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EXPLORING THE INFLATIONARY EFFECT OF OIL PRICE VOLATILITY IN AFRICA'S OIL EXPORTING COUNTRIES

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Abstract. *A range of explanations had been offered for the apparent change in oil price-inflation relationship outcomes ranging from the possible use of alternate energy sources, change in the structure of output regarding fewer oil intensive sectors and the role of fiscal and monetary in the affected oil-exporting countries. These changes had drawn the attention of stakeholders, government and the society at large to the anecdotal relationship among oil price volatility, inflation, and output in Africa oil-exporting countries. This study leans empirical credence to the impact of oil price volatility on inflation and economic performance in the Africa oil-exporting countries from 1995 through 2017. We employed the Pool Mean Group estimation procedure with the inference drawn at a 5% level of significance. We found that oil price volatility had a negative and significant effect on inflation in Africa oil-exporting countries. The study concluded that oil price volatility had a substantial impact on inflation in the Africa oil-exporting countries. The study, therefore, recommended that Africa oil-exporting countries should adopt precautionary measures to monitor inflation potentials due to different responses of inflation to positive and negative oil price shocks.*

Key words*: Oil Price Volatility; Inflation; Growth Outcomes; Pool Mean Group; Africa.*

JEL Classification: C33, O55, Q41

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1. INTRODUCTION

The significance of crude oil and its resulting volatilities of prices have been studied expansively since the oil price fluctuations of 1973 and 1979, the Yom Kippur war and the Iran Crisis, amongst others. The significant changes in the oil prices from the first quarter of 1975 to the fourth quarter of 2016 revealed some striking features in the global economies. In the 1970s, economies around the world witnessed growing inflation rates that were subsequently ensured by a rapid increase in global oil prices (Mohaddes & Pesaran, 2017). In contrast to the 1970s experiences, a downward trend of oil prices and inflation was witnessed in 1980s and 1990s, respectively, and further attributed to dwindling oil prices in global markets (Hamilton, 1996). In the 2000s, oil prices steadily increased with sharp thwart in 2008, followed by a substantial decrease in 2009 and remained throughout the fourth quarter of 2014, and rebound after that (Bala, Chin, Kaliappan & Ismail, 2017). Prominent volatility of price in these developments and thereafter will deepen the understanding of all economic agents, namely government, firms and households on the sizeable effects of oil price volatility on inflation in both oil-exporting and importing economies (Shafiee & Topal, 2010).

Theoretically, oil price volatility should affect oil importing and exporting countries differently at microeconomic and macroeconomic levels (Mohaddes & Pesaran, 2017). For oil-importing countries, at the macro level, the decrease in oil prices should support robust growth, reduce inflation, and expand fiscal stabilities, which should mitigate macroeconomic weaknesses and, consequently, broaden policy scope. Conversely, increases in oil prices reduce active household income in various ways. Firstly, households pay more for energy-intensive products they consume directly (Zhang, Broadstock, & Cao, 2014). Secondly, an increase in oil prices intensifies the prices of all goods and services that use fossil fuels and the associative by-product of crude for domestic purposes (Elder & Serletis, 2010). Higher oil prices reduce the growth rate of GDP and consequently reduce the household income (Ahmed, Bhutto & Kalhoro, 2018).

For Africa's oil-exporting countries within the OPEC, oil price volatilities have exerted enormous consequences on their economies due to over-reliance on oil earnings as their primary source of revenue. Raising oil prices generates a supplementary income for oil-producing economies which can be used to develop infrastructure or diversify the local economy and subsequent investment in the foreign economies (Omojolaibi, 2013). Conversely, the rising oil prices not only hinder output growth but also ignite the overall rise in the price level in the economy due to the significance of oil as a respective input for the production (Kilian, 2014). An increase in input costs would compel a further rise in the cost of final products. A slight increase in oil prices compels carrying a charge and other allied fees of piloting economic activities to increase, which are eventually borne by final consumers (Salisu, Isah, Oyewole & Akanni, 2017). This perception mostly induces both firms and households to lessen their consumptions and investments. Hence, how much variations in the consumer price index can be credited to oil price volatility? Which structural policy frameworks govern the size of the inflationary effect of oil price volatility? Forms significant policy and research questions if we are serious about redefining the scope of oil price stability and associative welfare implications that are usually threatened by the inflationary factor.

It is challenging that most of the recent studies on the impact of oil price volatility on inflationary effect have mainly focused on developed countries, oil-importing countries and country-specific without considering Africa's group of OPEC's oil-exporting countries despite

their growing importance in oil consumption arena. Selected Africa's oil-exporting countries, namely Nigeria, Angola, Gabon, Libya and Algeria control 6.95% and 6.46% of the global oil production and the world's oil reserves respectively (OPEC, 2016). These countries are not only oil-exporting nations, but they also engage in the importation of petroleum products which might be attributed to low national oil production, environmental factors and national oil reserve. Besides, for more than a decade now, both oil-exporting and importing countries in Africa have been experiencing macroeconomic instabilities of remarkable magnitude (Bashiri Behmiri & Pires Manso, 2013; Chironga, Leke, van Wamelen, & Lund, 2011; Ordway, Naylor, Nkongho, & Lambin, 2017). An indispensable feature described by sizeable fiscal disparity, inflation, recession, weakening output, increasing unemployment and alarming weakening characterises Africa's oil-exporting OPEC member countries (George, 2012).

This study is significant for two reasons. First, it examines the dynamic relationship between oil price volatility and inflation in a group of countries that possesses about 8.82% of the world's proven oil reserves in 2017 (OPEC, 2018). With their vast oil reserves, Africa's oil-exporting countries within the OPEC have become significant players in the global oil market. Secondly, oil is a crucial input factor in production, and a primary driver of economic performance in the majority of OPEC member's countries as their government revenues and Gross Domestic Product (GDP) depend heavily on oil revenues. It then becomes apt to appropriate data and methodology to lean experimental proof to the underlying structural relationship between oil price volatility and inflation in Africa's oil-exporting countries that are members of OPEC. The study attempts to explain the fundamental dynamics of the oil-price-inflation nexus in Africa with a view of coming up with crucial policy implications and for research purposes.

2. LITERATURE REVIEW

Sequel to the empirical work of Hamilton (1983) on examination of the effects of oil price changes on economic activities, the author resolves that oil price uncertainty has a sizeable impact on the U.S economy following World War II. However, Hamilton's empirical results have been subjected to empirical confirmation by several subsequent studies (Mork, 1989; Hooker, 1996 and Mork, Olsen, & Mysen, 1994), thereby renewing the examination of the effects of oil price fluctuations on diverse economic variables with a given country or other. For instance, Cuestas and Gil-Alana (2018) investigate the impact of oil price movements on unemployment in Central and Eastern Europe. Wei and Guo (2016) examine the implications of oil price shocks on China's stock market. Allegret, Couharde and Coulibaly (2014) investigate the effects of oil price fluctuations on the current account position for 27 selected oil-exporting countries. In another study, Nusair (2016) examines the impacts of oil price shocks on the real GDP of the Gulf Cooperation Council (GCC) countries through nonlinear ARDL model. The authors report evidence of asymmetries in all the samples or groups. Contrastingly, Tang, Wu, and Zhang (2010) employ a structural vector autoregressive (SVAR) model on a study on China and affirm that an oil price increase negatively influenced investment and output, and positively influenced inflation rate and interest rate respectively. Álvarez, Hurtado, Sánchez and Thomas (2011) examine the impact of oil price fluctuations on consumer price inflation in Spain and the euro area and resolve that the inflationary impact of oil price increases in both economies is

negligible. The authors report that the 10 percent changes in oil prices are linked to averages 0.2 percent points of consumer price inflation shifts in both Spain and the euro area, which is a relatively small number.

Given the oil price-inflation relationship, extant literature predominately focuses on developed and developing countries with almost no studies on Africa's oil-exporting countries. For example, using the nonlinear ARDL model, Lacheheb and Sirag (2019) suggest that oil price increases have a positive and significant effect on inflation in Algeria, but insignificant falling oil prices. Lorusso and Pieroni (2018) resolve that U.K. inflation increases in response to adverse oil supply shocks. Utilising symmetric and asymmetric panel ARDL models, Salisu *et al.* (2017) report a significant long-run and positive influence on inflation as induced by variations in oil price in selected oil-exporting and oil-importing countries. There exist mixed results for the short-run effect. They also find that the cost of oil has a more significant impact on inflation in the long-run in net oil-importing countries than in net oil-exporting countries and that oil price asymmetries are more critical for oil-exporting countries. Kun (2017) explored the effects of oil prices fluctuations on Malaysia's domestic price inflation at disaggregated levels using both linear and nonlinear autoregressive distributed lag (ARDL) techniques. The author provides evidence of symmetric and asymmetric pass-through effects of oil price changes on domestic prices across sectors. Oil price changes lead to the positive impact of higher output growth but may directly cause higher import and production prices in the long run through cost channels. On the other hand, oil price changes have a limited direct effect on consumer prices in the long term. The impact of oil prices on consumer prices occurs indirectly through transmission from import prices and production costs.

Bala *et al.* (2017) report a positive relationship between the oil prices and inflation in an autoregressive distributed lag (ARDL) of the model of Malaysia. While Artami and Hara (2018) analyse the asymmetric impact of oil price fluctuations on the economic growth of and inflation in Indonesia through the vector autoregressive (VAR) estimation model spanning from the first quarter of 1990 to the fourth quarter of 2016. The authors resolve that oil price-growth relationship is asymmetric. The resultant implications of favourable and unfavourable fluctuations of oil prices are established to be not statistically significant to inflation. In order to investigate the long-run effect of oil exports and food output on inflation in OPEC member countries in Africa, Bala and Chin (2018) explore the ARDL model. The models gauge oil price-inflation relationship and reveal there is a negative relationship between the index of food production and inflation, indicating that a rise in food supply decreases the rate of inflation. The results also show that oil exports have a significant positive impact on inflation. Also, Choi, Furceri, Loungani, Mishra and Poplawski-Ribeiro (2018) consider the impact of oil price fluctuations on domestic inflation of selected developed and developing economies over the period from January 1970 to December 2015. The authors report that an increase in oil inflation by ten percent would initiate about 0.4 percent increases in domestic inflation in both developed and developing countries. They also report a case of asymmetric, suggesting that positive oil price shocks are having a more substantial effect than adverse oil price shocks. They resolve that such results have declined over time due to a credible monetary policy put in place and less reliance on energy imports by the domestic economy.

In selected Central and Eastern European countries, Živkov, Đurašković, and Papić-Blagojević (2020) examine the effect of oil price fluctuations on the consumer price. The authors explore a Markov wavelet-based switching technique to split different time

horizons between the impacts. The findings show that in Central and Eastern European countries, the transmission of oil price increases to inflation is relatively low to about 1–6 percent points as an oil price increase to 100 percent. However, the findings show that exchange rates are not a significant factor in the transmission of oil shocks to inflation, even when high depreciation occurs. By and large, one can conclude that, despite the vast literature related to inflation and oil price volatility, there is no shared consensus. There are few studies in oil-exporting nations, but such studies are carried out majorly when the oil price was increasing and before the global financial crisis of 2008. Studies that integrated the crisis and boom periods to examine both symmetric and asymmetric effects on output growth and overall price level are almost non-existent in the literature.

3. DATA AND METHODOLOGY

3.1. Data

The dataset explored to estimate the models were sourced from the World Development Indicators (WDI), International Monetary Fund's International Financial Statistics (IFS) database, while oil price data were obtained from OPEC (2018) Annual statistical bulletin. The variables considered in this study included the Consumer Price Index (CPI), real Gross Domestic Product (GDP) growth rate, oil prices, and government final consumption expenditure and, the data used in the study were quarterly, covering a period from 1995 to 2017. This data included the periods of the global food crisis and the recession of 2008 to 2009 because the macroeconomic performances of mostly all the economies were affected and this brought about significant volatility in macroeconomic indicators and oil prices. The choice of the macroeconomic variables was based on the submission of Hooker (1996). Real GDP as a measure of growth outcomes agrees with the exact standard measure in the literature (see Cunado *et al.*, 2015; Akinleye & Ekpo, 2013; Iwayemi & Fowowe, 2011; Hooker, 1996 for examples). Thus, the import from the previous empirical studies on oil prices and economic activities revealed that two different features ranging from the approach at which oil prices are used at their levels and employs various volatility measures to capture the oil price uncertainty. These two methods differ in the way in which they integrate oil price into their models. In divergence to the vast number of studies that examine the impact of oil price shocks, this study investigated the effect of oil price volatility on inflation by considering realised volatility. The realised oil price volatility (R.V.) was chosen following Rafiq and Salim (2014) as the oil price volatility index in the study. Realised volatility is based on the idea of using the sum of squared intraday returns to generate more accurate daily volatility measures. According to Andersen and Bollerslev (1998), the daily realised volatility is estimated as the sum of squared intraday returns. It is viewed as an alternative measure of volatility due to an unbiased and highly efficient estimator of the volatility of returns, as reported in Barndorff-Nielsen and Shepherd (2002).

3.2. Methodology

A fundamental assumption is that the economic responses to oil price volatility can be explained using both supply and demand channels. We illuminated the diverse impact of the oil price volatility and inflation in the period of review for selected Africa's oil-exporting countries within OPEC. The study panel sample has five (5) countries and 23

years, and so has more years than cross-sample observation; some of the variables were stationary at a level while others at the first difference I(1). Given this, the most appropriate model is the Pool Mean Group Autoregressive Distributed Lag (ARDL) model proposed by Pesaran, Shin and Smith (1999). According to the authors, the superiority of the ARDL model over dynamic panel models relies on the ability to produce consistent estimates and ability to produce country-specific results. A dynamic heterogeneous panel regression was written by using ARDL (p, q) approach where 'p' is the lags of the dependent variable and 'q' is the lags of the independent variables (Pesaran *et al.*, 1999). The model estimated has the form of an ARDL (p, q…q) as:

$$CPI_{it} = \sum_{j}^{p} =_1 \propto_{ij} CPI_{i,t-j} + \sum_{j}^{q} =_0 \gamma_{ij}{}' X_{i,t-j_1} + \mu_t + \varepsilon_{it} \quad (1)$$

where X represents the vector of explanatory variables. Modifying equation (1) turns to:

$$\Delta CPI_{it} = \varphi_i\left(CPI_{i,t-1} - \beta_i' X_{it}\right) + \sum_{j=1}^{p-1} \propto *_{ij} \Delta CPI_{i,t-j} + \sum_{j=0}^{q-1} \delta *_{ij}{}' \Delta X_{i,t-j} + \mu_t + \varepsilon_{it} \quad (2)$$

Equation (2) was transformed as:

$$CPI_{it} = a_{1i} CPI_{i,t-1} + a_{2i} RV_{i,t-1} + a_{3i} Y_{i,t-1} + \sum_{j=1}^{p-1} \nu_{ij} \Delta CPI_{i,t-j} + \sum_{j=0}^{q-1} \nu_{ij} \Delta CPI_{i,t-j} + \mu_i + \varepsilon_{it} \quad (3)$$

where μ_i and i denoted the group-specific effect and the number of groups respectively. t represented the number of periods while CPI_{it} gives the semi derivatives of consumer price index used as a proxy for inflation. y_t denoted the logarithm of economic performance (proxy by real GDP growth rate) and RV_t is the logarithm of oil price volatility. The log transformation of these series facilitates the computation of elasticity coefficients that are time-invariant for the oil price-inflation relationship.

4. Empirical Results and Discussion

4.1. Panel Unit Roots and Cointegration Tests

We begin by presenting results from the modelling of the effect of oil price volatility on inflation. The preliminary tests of univariate properties of variables affirmed that none of the variables was integrated of the order of 2, that is I(2). Presence of variables of order I(2) would require greater exponential smoothening of the model. Four conventional unit root tests, the Levin-Lin-Chu (L.L. test) Im, Pesaran and Shin (IPS test), Fisher ADF test and Fisher PP test were conducted to ascertain the preliminary properties of the data set. The test results are reported in Tables 1-3, respectively.

Table 1 Levin-Lin-Chu Panel Unit Root Test

Variables	Level		1st difference		Order of Integration
LnCPI	1.95556	(0.0253)**			I(0)
lnIR	-0.75431	(0.2253)	-7.72287	(0.0000)*	I(1)
lnRGDP_GR	2.75957	(0.9971)	-2.04247	(0.0206)**	I(1)
RV	-9.43083	(0.0000)*			I(0)
GEXP	0.64438	(0.7403)	-1.91495	(0.0277)**	I(1)

* represents a 1% level of significance
** represents 5% level of significance

Table 2 Im, Pesaran and Shin Test

Variables	Level		1st difference		Order of Integration
LnCPI	1.83222	(0.9665)	-8.07326	(0.0000)*	I(1)
lnIR	0.08348	(0.5333)	-9.29338	(0.0000)*	I(1)
lnRGDP_GR	-2.4241	(0.0077)*			I(0)
RV	-7.86806	(0.0000)*			I(0)
GEXP	2.15631	(0.9845)	-5.30161	(0.0000)*	I(1)

* represents 1% level of significance

Table 3 Fisher ADF and Fisher PP Panel Unit Root Test

Variables Unit Root	Fisher ADF Test			Fisher PP Test		
	Level	1st difference	Order of Integration	Level	1st difference	Order of Integration
LnCPI	3.66617 (0.9612)	89.5012 (0.0000)*	I(1)	4.27335 (0.9342)	120.182 (0.0000)*	I(1)
lnIR	10.6403 (0.2229)	91.7322 (0.0000)*	I(1)	12.2613 (0.1399)	113.115 (0.0000)*	I(1)
lnRGDP_GR	29.1377 (0.0012)		I(0)	35.6923 (0.0001)*		I(0)
RV	80.2751 (0.0000)*		I(0)	142.001 (0.0000)*		I(0)
GEXP	1.89689 0.9971)	50.0835 (0.0000)*	I(1)	2.95446 (0.9825)	30.9297 (0.0006)*	I(1)

* represents 1% level of significance

Tables 1, 2 and 3 show the p-values obtained from the four different unit root tests. Both level and first difference of the unit-roots were carried out to ensure all variables are stationary. Thus, given the findings of the various unit root tests, all the under-listed variables were suitable to be included in our panel models. The cointegration test results were reported in Table 4. The Pedroni cointegration test presented the Pedroni cointegration test with seven different sets of residual-based tests. These residual-based tests were divided into two groups. Four out of the seven trials were within-dimension tests (the panel v-statistic test, the panel rho-statistic test, the panel PP-statistic test, and the panel ADP-statistic test). The remaining three tests were between-dimension tests (the group rho-statistic test, the group PP-statistic test, and the group ADF-statistic test). Within-dimension regression was based on pooling the estimators in the autoregressive coefficient across individual countries on the residuals, while between-dimension regression was based on averaging the individual coefficient estimators of each country. The table showed the Pedroni residual cointegration test with different deterministic trend specification model assumptions. The within-dimension tests presupposed standard Auto-Regressive (A.R.) coefficients among cross-sections while the between-dimension presupposed individual A.R. coefficients. The lag length was determined with Schwarz information criterion while the spectral estimation and bandwidth were done with the Bartlett method and with Newey-West procedure respectively.

From Table 4, the null hypothesis of the test is that there is no cointegration amongst these variables. Thus, given the results, as seen in Table 4, we rejected the null hypothesis more times than accepting. Consequently, we drew the same conclusion for each of the

deterministic trend specifications on the Pedroni test. These tests, therefore, suggested that there was no cointegration amongst the variables in the model.

Table 4 Pedroni Residual Cointegration Test for Panel Data

Alternative hypothesis: Common AR coefficients. (within-dimension)						
Pedroni's Technique	Group 1		Group 2		Group 3	
	Statistic	Prob.	Statistic	Prob.	Statistic	Prob.
Panel v-Statistic	-20.38685	1.0000	-28.92190	1.0000	-19.67369	1.0000
Panel rho-Statistic	-2.389373	0.0084	-4.062819	0.0000	-2.766529	0.0028
Panel PP-Statistic	-2.459962	0.0069	-4.713079	0.0000	-2.748783	0.0030
Panel ADF-Statistic	-2.670857	0.0038	-4.954406	0.0000	-2.912634	0.0018
Group rho-Statistic	0.576641	0.7179	-0.028946	0.4885	0.229310	0.5907
Group PP-Statistic	0.084655	0.5337	-0.949898	0.1711	-0.634294	0.2629
Group ADF-Statistic	-0.121212	0.4518	-0.780730	0.2175	-0.782130	0.2171

Note: All statistics are from Pedroni's procedure (1999) where the adjusted values can be compared to the N (0, 1) distribution. The Pedroni (2004) statistics are one-sided tests with a critical value of -1.64 (k < -1.64 implies rejection of the null), except the v-statistic that has a significant value of 1.64 (k > 1.64 suggests rejection of the null).
Source: Author's computation (2019)

4.2. Estimation Results

Table 5 presented the results of the panel ARDL/PMG estimate of the effect of oil price volatility on inflation of five (5) Africa oil-exporting countries.

Table 5 Oil Price Volatility and Inflation ARDL/PMG Results

Variable	Coefficient	t-Statistic	Prob.
Long Run Equation			
RV	-0.025568	-2.018450	0.0442**
LNRGDP_GR	-0.238907	-3.881039	0.0001**
LNGEXP	0.388006	8.522404	0.0000**
Short Run equation			
ECT	-0.030077	-1.754551	0.0801
D(RV)	0.000547	1.346863	0.1788
D(LNRGDP_GR)	-0.022931	-0.588841	0.5563
D(LNGEXP)	0.014575	0.850065	0.3958
C	-0.084903	-1.500434	0.1343

Notes: Dependent variable is the log of CPI
*significant at 5 percent level
Source: Author's computation (2019)

The results of the model were presented in Table 5. Table 5 showed the summary of the PMG estimation results for the panel containing the sample of all African countries where the long-term and short-term coefficients are based on the elasticity of CPI in Equation (3). The PMG estimation results in Table 5 showed that oil price volatility is negatively and statistically significant with the inflation in the long-run. This suggested that if there is any deviation from long-run equilibrium, the error term will modify the model such that it returns to equilibrium. The ARDL PMG estimator results in Table 5 revealed that in the long run, a percentage increase in the global oil price volatility would

lead to a 0.02 percent decrease in inflation, proxy with consumer price index (CPI) of African OPEC members' countries. While Table 5 revealed further that inflation is positively related to fiscal policy measure, government final consumption expenditure increases in the long run. The results showed that in the long term, a percentage increase in the government final consumer expenditure would lead to a 0.38 percent increase in inflation.

Meanwhile, the results seem to be diverse and insignificant in the short-run. The country-specific effects of oil price volatility on inflation were presented in Table 6. As noted in the corresponding table, a result of the estimate of four all countries appeared to have a significant error correction term (ECT) within the range of 0 and -2 which specified the appropriateness of the model. The results, however, the PMG ECT p-value of the model confirmed the short-run relationship for all countries. This implied that the short-run for each country (Algeria, Angola, Gabon, Libya, and Nigeria) were the same. For five countries, they confirmed our expectations that all the variables were correlated in the short term. The results in Table 6 suggested, however, for the cross-countries analyses data that the PMG estimators allow for heterogeneity in short-run coefficients. The short-run results revealed that global oil price volatility has a positive and significant effect on the economies of four of the 5 African OPEC members' countries, namely Algeria, Angola, Gabon, and Nigeria. All things being equal, a 1% increase in global oil price volatility significantly increases inflation by 0.01%, 0.17%, 0.07% and 0.07% in Algeria, Angola, Gabon, and Nigeria respectively. While a negative relationship was exerted in the case of Libya (-0.00067; p=0.000) suggesting that a 1 % increase in global oil price volatility significantly decreases inflation (CPI) by 0.06%.

Table 6 Country-specific results of the effect of oil price volatility on inflation in the Africa oil-exporting countries

Country	Variables	Coefficient	t-Statistic	Prob.
Algeria	ECT	-0.041131	-133.9829	0.0000**
	D(RV)	0.000120	234.3942	0.0000**
	D(LNRGDP_GR)	0.001157	0.031546	0.9768
	D(LNGEXP)	-0.026727	-23.61686	0.0002**
Angola	ECT	-0.004751	-874.5635	0.0000**
	D(RV)	0.001799	684.9063	0.0000**
	D(LNRGDP_GR)	-0.058337	-1.059066	0.3673
	D(LNGEXP)	-0.014226	-30.42526	0.0001**
Gabon	ECT	-0.014013	-146.5629	0.0000**
	D(RV)	0.000717	1715.846	0.0000**
	D(LNRGDP_GR)	0.081021	10.88570	0.0017**
	D(LNGEXP)	0.032834	57.85326	0.0000**
Libya	ECT	-0.092124	-212.9785	0.0000**
	D(RV)	-0.000667	-212.9785	0.0000**
	D(LNRGDP_GR)	0.012605	695.2135	0.0000**
	D(LNGEXP)	0.069366	61.52553	0.0000**
Nigeria	ECT	0.001635	24.15500	0.0002**
	D(RV)	0.000767	528.3258	0.0000**
	D(LNRGDP_GR)	-0.151101	-2.434628	0.0929
	D(LNGEXP)	0.011627	14.65194	0.0007**

Notes: Dependent variable is the log of CPI
*significant at 5 percent level
Source: Author's computation (2019)

Table 6 further revealed that, in the short-run individual country analysis, fiscal policy measure, proxy with government final consumption expenditure is positively related to inflation in Gabon (0.033 P=0.000), Libya (0.069; p=0.000) and Nigeria (0.012; p=0.007) respectively, but negatively related to inflation in Algeria and Angola. All things being equal, a 1% increase in government final consumption expenditure significantly increases inflation (consumer price index) by 3.3% 6.9% and 1.2% in Gabon, Libya, and Nigeria respectively. Also, the GDP growth, proxy of economic performance is positively linked to inflation in Algeria (0.001; p=0.976), Gabon (0.08 P=0.001) and Libya (0.012; p=0.000), but exerted negative relationship with inflation in Angola (-0.058; p=0.3673) and Nigeria (-0.151; p=0.093), though, insignificant.

4.3. Discussion of findings

The broad objective of this study was to examine the impact of oil price volatility on inflation in selected Africa's oil-exporting countries within OPEC. This study employed both descriptive statistics and econometric techniques to analyse quarterly data from the selected African OPEC countries from 1995 to 2017. The panel ARDL/PMG results reveal an antagonistic relationship for the persistent rise in the general price level (inflation) as induced by volatility in the price of oil in African OPEC's oil-producing nations. The ARDL/PMG revealed that in the long run, a percent increase in the global oil price volatility would lead to a 0.02 percent decrease in inflation. Studies such as Mork (1989); Mork, *el al* (1994); Blanchard and Gali (2007); and Hamilton (1996) have affirmed the existence of oil price-inflation relationship. The findings also explained that inflation is positively related to fiscal policy, measured with government final consumption expenditure in the long run. The results revealed that in the long run, a percent increase in the government final consumer expenditure would lead to a 0.38 percent increase in inflation. This suggested that the central authorities in the selected countries need to implement a practical expansive monetary cum restrictive fiscal policy measures to achieve price stability target. We found an inconsequential short-run association in the model estimated. The country-specific effects of oil price volatility on inflation results revealed that global oil price volatility has a positive and significant effect on the economies of four of the five Africa oil-exporting countries within OPEC, namely Algeria, Angola, Gabon, and Nigeria. All things being equal, a % increase in global oil price volatility significantly increases inflation by 0.01%, 0.17%, 0.07% and 0.07% in Algeria, Angola, Gabon, and Nigeria respectively. While a negative relationship was exerted in the case of Libya (-0.00067; p=0.000) suggesting that a % increase in global oil price volatility significantly decreases inflation by 0.06%. The fiscal policy measure, proxy with government final consumption expenditure is positively related to inflation in Gabon (0.033 P=0.000), Libya (0.069; p=0.000) and Nigeria (0.012; p=0.007) respectively, but negatively related to inflation in Algeria and Angola. All things being equal, a % increase in government final consumption expenditure significantly increases inflation by 3.3% 6.9% and 1.2% in Gabon, Libya, and Nigeria respectively. Also, the GDP growth, is positively linked to inflation in Algeria (0.001; p=0.976), Gabon (0.08 P=0.001) and Libya (0.012; p=0.000) but exerted negative relationship with inflation in Angola (-0.058; p=0.3673) and Nigeria (-0.151; p=0.093), though, insignificant.

5. Conclusions and Policy Implication

The study explored an empirical analysis of the impact of oil price volatility on inflation and economic performance in Africa's oil-exporting countries. Given that a vast number of studies on the effects of oil volatility on both oil-exporting and importing countries and such studies have primarily driven theoretical propositions about the oil, inflation and economic performance relationship, the uniqueness of this study is that oil price volatility was measured using realised volatility, and focused mainly on selected members of the organisation of petroleum exporting countries (OPEC). The result of the effect of oil price volatility on inflation showed that oil price volatility (β= -0.0255; t=0.044) had a negative and significant impact on inflation in OPEC's Africa oil-exporting countries. The study concluded that oil price volatility had a significant effect on inflation in the OPEC's Africa oil-exporting countries in the long run, but seemed to be diverse in the short run. This conclusion further confirms the apparent weakening of the relationship between oil price-economy and inflation relationship due to monetary and fiscal dynamics that have characterised the African economy over time. The finding that an increase in oil price initiates the inflation rate deserves singular attention. Each of selected OPEC's Africa's oil-exporting countries should diversify their export structures and develop their manufacturing export capability. Each of them should encourage domestic food production both in quantity and quality since food production is anti-inflationary. Precisely, the agricultural administrators of these OPEC's Africa's oil-exporting countries need to come up with effective programs that would scale up food production to benefit their economies during oil price hikes. Consequently, each authority should also upkeep and inspire the private sector to invest in and grow the agricultural industry. Other intervention tools that policy-makers can use to combat inflation and improve economic performance are monetary and fiscal policies, and these should be maximally optimised for social welfare gains.

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ISTRAŽIVANJE INFLANTORNOG UTICAJA NA VOLATILNOST CENE NAFTE U AFRIČKIM ZEMLJAMA-IZVOZNICIMA NAFTE

Rezime: Ponuđen je niz objašnjenja za očiglednu promenu u ishodima odnosa između cene nafte i inflacije, od mogućeg korišćenja alternativnih izvora energije, preko promena u strukturi proizvodnje u okviru naftno-intenzivnog sektora, do uloge fiskalne i moneterne politike u zemljama koje su izvoznici nafte. Ove promene su privukle pažnju stejkholdera, vlada i celokupnog društva na anegdotski odnost između volatilnosti cene nafte, inflacije i proizvodnje u afričkim zemljama – izvoznicama nafte. Ova studija oslanja se na empirijsku verodostojnost uticaja volatilnosti cene nafte na inflaciju i ekonomski učinak afričkih zemalja- izvoznica nafte od 1995. do 2017. godine. Koristili smo proceduru procene objedinjene srednje grupe sa zaključkom izvedenim na nivou značaja od 5%. Utvrdili smo da volatilnost cene nafte ima značajan uticaj na inflaciju u afričkim zemljala-izvoznicama nafte. Studija, prema tome, predlaže da afričke zemlje-izvoznice nafte treba da preduzmu mere predostrožnosti i da prate inflatorne potencijale usled različitih odgovora inflacije na pozitivne i negativne skokove cene nafte.

Ključne reči: *Volatilnost cene nafte; Inflacija; Ishodi rasta; Objedinjena grupa; Afrika.*