as follows;

$$COP = f(EXCR) \quad (1)$$

Where

*COP* = Crude oil prices

*EXR* = exchange rate

The explicit form of equation 1 is represented as follows:

$$COP_t = \alpha_0 + \alpha_1 EXCR_t + \alpha_2 EXCR(-1) + \alpha_3 COP(-1) + \varepsilon_{t-1} \quad (2)$$

The operational model for estimated is specified in natural logarithmic transform to take care of dimensionless of variables unit of measurement and to linearized the variable functions.

### 3.3. Data Estimation

This study used econometric tools for four stage analysis of the variables of panel data. Stage one evaluated the descriptive statistics of the variables. The second stage of estimation applied unit root test of stationarity. The third stage examined the co integration test. Short and long run of ARDL and NARDL models made up the last stage of estimation. The research adopted E-views econometric package for the estimation process and results presented in tables.

### 3.4. Data Source

Data used in the estimation were sourced from <https://tradingeconomics.com> and <https://tradingeconomics.com/commodity/brent-crude-oil#> covering the period of 2011 to 2020.

	COP	EXCR
Mean	446.31	135.63
Median	185.00	116.45
Maximum	1429.0	384.50
Minimum	14.00	49.00
Std. Dev.	464.30	62.459
Skewness	0.894	1.341
Kurtosis	2.2524	5.3731
Jarque-Bera	15.647	53.452
Probability	0.00040	0.000
Observations	100	100

Source: E-views 10.0 Extracts

### 4.3. Unit Root Test of Stationarity of Variables

**Table 4.3 Panel Unit Root Test Results**

Variables	Order	Breitung- test	P-value	Decision: P<0.05	Conclusion
COP	I(0)	-6.5389	0.0000	No unit root	Stationary
EXCR	I(2)	-1.8817	0.0299	No unit root	Stationary

Source: E-views 10.0 Extracts

Test of presence or absence of unit root of the variables of Africa oil exporting countries. The variables of crude oil volatility-COP was stationary at level, I(0).but exchange rate of the exporting countries of crude oil in Sub Sahara Africa -EXCR is stationary at order 2, (2) as the variable was significant at 5% as the respective probabilities were less than 0.05 at 5% level. The finding suggested that, there is possibility of ARDL Panel Estimation between crude oil prices volatility and exchange rates.

### 4.4. Test of Panel Co integration of Variables

The results of the co integration test of the panel variables were shown in table 4.4.

**Table 4.4: Co integrating variables**

Pedroni Residual Cointegration Test				
Series: COP EXCR				
Date: 10/06/21 Time: 12:10				
Sample: 2011 2020				
Included observations: 100				
Cross-sections included: 10				
Null Hypothesis: No cointegration				
Trend assumption: No deterministic trend				
User-specified lag length: 1				
Newey-West automatic bandwidth selection and Bartlett kernel				
Alternative hypothesis: common AR coefs. ("within-dimension")				
			Weighted	
	Statistic	Prob.	Statistic	Prob.
Panel v-Statistic	-1.530601	0.9371	-1.688152	0.9543
Panel rho-Statistic	-4.057549	0.0000	-3.922822	0.0000
Panel PP-Statistic	-11.56170	0.0000	-11.55999	0.0000
Panel ADF-Statistic	-4.575837	0.0000	-4.665389	0.0000
Alternative hypothesis: individual AR coefs. (between-dimension)				
	Statistic	Prob.		
Group rho-Statistic	-2.141361	0.0161		
Group PP-Statistic	-13.89247	0.0000		
Group ADF-Statistic	-4.416931	0.0000		
Cross section specific results				
Phillips-Peron results (non-parametric)				

Source: E-views 10.0 Extracts

In table 4.3, the trace weighted statistic, of Pedroni Residual Co integration test, reveal that there is co integration between crude oil prices volatility and exchange rates of ten selected Sub Sahara Africa countries exporting oil, hence  $H_0$  was not rejected in favour of the alternative hypotheses at 5 per cent since the probability value exceeded the critical values at the 0.05 level of the panel co integrating test statistic criteria. This implies that there is long-run equilibrium relationship among the variables of crude oil prices volatility and exchange rates of ten selected Sub Sahara Africa countries exporting oil within the study periods.

#### 4.5. ARDL Model Estimate of Short run Results

Dependent Variable: D(COP)				
Method: ARDL				
Date: 10/06/21 Time: 12:03				
Sample: 2013 2020				
Included observations: 80				
Maximum dependent lags: 2 (Automatic selection)				
Model selection method: Akaike info criterion (AIC)				
Dynamic regressors (2 lags, automatic): EXCR				
Fixed regressors: C				
Number of models evaluated: 4				
Selected Model: ARDL(2, 2)				
Note: final equation sample is larger than selection sample				
Variable	Coefficient	Std. Error	t-Statistic	Prob.*
Short Run Equation				
COINTEQ01	-2.084340	0.240685	-8.660024	0.0000
D(COP(-1))	0.334600	0.191324	1.748868	0.0866
D(EXCR)	-0.329539	0.821610	-0.401089	0.6901
D(EXCR(-1))	0.446281	1.601498	0.278665	0.7817
C	1299.849	128.6286	10.10544	0.0000
Mean dependent var	0.962500	S.D. dependent var	877.8927	
S.E. of regression	334.8794	Akaike info criterion	12.16664	
Sum squared resid	5495065.	Schwarz criterion	13.49527	
Log likelihood	-557.3318	Hannan-Quinn criter.	12.70436	
*Note: p-values and any subsequent tests do not account for model selection				

Source: E-views 10.0 Extracts

In the ARDL model of estimating exchange rates of crude oil exporting countries in Sub Sahara Africa countries shows that at previous lag 1, (-1), log exchange rates-DEXCR (-1), and log of oil price volatility-DCOP (-1) have positive impact on oil price volatility-COP. A unit change in log exchange rates-DEXCR (-1), and log of oil price volatility-DCOP (-1) accounts for positive crude oil prices (COP) by 0.4446(44.46%) and 0.3346 (33.46%) across the ten oil exporting African countries between 2011-2020. Log of exchange rates-DEXCR at raw value that is at level affected crude oil prices (COP) negatively. Change in Log of exchange rates-DEXCR result in 0.3295 (32.95%) decrease in crude oil prices (COP) as function of crude oil exporting countries Africa.

Test of short run of ARDL indicated that coefficient COINTEQ01 has negative value and it is statistically significant at 5%. This implies that there is short run effect of previous and present values of exchange rate (-1) and exchange rate on crude oil prices in the present (COP) and previous (COP(-1)) years among the exporting countries in Africa.

#### 4.6. ARDL Model Estimate of Long run Results

Dependent Variable: D(COP)				
Method: ARDL				
Date: 10/06/21 Time: 12:03				
Sample: 2013 2020				
Included observations: 80				
Maximum dependent lags: 2 (Automatic selection)				
Model selection method: Akaike info criterion (AIC)				
Dynamic regressors (2 lags, automatic): EXCR				
Fixed regressors: C				
Number of models evaluated: 4				
Selected Model: ARDL(2, 2)				
Note: final equation sample is larger than selection sample				
Variable	Coefficient	Std. Error	t-Statistic	Prob.*
Long Run Equation				
EXCR	-0.847333	0.412997	-2.051671	0.0456
*Note: p-values and any subsequent tests do not account for model selection				

Source: E-views 10.0 Extracts

The variables of exchange rate-EXCR of the ten Sub Sahara crude oil producing Africa countries has long run relationship with the crude oil price volatility-COP as the value of the speed of adjustment is -0.8473 with probability of 0.045 less than 0.05 at 5% level. The model of ARDL is better at ARDL (2,2) for estimation.

#### 5. SUMMARY OF FINDINGS, POLICY IMPLICATION AND CONCLUSION

##### 5.1. Summary of Findings

The study exchange rate on the shock of crude oil price volatility of ten selected export Africa countries from 2011 to 2020 suggested that variables of exchange rate-EXCR and the volatility of the crude oil price volatility-COP of the ten Sub Sahara crude oil producing Africa countries has long run relationship as the value of the speed of adjustment is -0.8473 with probability of 0.045 less than 0.05 at 5% level. However, in the short run relationship exchange rate is not co integrated with oil price volatility. The model of ARDL is better at ARDL (2,2) for estimation.

The findings of this study confirm that exchange significantly impacted crude oil price volatility in African oil exporting countries. This study empirical findings of Obi, Awujola and Ogwuche (2016) studies were based on Nigeria as a mono-product economy having crude oil as exporting commodity such that changes in oil prices has implications for the growth of the economy and exchange rate movements.

The findings revealed that Unit root tests, Johansen co-integration technique, variance decomposition test, gran variables have both short run to long run dynamics. Change in oil price resulted in proportionate increase in real exchange rate, interest rate and Gross Domestic Product in Nigeria. The findings are in tune with the research output of

Mathew and Harold (2017) that suggested monetary control measures to encourage positive shocks in oil to be experienced in Africa. More, Hakan, Nildag, and Nukhet (2010) study on oil supply shocks indicating lower output growth but impacted positively on the positive output of oil demand shocks collaborated this study.

##### 5.2. Conclusion

The study suggested that exchange rates of crude oil exporting countries in Sub Sahara Africa countries reveals that log exchange rates-DEXCR (-1), and log of oil price volatility-DCOP (-1) have positive impact on oil price volatility-COP. Log of exchange rates-DEXCR at raw value that is at level affected crude oil prices (COP) negatively. Change in log exchange rates-DEXCR (-1), and log of oil price volatility-DCOP (-1) account for positive crude oil prices (COP) by 44.46% and 33.46% across the ten oil exporting African countries. Change in Log of exchange rates-DEXCR result in 32.95% decrease in crude oil prices (COP) of crude oil exporting countries Africa.

##### 5.3. Policy Implications

The economic policy implication of this study suggests that monetary policy on exchange rate must be designed by the oil producing countries in Africa to enable better microeconomic performance for sustainable growth and development. Diversification of economy to tame the level of dependence on forex to ensure development in Africa.



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