Journal DOI: 10.36713/epra1013 | SJIF Impact Factor (2025): 8.619 ISSN: 2347-4378
EPRA International Journal of Economics, Business and Management Studies (EBMS)
Volume: 12 | Issue: 2 | February 2025 -Peer-Reviewed Journal

ANALYSIS OF MACROECONOMIC SHOCKS AND INFLATIONARY PRESSURES AMONG SELECTED OIL PRODUCING AFRICAN COUNTRIES

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ABSTRACT
The study examined the effect of macroeconomic shocks on inflation among selected oil producing African countries. The study uses time series data spanning from 1990 to 2020. These variables used includes inflation, interest rate, exchange rate, gdp, and global oil price. Variables were tested for stationarity using both Augmented Dickey –Fuller and Phillips-Peron unit root test. Structural vector autoregressive model was estimated in determining the shock effect of macroeconomic variable to achieve the specific objective of the study. The result of unit root tests for stationarity of the variables reveals a mixture of order of integration of the variables at different level of stationarity. Co integration test result indicates the existence of Co integration relation among the variables. While cross sectional dependence test accepts the null hypothesis of no cross sectional dependence against the alternative hypothesis. Impulse response function result indicates that a one-unit shock to oil price has a significant impact on macroeconomic variables. This study recommends that oil producing African countries should resort to implement shocks absorbing policy mechanism to cater for the impact of global oil price fluctuation and its attendant effect on domestic prices of goods and services among others.
KEYWORDS: *Cointegration, Macroeconomic Shock, SVAR*

1. INTRODUCTION

Inflation has been broadly described as an economic situation where increase in money supply is faster than the production of new goods and services in a particular economy (Obi & Ajana, 2015). Kapoor and Verma (2018) in a similar notation described it as situation where money supply increases or price of commodities increase. Inflation arises in an economy due to rise in money income of some sectors of the economy without any correspondent increase in the level of productivity, giving rise to an increase in the aggregate demand for goods and services which according to Obi and Ajana (2015) cannot be met at the current prices by the total available supply of goods and services in the economy.

According to Asekunowu (2016), a country's high inflationary pressure would have a dwindling effect on exports of goods and services because the prices of tradables will become less competitive in the international markets thereby frustrating foreign purchases and consumption of such tradables. This may lead to decline in national income and inflict adverse consequences on employment and economic growth. Mengitus and lee (2014) Stresses that high rate of inflation is harmful to economic growth and trade balance as the cost of borrowing lowers the rate of capital investment while Manual and San (2019) concludes a positive nexus both at short and long run among inflation and trade balance for Malaysian economy which shows that a rise in inflation rates lead to improvement in the trade balance, even though his conclusion did not conform to the past researches, further researches may be required to validate it.

Other economists mainly supporters of institutional theory of inflation are less sure about the negative relation between inflation and growth. They agree that price level rises have the potential of generating inflation and that high accelerating inflation undermine growth, but they do not agree that all price levels increase start an inflationary process (Schiller 2003),

Kiganda, (2014) asserts that Inflation is an unavoidable property of every nation around the world. It has been a debatable issue since early 1970s when it records a high figure due to increases in oil price. Since then curtailing inflation has become a task before every nation. According to Riadh et al., (2016), structural changes of oil supply and demand due to diverse economic and political factors exacerbate volatility and raise the likelihood of oil price

shock. The impact of past inflation on future prices appears to be very important in some African countries. Inflation and inflation volatility in Sub-Saharan Africa (SSA) have been gradually declining. In the 1980s, monetary policy was subordinated to the objective of financing large fiscal deficits in the region. This led to high inflation and, in combination with fixed exchange rates led to overvalued real exchange rates (Berg et al., 2015). Gupta and Sharma (2018) further emphasises the crucial role oil plays in total energy requirement of an economy that any change in price of oil would have a significant impact on the economy. Since World War II there were sharp increases in oil prices and other related products. From 1960 to date, one may conclude that the past forty years was characterized by many periods of oil price shocks with different implications on both economic activity and inflation.

According to Castillo et al., (2010) higher oil price volatility induces higher levels of average inflation, when oil has low substitutability and the central bank responds to output fluctuations, making oil price to matters for the level of average inflation. Similarly, Jareg and Pierce (1974) observed that an open economy is always susceptible to a variety of external influences or shocks that have important impacts on income, employment and prices. While these external shocks are unforeseeable and unavoidable economic policy must somehow deal with their consequences. Ahmed et, al. (2018) observe that soaring oil prices not only impede economic growth but, also cause general increase in the price level in the economy. Since the crude oil is extensively used as a common input for production and as well as the distribution of goods, the increasing oil prices directly affect cost of production and indirectly affect the delivery cost of goods and services. Oil prices have risen exponentially causing considerable volatilities in international markets (Conget et, al., 2008). These changes in oil prices directly affect transportation costs, heating bills, and the prices of goods made with petroleum products. Oil price spikes induce greater uncertainty about the future, which may lead to firms and households delaying purchases and investments. The motivation of this study cannot be overemphasis. The study of the relationship between oil price shock and inflation around the globe has been the focus and remains a focal point to macroeconomists researchers. Fact findings from empirical evidences, seminars, symposiums conference arrived at conflicting evidences about whether global oil price shocks at different time horizon have inflationary implication or not. Most of these evidences are based on developed economies that are main energy consumer. This study however, deem it necessary to go beyond and examine the feature of the global oil fluctuations in the context of emerging and developing African oil producing countries that explicitly account for the impact of global shocks on domestic economies, as well as for those of individual economies will be considered. Therefore. the broad objective of the study is to analyze the macroeconomic shocks and inflationary pressure in some selected oil producing African countries. (Algeria Equatorial Guinea, Egypt Ghana and Nigeria)

2. LITERATURE REVIEW

Macroeconomists in general are of the view that global oil price shocks in the 1970s was a source for subsequent economic downturn. Nevertheless, there are debates on whether oil prices themselves are the main cause of recession. As such, the two oil price shocks since 1990s did not have substantial impact on the GDP growth and inflation Bala and Chin (2018) employ ARDL dynamic panels model in analysing the asymmetric impacts of oil price changes on inflation in Algeria, Angola, Libya, and Nigeria. Oil price data used are the actual spot oil prices viz-a-viz the Brent, West Texas Intermediate (WTI), and Dubai oil price. These prices were used to estimate the short- and long-term impacts of oil on inflation. The findings indicate that both negative and positive changes in oil price positively influenced inflation. Other results show that food production is negatively related to inflation but GDP, exchange rate and money supply are positively related to inflation. Using nonlinear approach, Ali (2020) examines the impacts of oil price changes on inflation. The results of the nonlinear ARDL model indicates the existence of co-integration which means that there is a long-run equilibrium relationship between inflation, oil prices, GDP, and money supply, in the Egyptian economy during the period 1960-2017. Results also captured short-run and long-run asymmetric impacts of oil price increases and decreases on inflation. These results impose challenges that minimize the ability of the Central Bank of Egypt in controlling inflation rates in the short-run because changes in oil prices, which positively affect inflation, are determined globally and outside the effective area of domestic monetary policy.

Baumeister and Le Roux (2017) conducted a study on the reaction of inflation to macroeconomic shocks in Zimbabwe between 2009 to 2012. The study employed vector error correction approach in their analysis. Variable use includes consumer price index, exchange rate, money supply, food and oil price. The empirical findings show that the reaction of price formation in Zimbabwe to external shocks is immediate with permanent effects. Specifically, the study found that an appreciation of the South African rand or Zimbabwen dollar against the US dollar, results in a sharp increase in inflation during the first 6 months and the effects are permanent.

Using a Structural VAR model, Riadh et.al. (2016) examine the impact of oil price shocks on inflation and the real exchange rate in a group of six oil exporting and importing countries: Iran, Saudi Arabia, Algeria, Bahrain, Tunisia and Morocco. The impulse response functions indicate that, in the long run, oil price fluctuations have the major impact on real exchange rate of the oil-importing countries (Tunisia and Morocco) while the impact on inflation is smaller and absorbed by the rigidity of subsidized products prices. Variation in the real exchange rate in Bahrain is explained by oil price innovation and More than 17% of fluctuation in Saudi Arabia real exchange rate is explained by oil price shock. The variance decomposition results also assert that oil price shocks do not explain notably the variation in the two considered variables in Algeria and Iran.

Karimili et al. (2016) has found oil price shock significantly affect domestic inflation in Russia, Azerbaijan and Kazakasthan. A study conducted in Indonesia by Adam et al. (2015) using difference equation model shows that a unit increase (decrease) in world crude oil prices caused the inflation rate to go up (fall) by 0.33 percent. Akcelik and Ognuc (2016) applying vector autoregressive model showed that a 10 percent change in international crude oil price contributed to 0.42 percent change in consumer inflation in Turkey, which is a major oil importing nation. In the recent time Dipesh and Hary (2019) used a nonlinear autoregressive distributed lag model in analysing asymmetric oil price pass through on inflation in Nepal for the period of 1987-2018. Cointegration results indicates the presence of long run asymmetric adjustment between price of petroleum product and inflation.

Direye (2019) employed Vector Autoregressive model to determine dynamic impacts of global oil and food price shocks on inflation in Papua New Guinea. The findings of the study reveal that fluctuations of the headline and core inflation measures are explained by their own shocks, the exchange rate shock appears to be more pronounced than the rest of the variables in the system. Similarly, a positive shock to international oil prices also results in a sharp increase in inflation, during the first 6 months, remaining high over the forecast period. The impact of a positive shock to food prices, is however, transitory, only felt during the first 4 months, before declining during the next 4 months and remaining at a moderately high level over the forecast period.

In studying the impact of oil price shocks on inflation in 72 advanced and emerging economies for periods covering 1970 to 2015, Choi, et al. (2017) find that improvement in monetary policy conduct has reduced the impact of oil price shocks over time. In the same vein. Ahmed et, al. (2018) conducted a study on the impact of oil price shock on key macroeconomic variables including inflation in five SAARC countries for the period 1982-2014. They applied structural vector auto regression to test for impulse response function and forecast error variance decomposition. The result of the findings indicates the existence of long-run equilibrium relationship between all the underlying variables. However, the empirical findings of IRF explained significant variation among all underlying macroeconomic variables in response to exogenous oil price shocks at different time horizons. So also the results of FEVDM evidence that each country in a study group responds differently to oil price shocks which corresponds to their independent policies, macroeconomic fundamentals, sector constructions and heterogeneity across the countries. The findings of their study will assist governments in reforming public policies in the region by controlling macroeconomic fluctuations due to oil price shocks.

Nguyen, et.al, (2015) employ the Global VAR model, using quarterly data. For the period 1998:1–2013:1. Variables used are consumer prices index, nominal effective exchange rate, broad money nominal interest rates and real GDP, global oil and food prices. Their findings indicate that the main drivers of inflation have been domestic supply shocks and shocks to exchange rate and monetary variables in the past twenty years. (Iwayemi & Fowowe, 2011) when conducting an empirical analysis of the effects of oil price shocks on Algeria, Egypt, Libya and Nigeria (largest African oil exporters) found little evidence of a short-run effect of oil price shocks on macroeconomic variables and concluded that oil price increases have not been channeled into improving economic activities. (Lacheheb and Sirag, 2019) examined the relationship between oil price changes and inflation and concluded that oil price fluctuations have an asymmetric effect on inflation. Almgren & Holmberg (2022) examine the effects of oil price shocks on inflation in the G-7 countries using a Structural Vector Autoregressive model. Impulse Response functions (IRFs) and Forecast Error Variance Decompositions (FEVDs) are estimated. The results suggest that in periods of oil independency, oil price shocks induce a lower response in inflation compared to periods in which the G-7 economies are considered oil dependent.

3. METHODOLOGY

Methodological aspect of the study encompasses the source and types of data, methods of data collection and analysis, description of variable as well as model specification.

Research Design

The study basically designed to investigates ho global oil price shocks influence inflationary pressure in some selected African oil producing countries for the period spanning 1990 to 2020. The study rises question as to what

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extent macroeconomic shocks affect domestic inflation and to that effect the study advances an objective to evaluate how global oil price shocks influence domestic inflation in African oil producing countries. Data on inflation rate as a measure of consumer price index (CPI), global oil price measure of average prices of Brent, Dubai and Texas crude oil price bench mark, (oilp), exchange rate is measured as the measure of united state dollar against currency of each country under investigation, Interest rate and gross domestic product (gdp) for the period spanning 1990 were source from World Bank and analyzed using structural vector autoregressive model. The study is segmented according to introduction, literature review methodology analysis of result and concussion

Data Sources

Data used in empirical analysis may be collected by a governmental agency such as the international agencies like International Monetary Fund (IMF) and the World Bank. Data on Inflation, Global oil price, Gross Domestic Product (gdp), Exchange Rates, Domestic Interest rate, are constructed and sourced from World Development Indicators (WDI) of the World Bank, African Development Bank (ADB), Bank for International Settlements (BIS) and the International Monetary Fund (IMF). Datasets not available in these databases are obtained from domestic statistical agencies of each country and adjusted according to the other data set

Analytical Technique

The technique used in this study is the modern econometrics time series analysis in analyzing and estimating how selected macroeconomic variables relate and influence one another. This method according to Madalla (1992) gives the best technique for the verification and reputation of theory. It also provides quantitative estimation of relationships among variables without much subjective judgement. The process of estimation and analyses also depend on the nature of the series. However, this research focuses on more than one countries which make the study a panel study. The analysis of data begins with some pre estimation test like the cross sectional dependence test. The ADF unit root test for the stationarity and Structural vector autoregressive model used to analyzed the shocks effect to inflation in a country specific approaches

Model Specification

The study used Structural VAR (SVAR) model to analyzed the impact of oil price shocks on inflation. Following the studies of Riadh et.al. (2016) Baumeister and Peersman (2013), we consider the SVAR model and modified to suit the interest of this study:

$A\ \ X_1 = A_1X_{t-1} + A_2X_{t-2} + - - - + A_aX_{t-a} + \varepsilon_t$ …….(1)

Where ΔX_t =(Δoilp, Δexr, Δitr, Δgdp, inf an (n=1) vector including oil price, real exchange rate, interest rate and inflation. Ai is the (5∗5) matrix of coefficients for i = 0,1,…,q and

ε = ($(\varepsilon_t^{oilp}$,, ε_t^{exr} ε_t^{itr} ε_t^{gdp}, $\varepsilon_t^{inf})$ represent the vector of structural disturbances. The reduced form of equation 1 is:

$X_t = \beta(L)X_t + \mu_t +$ …….(2)

Where $\beta(L) = A_0^{-1}\ A_1(L)\ and\ A_1(L)$ is a matrix of polynomial in the lag operator.

In order to proceed with identification of oil price shock we impose the short-run restrictions on the endogenous variables included in SVAR.

$$\begin{vmatrix} 1 & 0 & 0 & 0 & 0 \\ b_{21} & 1 & 0 & 0 & 0 \\ b_{31} & b_{32} & 1 & 0 & 0 \\ b_{41} & b_{42} & b_{43} & 1 & 0 \\ b_{51} & b_{52} & b_{53} & 5_4 & 1 \end{vmatrix} \begin{bmatrix} \mu_{oilp} \\ \mu_{exr} \\ \mu_{itr} \\ \mu_{gdp} \\ \mu_{inf} \end{bmatrix} = \begin{vmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{vmatrix} \begin{bmatrix} \varepsilon_{oilp} \\ \varepsilon_{exr} \\ \varepsilon_{itr} \\ \varepsilon_{gdp} \\ \varepsilon_{inf} \end{bmatrix}$$

The oil price is assumed to be exogenous and the error term of international oil price will be equal to its structural error term. The reduced error term for oil price can be expressed as follows:

$\mu_{oilp} = \varepsilon_{oilp}$……..(3)

For inflation, oil price fluctuation can have a contemporaneous effect on it because an increase (decrease) in oil price can raise (reduce) the cost of production and distribution of good and service. Thus, the reduced error term of the inflation can be expressed as follows:

$inf = -b_{51}\varepsilon_{oilp} - b_{52}\varepsilon_{exr} - b_{53}\varepsilon_{itr} - b_{54}\varepsilon_{gdp} + \varepsilon_{inf}$ …….(4)

The equations (4) allows us to establish the impact of oil price variation on domestic inflation rate of the selected African producing countries.

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4. RESULTS

Table: 4.1 Descriptive Statistics

	inf	exr	itr	gdp	oilp
Observation	155	155	155	155	155
Mean	13.062	145.04	9.5403	6.6301	47.7212
Min	0.3391	0.0326	1.4500	-9.1100	13.0600
Max	72.835	732.39	35.759	149.97	105.010
Median	10.370	54.748	8.8958	4.3000	41.2600
Std dev	11	205	6.6908	14.904	30.0644
Skewness	10.501	I.4005	1.5339	6.6653	0.64532
Kurtosis	2.4433	3.5355	6.1544	59.308	2.10896
Jarq-bera	523.45	52.386	125.05	216624	15.8857
prob	0.0000	0.0000	0.0000	0.0000	0.0003

Source: Authors computation using E-views 12v, 2024

The descriptive statistics for all the variables used in this study are presented in Table 4.1. It describes the basic features of the data used in this study. The target variable been Inflation (inf) and other influential variables like Interest rate (itr), Exchange rate (exr), Economic growth (gdp), and global oil price (oilp). The data covers 30 years and the sample size comprises of 150 total observations The results showed the mean, standard deviation, maximum and the minimum value of each variable.

The mean and median value of inf is 13.06223 and 10.37049, exr has mean value of 145.044 and median value of 54.74893. Mean and median value among the independent variables is the itr calculated as 9.540366 and 8.895833 respectively The least mean value of 6.63015 and median 4.30000 is associated with gdp, while oilp has mean and median value of 47.782129 and 105.0100 respectively.

The Jarque-Bera estimate indicates that Inf, , exr, itr, gdp, dcps,,gxp and oilp are all positive and normally distributed across the period with a kurtosis values of 2.4, 3.5, 6.1, 59.3, 2.1 respectively. On the other hand, its tends to be positively skewed with a maximum of 732.39% and a minimum of -51.98% for all the distribution. The kurtosis of 59.3 shows that it has a leptokurtic distribution as validated with the estimated value of the Jarque-Bera test of normality.

Table: 4.2 Results of Correlation Matrix

Var	Inf	itr	exr	gdp	oilp
Inf	1				
itr	0.563606	1			
exr	-0.208591	-0.460667	1		
gdp	-0.157937	-0.084430	0.341906	1	
oilp	0.051855	0.22178	0.097194	0.204123	1

Source: Authors computation using E-views 12, 2024

Correlation analysis is used to detect the existence of multi collinearity among the independent variables. It measures the strength and direction of the relationship among all pairs of the variables in question. It is also a statistical technique that gives clear illustration on how strongly each pairs of variable are related. The range of the value of coefficient of correlation ranges from -1 to 1, with 1, indicating strong positive relationship and -1 indicating a strong negative relationship. between two extreme values lies moderate and weak relationship as well as no relationship at all.

Table 4.2 shows that there is a positive relationship between the dependent variable (CPI) and some of the independent variables. Among the independent variables, which are positively related to inflation are itr with correlation value of (0.563606), oilp (0.051855). This implies that the higher the itr and oilp the higher the inflation rate on the other hand exr and gdp are negatively correlated with inflation with correlation values of -0.208, and -0.157. This indicates that the higher the exr, and gdp the lower the inflation rate within the study period.

Table: 4.3 Results of Cross Sectional Dependence Tests

Test	t-Stat	df	Pob.
Pesaran CD	8.946882	10	0.5372
Breusch-Pagan LM	-0.235484		0.8138
Pesaran-scaled LM	0.0334236		0.9733

Source: Authors computation using E-views 12v, 2024

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Cross sectional dependency test is a pre estimation test in econometric analysis. The test is normally carried out to identify the existence or otherwise of cross sectional dependences among the variables in the cross sectional unit. Literature offer a number of tests for the detection of cross sectional dependency. But for the convenient of this study, the study relies on the following: The Pesaran CD, Breusch-Pagan LM, and Pesaran-scaled LM. The result of the test is presented in table 4.3. Residual diagnostic for cross-sectional dependency revealed that all the results indicates absence of cross-sectional dependence among the variables. This shows that the null hypothesis of no cross sectional dependency is accepted against the alternative. In this regards we suggest using first generation unit root test for stationarity of the variables.

4.1 Structural Vector Auto Regression1 (SVAR)

The study uses disaggregated analysis with the application structural vector autoregressive (SVAR) model.

Table: 4.4 Result of Unit Root Test

		ADF		pp	
Countries	**Variables**	**Level**	**1st diff**	**level**	**1st diff**
Algeria	Inf	-1.514069	-5.610898***	-1.465452	-5.610898***
	Itr	-3.813089	-9.290337***	-1.802804	-9.290337***
	Iexr	-0.697604	-13.66637***	-1.420223	-18.98024***
	Gdp	-2.145473	-7.309263***	-2.145366	-7.452651***
	oilp	-4.352259**	-4.357168**	-4.017201**	-15.22077***
Eq/guinea	Inf	-4.583116**	-5.700675***	-2.932721	7.910883***
	Itr	-5.143503***	-4.800290***	-5.142657***	-20.54571***
	Iexr	-5.431184***	-6.989862***	-5.427975***	-12.11354***
	Gdp	-3.360425	-5.422954***	-3.360425	-10.90498***
	oilp	-4.352259**	-4.357168**	-4.017201**	-15.22077***
Nigeria	Inf	-2.534994	-4.441343**	-2.320819	-4.427855**
	Itr	-5.116102	-8.323802***	-5.124331*	-9.826577***
	Iexr	-4.040723**	-7.160492***	-4.279607**	-8.366584***
	Gdp	-3.258038	-8.787228***	-3.424909	-13.47708***
	oilp	-4.352259**	-4.357168**	-4.017201**	-15.22077***
Egypt	Inf	-2.995469	-6.731277***	-2.913572	-7.333716***
	Iitr	-4.007824**	-4.132743**	-2.795148	-6.562262***
	Iexr	-1.490730	-10.49781***	-3.146863	-14.30325***
	Gdp	-3.604217	-7.918158***	-3.314400	-7.918158***
	oilp	-4.352259**	-4.357168**	-4.017201**	-15.22077***
Ghana	Inf	-4.425800***	-7.100336***	-4.357704***	-24.34257***
	Itr	-4.530056**	-7.140577***	-4.676373***	-24.64391***
	Iexr	-7.560195***	-7.383328***	-7.562206***	-54.19326***
	Gdp	-3.155039	-6.162323***	-3.143455	-7.540172***
	oilp	-4.352259**	-4.357168**	-4.017201**	-15.22077***

Source: Authors computation using E-views 12v, 2024. Note *, **, ***, indicate significant at 10%,5%and 1% respectively

Unit root testing is an important econometric analysis used to test whether a time series is stationarity process. It is a pre- estimation used to determine the order of integration of a time series. The study here employed Augmented Dickey-Fuller(ADF) and Phillip-Peron (PP) unit root test to scrutinize time series properties of the variables in question. The result of both test is presented in table 4.4. Both ADF and PP specified that all the variables are not stationary at level except inflation rate interest rate and exchange rate in the case of Equatorial Guinea, exchange rate in the case of Nigeria, interest rate in the case of Egypt, and inflation rate, interest rate and exchange rate in the case of Ghana. Global oil price attained stationarity process at level in the case of all the countries. However, after taking the first difference, all the variables became stationary. it means all the variable are integrated of order 1(1)

4.2 Lag Length Selection Criteria

In an attempt to estimate the VAR, the study uses lag length selection criteria to give us the minimum number of lag to be included. The result of lag order selection in table 4.5 reveals that Akaike Information Criteria has the

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lowest value in all the countries under review. Therefore, the study relied on it to determine the number of lags used in estimating the SVAR model.

Table: 4.5 Result of the Lag Order Selection

lag	LogL	LR	FPE	AIC	SC	HQ
Algeria						
0	-349.4721	NA	68200.10	25.31943	25.55733*	25.39216*
1	-319.6564	46.85326*	50001.24*	24.97546	26.40282	25.41181
2	-292.2120	33.32535	50748.61	24.80085*	27.41768	25.60085
Equatorial guinea						
0	-349.4721	NA	68200.10	25.31943	25.55733*	25.39216*
1	-319.6564	46.85326*	50001.24*	24.97546	26.40282	25.41181
2	-292.2120	33.32535	50748.61	24.80085*	27.41768	25.60085
Nigeria						
0	-302.7417	NA	2421.914	21.98155	22.21944*	22.05427*
1	-281.1760	33.88882	3200.966	22.22686	23.65422	22.66322
2	-245.6782	43.10448*	1827.678*	21.47702*	24.09385	22.27701
Egypt						
0	-222.1778	NA*	7.673370*	16.22699	16.46488*	16.29972*
1	-202.1150	31.52729	11.29085	16.57964	18.00701	17.01600
2	-184.6285	21.23363	23.33856	17.11632*	19.73315	17.91631
Ghana						
0	-284.9890	NA	681.4817	20.71350	20.95140*	20.78623*
1	-260.6615	38.22901*	739.4324	20.76153	22.18890	21.19789
2	-230.5554	36.55735	620.5472*	20.39682*	23.01365	21.19681

Source: Authors computation using E-views 12v, 2024

Lag length selection criteria in table 4.5 shows that akaike information criteria AIC with least figure of 24.80085 is the best criteria used in estimating the SVAR for Algeria and Equatorial Guinea. In the same vein, Nigeria and Ghana chooses akaike information criteria with a least number of 21.47702 and20.39682 respectively. However, in the case of Egypt the result of the selection criteria for lag order opposes to AIC and chooses FPE that has minimum value of 7.673370.

4.3 Impulse Response Analysis

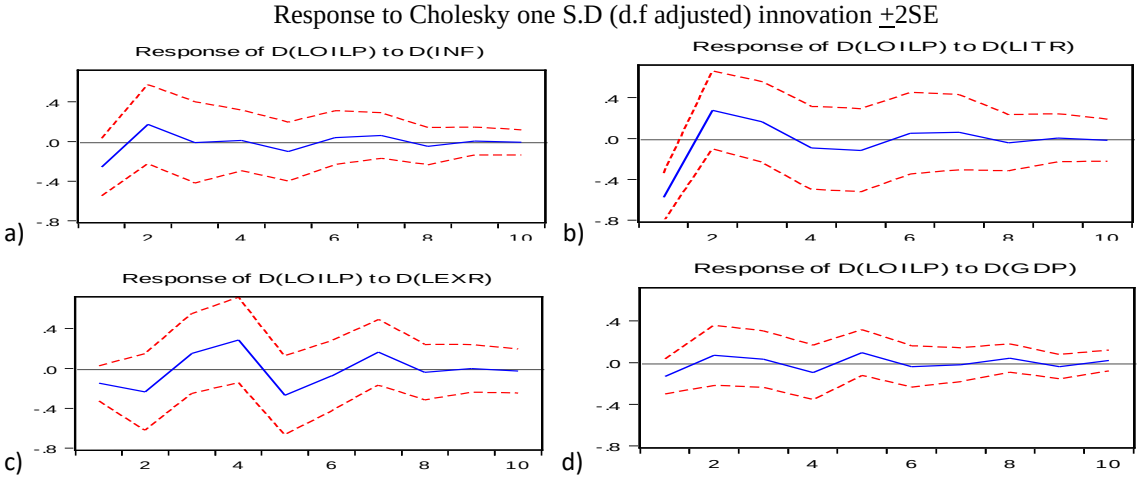

Fig. 4.1 Impulse Response Analysis - Algeria

The study used impulse response function to analysed the shock effect of oil price on inflation. The model shows the time varying volatility in the model. In VAR system Monte Carlo simulation method is used for the calculation of standard error and Choleskey ordering with degree of freedom adjusted is selected to evaluate the result. Figuer.4.1 shows the response of inflation, interest rate, exchange rate and gdp to shock in oil price in Algeria. The result of impulse response functions is shown in (Figuers: 1a-5). Figuer:1a illustrates the rate of inflation which is positively responded to oil price innovation over first to second time horizon after the impact, and then promptly starts declining and hits its bottom level at third time horizon after which the impact remained stagnant from fourth to fifth time horizon. It then falls to negative till its reaches the fifth time horizon. The impact regained

Journal DOI: 10.36713/epra1013 | SJIF Impact Factor (2025): 8.619 ISSN: 2347-4378
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at the fifth time until it reaches level at the six-time horizon when the impact suddenly appreciated to became positive. The silent impact continues but it still declines and hit back to bottom at eight horizons The volatility in impact continues up to tenth time horizon. Results shows that the impact of oil price shocks is statistically significant. This suggest that rising oil price cause cost of production that lead to decrease in output and eventually fall in aggregate supply in an economy. The excess demand in markets due to shortage in supply also lead to rise in price level.

(Figuer:1b) shows that the responce of interest to oil price shock is statistically significant as one shock in oil price shut the level of inflation upward until it reaches its climax at second time horizon then it starts to decline instantly and hit the bottom level at fourth horizon. Initially, oil price shock positively increases both at first and second time horizon. After fourth time horizon, the negative shock continues to move to reach the sixth time frame where it goes up again and regain its positive movement. After the sixth horizon, the interest rate volatility begins to decrease up to ninth time frame. This implies that from monetary perspective Algerian Central Bank might have increased interest rate to counter the adverse effect of oil price on real output. (Figure. 1c). shows that the reaction of exchange rate is volatile and significant all through except for eight to tenth time horizon. The Initial response to oil price shock is swift and had negatively significant downward slope and terminates. at the second horizon. At the second time horizon, it starts rising significantly and reaches the above bottom line at fourth time frame where it abruptly declined and hit the bottom at seven-time horizon. The fluctuation to shock does not stop at the seventh horizon. however, there has been a noticeable jump up until it reaches its climax and fall back to lowest at eight-time frame. The jolt movement subsided at ninth time frame to tenth horizon. Algerian currency experiences depreciation in the long run. (Figure: 1d) illustrates the impact of gdp to oil price shock in Algeria. At the beginning one shock to oil price induces positive but silent rise in the level of gdp. from first period to second, it then declines to hit the bottom at fourth time frame. The impact of shock continues to raise the gdp again and ends at seventh time horizon where it lapses back to eighth horizon. The ninth and the tenth horizon are the log run period within which gdp seems to maintain stability despite the shock.

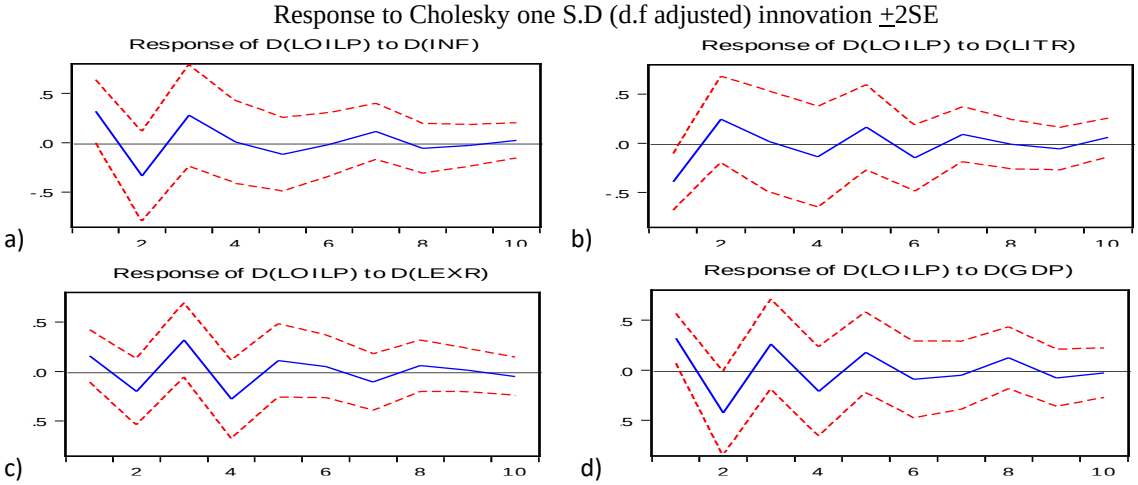

Fig. 4.2 Impulse Response Analysis - Equatorial Guinea

Figure. 4.2 illustrates impulse responses of variables (Inflation, Interest rate, Exchange rate and GDP) in Equatorial Guinea context. Figure: 2a depicts the reaction of inflation to oil price. It is observed that inflation drops in the first place to hit bottom at second time horizon after a shock to oil price. However, it then starts appreciating back to reach its maximum at third horizon where it gently slopes down to the bottom at fifth horizon. Thus, it then begins a gradual rise and reach its climax at seventh time horizon after which it falls for very short period. It again starts rising after ninth time horizon and onward. This suggests that shocks of oil price have inflationary impact on the economy of Equatorial Guinea and this finding is similar to the findings of Khan and Ahmed (2011) in case of Pakistan. The impact on interest rate of oil price shock is observed to be sharply risen and quickly drop back to hit bottom at fourth horizon, but it then begins rising and attains its peak at fifth time horizon (see. Figure. 2b). Nevertheless, after fifth time horizon interest rate starts declining and knocks its bottom at sixth time horizon after which it moves upward till it reaches its level at seventh horizon before it drops to negative at eight-time frame where its continues till the tenth time horizon. This implies that shock of oil price has adverse impact on interest rate in the short run but positive in the long run. The reaction of exchange rate reveals some negative response to oil price shock up to second time horizon, and then it sharply rises and reaches its minimum level at third time horizon (Fig. 2c). The response of exchange is observed volatile over the period

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under consideration. This implies that oil shock has short term negative impact on exchange rate of Equatorial Guinea. Oil price has negative impact on real output and it continuously goes down and hits the bottom level during second time horizon (Figure. 2d). Afterwards, it starts rising and reaches its maximum level during third time horizon after which it begins to fall up to fourth time horizon. The shock trend exhibits a strong volatility in the first five period horizons. Moreover, after sixth time horizon Equatorial Guinea economy experiences contractionary impact in the long run. This implies that rising oil prices is a cause to decrease in the availability of inputs, which leads to lower output in oil producing countries like Equatorial Guinea.

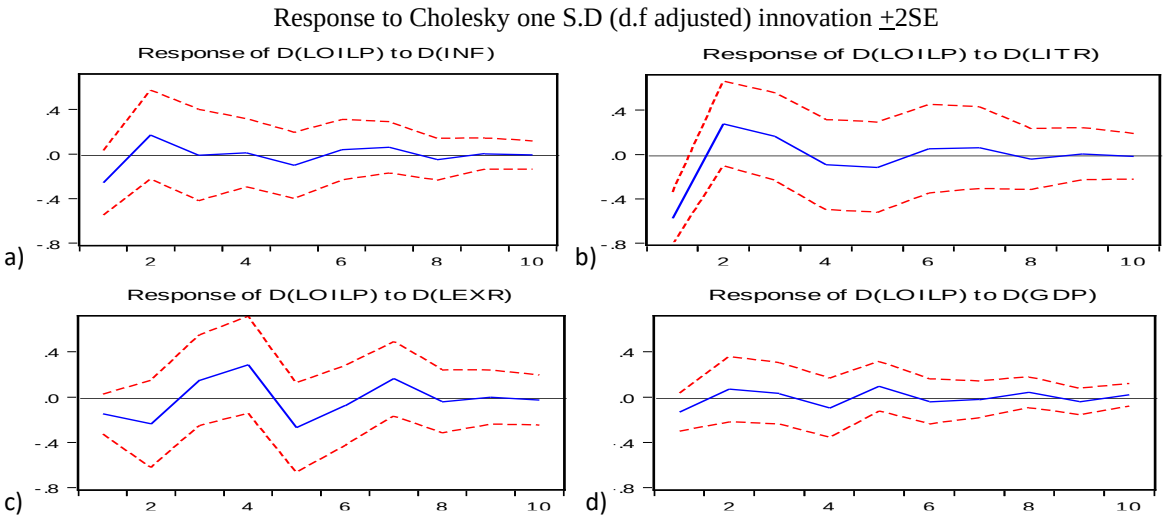

Fig 4.3: Impulse Responses Analysis-Nigeria

Figure.4.3 presents impulse responses of inflation rate, interest rate, exchange rate. and GDP, of Nigeria. The shock effect of oil price on inflation in Nigeria begins with rising trend in the first and second time frame but then its sharply declines to rock bottom at fifth time horizons. However, the price level silently goes up and attains its peak at eighth time horizon until it drops down again (Figure. 3a). Since then inflation starts declining slowly and becomes insignificant at eighth, ninth and tenth time horizon. This shows that oil price shock does not affect price level in Nigeria in the long run but does so in the short run. At the beginning, the reaction of interest to the shock of oil price in (Figure. 3b) is significant over first to second time horizon, after that it goes down swiftly and becomes stagnant between third and fourth time horizon, after fourth time horizon interest rate begins to increase slowly and reaches its maximum point at seventh time horizon after which it gently and insignificantly falls to become stagnant after ninth time horizon. This result shows that the economy experiences contractionary impact after inflationary oil price shock The response of exchange rate to oil price shock is statistically significant and more volatile throughout the time horizons (Figure.3c). Initially, the exchange appreciates up to second time horizon, and then it starts depreciating and hits its lowest level at fourth period after which it begins to rise and achieves its maximum level at seventh time horizon. After seventh time horizon the response of exchange rate again goes down and remains negative. This result suggests that exchange in Nigeria is affected by oil price shock in both the short and long run.

The impulse response function of GDP is insignificant for first two time horizons, and then it is observed for about up to fifth time horizon (Figure. 3d). After sixth time horizon real output starts going up and attains its peak at seventh time horizon after which it again moves downward until the eight period. After the eight-time horizon it begins to rise, which shows expansionary phase in the Nigerian economy in the long run. This advocates that oil price has short term adverse influence on the Nigeria's GDP.

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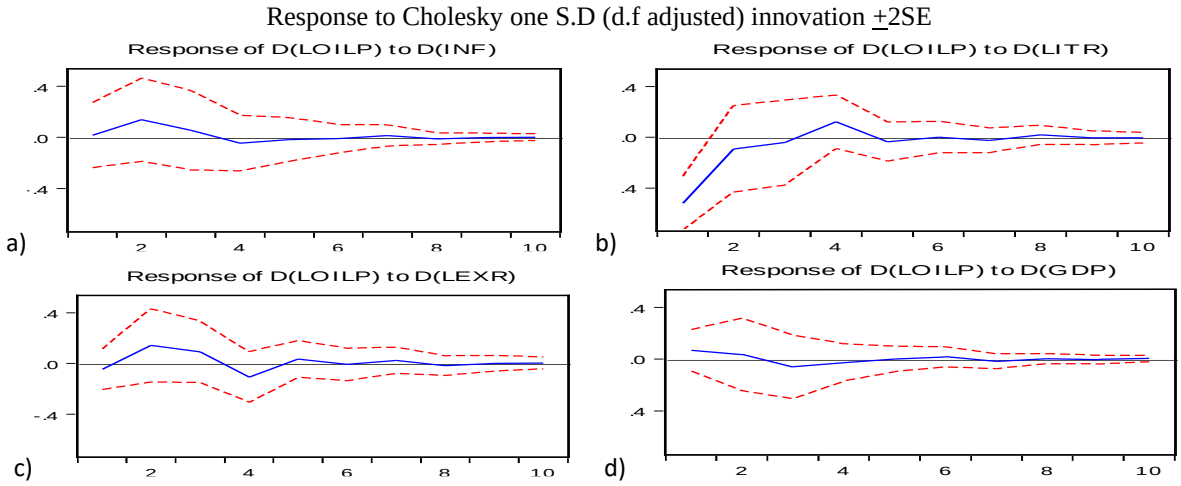

Fig.4.4, Impulse Response Analysis – Egypt

Figure.4.4 presents impulse responses of Inflation, Interest rate, Exchange rate and. GDP, of Egypt. The impact of oil price shock on inflation in figure.4a is observed with the level of price risen in the initial stage to reach its peak at second time horizon when its begins to drop slowly and hit the bottom at fourth time horizon. Meanwhile the reaction to price become stagnant after the fourth period and stretches up to tenth horizon. This shows that inflation is sensitive to oil price in the short run and long run resistive in the context of Egypt. The Egyptian interest rate response to shock is illustrated in figure.4b. the result of oil price shock to inflation is insignificant and negatively sign for most of the time horizon. At the onset, it is observed the general price level is increasing in a negative sign until it reaches it climax at second time horizon when it then slowly trends down to bottom at fifth horizon. The negative shock trend continuously stretches to reach sixth time horizon and become stagnant from eighth horizon up to tenth time frame. This result indicates that interest rate in Egypt is not so volatile to shock for the period under review. Figure.4c demonstrate the shock effect of oil price to exchange rate in Egypt. Initially exchange rate responded positively and significant to one shock of oil price. This shock effect induces exchange to risen until it reaches its maximum level second horizon and then slop down gently to its lowest point at fourth time frame. It is also observed that exchange rate reacts to shock and goes up and levelled at sixth time horizon. Until then its insignificantly stretches towards the eight ninth and tenth period horizon. This result shows that an insignificant response of exchange rate to oil price I the log run for Egyptian economy. Figure.4d portrays the reaction of gdp to global oil price shock. The gross domestic product (gdp) shows positive but declining respond in the beginning and it sustain until its turn to be negative and knock the bottom at third time frame. After that it still regains to stabilise stretches insignificant through seventh up to tenth time horizon. This indicates that gdp is more responsive to shock in the first and second quarter than the preceding quarters. We may suggest that the long reaction of gdp to oil price shock is insignificant for Egypt economy.

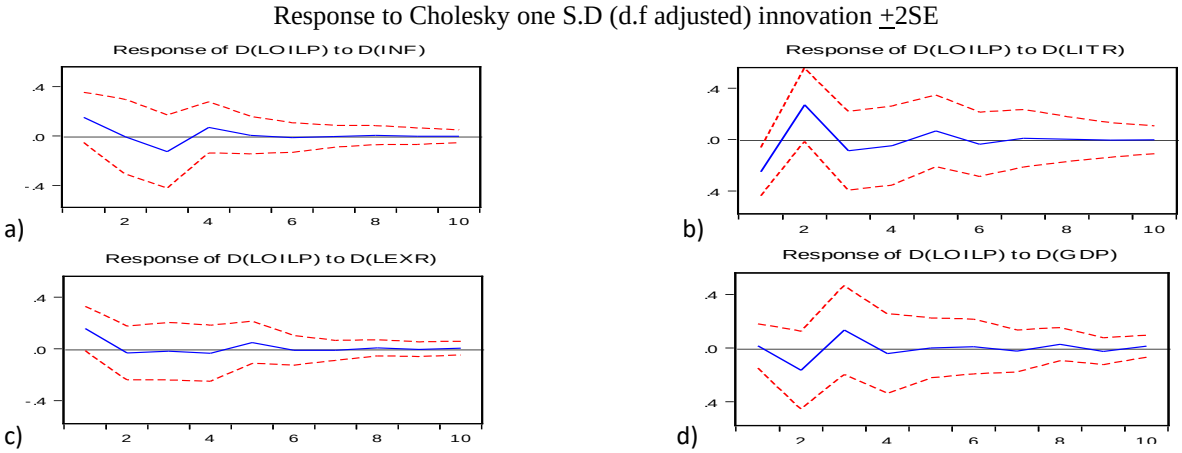

Fig 4.5 Impulse Response Analysis – Ghana

Figure. 4.5 depicts the outcome of impulse response functions of Inflation, Interest rate, Exchange rate and. GDP for Ghanaian economy. Figure. 5a result of the analysis of impulse response indicate that Ghana's general price

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level is responsive to global oil price shock. It can be seen that initially the price level is fallen toward bottom till it reaches the maximum bottom level at third time horizon. Inflation responded again and rise to levelled at horizon four since then it elapses and become stagnant throughout the preceding time frame. This is to show that inflation in Ghana is not so responsive to oil price shock in the long run but responsive in the short run. The impulses response analysis indicate that Interest rate is so responsive to oil price shock in Ghana in the short run (see Figure. 5b). In first time frame it rises up passively and significantly to reach its maximum level at second time horizon until it quickly decline to hit the bottom at third time frame before it negatively and insignificantly extent to the fourth and the fifth time horizon. Its noteworthy that reaction of interest rate to oil price become stagnant for the rest of the time frame after a falls in response at fifth time horizon. This suggested that interest rate is volatile in the short run but stagnant in the long run. However, it ought to be concluded that oil price not matters for interest rate in the long run for the period under review. Figure. 5c present the responses of Exchange rate to negative and positive shocks effects of oil price in Ghana. The reaction of exchange rate in Ghana is negative for most of the time frame. The positive declining response was experience in the first time horizon. and a silence positive rise was notice during the fifth time frame and then it quickly decline to hit the bottom at sixth time frame before it negatively and insignificantly stretches to the seventh up tenth time horizon. This indicates that the reaction of exchange rate to oil price shock become stagnant for the rest of the time frame. It is a clear indication that exchange rate is negatively related to oil price shock in Ghana's economy within the study time frame. The result of the shock effect of oil price to gdp is demonstrated in (Figure. 5d). the response of gdp is highly volatile in the short time horizons. In the short run gdp react significantly positive and negative to one shock of oil price. until the fourth time frame where the impact become negative and stagnant all through the long run.

4.4 CUSUM Stability Test for oil Price and Inflation Models

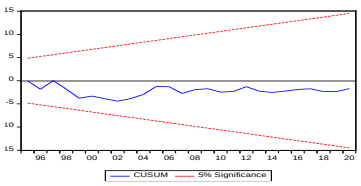

Fig: 4.4.1 --Algeria

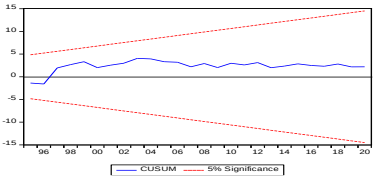

Fig: 4.4.2 –E/ Guinea

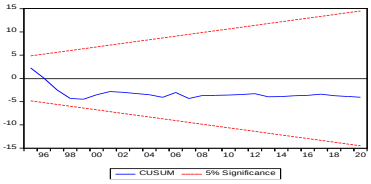

Fig: 4.4.3 --Nigeria

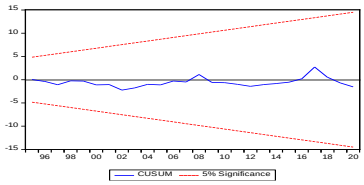

Fig: 4.4.4 --Egypt

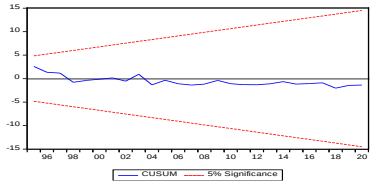

Fig: 4.4.5 -hana

Figure 4.4.1-5 presents CUSUM stability test for model analysing shock effect oil price on inflation of the countries under consideration viz a viz Algeria, Equatorial Guinea, Nigeria, Egypt and Ghana respectively. The model consists of inflation rate, exchange rate, gdp and oil price. The figures plot the results for CUSUM tests. The results indicate the absence of any instability of the coefficients because the plots of the CUSUM statistics fall inside the critical bands of 5 percent confidence interval of parameter stability. Therefore, there exists stability in the coefficients over the sample period for Algeria, Equatorial Guinea, Nigeria, Egypt and Ghana

5. CONCLUSIONS

5.1 Introduction

The study in general aimed at investigating the shock effects of macroeconomic variable on inflation in some selected oil producing African countries. Data for the study was analyzed using structural vector autoregressive (SVAR) model. the model consists of global oil price, Inflation rate, Interest rate, Exchange rate, and gross domestic product (GDP) countries under investigation

5.2 Summary of the Findings

Findings indicate that the responses of key macroeconomic variable to shock effect of global oil price is positively and negatively significant. The variables considered in among the selected African countries respond to a one shock of oil price in varying degree across the time horizon. Inflation, the target variable has a strong and positive response in line with a priori expectations. This result is in conformity with the study carried out by Riadh et.al. (2016)

5.3 Conclusions

The study examined the effect of macroeconomic shock on inflation in some selected oil producing African countries. Data spanning the period 1990 to 2020 is analyzed he study employed structural vector autoregressive (SAVR) to examine the shock effect of global oil price. The study identifies five oil producing African countries based on Ghura & Ppattig (2012) and Kelikume (2018) classification of a country as resource rich if export of non-renewable natural resources (oil) constitutes more than 25% of the country's total export. As such the study observed that countries under review are all integrated to global oil transection. Based on the findings the study concludes that macroeconomic variables induces inflationary pressure among selected oil producing African countries both in the short and long run. Findings of the study reveals that global oil price shock influences domestic inflation among oil producing African countries at different time horizon for the period under reviewed The implication of the finding is that fluctuation in global oil price would have a corresponding effect on domestic prices and economic wellbeing. This entails that due to shift in demand and supply for oil around the globe, there has been a significant swing in inflation rates of the countries under consideration.

5.4 Recommendation

Base on the conclusion, the study advances the following recommendation
Governments of oil producing African countries should put in place measures consistent with their economy peculiarities to arrest and subdue the effects of oil price shock on inflation. This can be facilitated by deregulation of the sectors to improve productivity, efficiency, managerial and administrative bureaucracy.

There is the need for oil producing African countries to address the issue bordering oil facilities to ensure availability and affordability of oil product. This can be possible by renovating the existing and rebuilding of new refineries where necessary. This measure could help mitigate and address the potential effects of globally determined commodity price particularly the oil price. It also caters for domestic oil demand and reduce unnecessary cost of refined oil importation by major marketers.

5.5 Limitations

Despite achieving the set objectives, there are certain limitations associated with the study. The study is earlier proposed to cover 1970 -2020. This period is assumed enough to get data of all the countries under review. The time frame of the study was also enough for normality purposes and econometric specification both at panel and time series analysis. but due to unavailability of required data from most countries, the period under review was slashed down 1990-2020

The study falls short of including some important variables. That was also constrained by inaccessibility and unavailability of data especially for the war affected countries. The study earlier intends to use GVAR methodology but due to the nature of third world countries data particularly of Africa and complexity in measurement, the study resort to other model suitable for the nature of our data.

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