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THE SHORT AND LONG RUN DYNAMICS OF MONETARY POLICY, OIL PRICE VOLATILITY AND ECONOMIC GROWTH IN THE CEMAC REGION

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ABSTRACT

The effects of shocks on oil prices will always attract the interest of researchers and policy makers as long as such countries are oil revenue dependent. This is the case in the Central African Economic and Monetary Community (CEMAC) where 70% of the regional countries are net oil income earners. In this study, an in-depth investigation was carried out on the short and long run dynamics between monetary policy, oil price volatility and economic growth in the oil producing CEMAC countries. The target countries are Cameroon, Chad, the Democratic Republic of Congo, Equatorial Guinea, Gabon and the Republic of Congo, and the data for the study covered 1980-2018, a period of 38 years. The study employed the panel autoregressive distributed lag model for the short- and long-run dynamics, while a structural vector autoregressive (SVAR) model was employed for shocks and spillover effects. The results identified oil price volatility, GDP growth rate and exchange rate as highly influential variables in the long run, while exchange rate and GDP growth rate only have significant short run influences on monetary policy rates in the region. The countries of the region need to intensify efforts towards the diversification of individual economic base, reduce the importation of foreign goods and formulate monetary policies that will strengthen their currencies and boost the growth potential in the communities.

Contribution/Originality: This study contributes to the existing literature on the dynamics of monetary policy, oil price volatility and economic growth in oil producing CEMAC countries. It points out the continued degradation of foreign exchange reserves resulting from continuous low oil and commodity prices and provides valuable policy recommendations for oil revenue dependent countries.

1. INTRODUCTION

The short and long run relationships between monetary policy dynamics, oil price volatility and economic growth in an oil dependent country or economic bloc will always attract the interest of researchers as long as the implication of shocks to oil price remains obvious. The current ongoing adverse effects of the COVID-19 pandemic that has thrown the global economy into recession. For the first time since the great recession of 1929, the price of oil hit negative values this year (20/04/2020 – $17.36 and 21/04/2020 – $9.12) as a result of a massive spike in COVID-19 cases, leading to less or no demand for oil products. Expected to be worst hit as a region is the Communauté Économique et Monétaire de l'Afrique Centrale (CEMAC), where six out of the nine countries account for 70% of the countries that are net oil income earners, thereby making their economies susceptible to oil price volatility. As noted by Assoumou-Ella (2018), lack of diversification by governments in the CEMAC region could trigger the existing economic and political challenges of the region in the face of a shock to oil prices. Until now, only Cameroon was adjudged to have a relatively diversified economy and its implementation of reforms were certified to be satisfactory (African Development Bank, 2018). Omolade and Ngalawa (2017) observed in their study that an environment where a flexible exchange rate operates may enhance economic growth in the face of a sudden drop in oil price. However, this is not the case in this region whose currency is pegged to the Euro CFA franc.

There is plenty of evidence that shows the connection between monetary policy dynamics, oil price volatility, economic growth, and other macro-economic variables (see Al-Ezzee, 2011; Bala & Chin, 2018; Gershon, Ezenwa, & Osabohien, 2019; Olayungbo, 2019; Schubert & Turnovsky, 2011), but opinions differ on the dimension and direction of such relationships (Bala & Chin, 2018; Belke & Awad, 2014; Ianchovichina, Loening, & Wood, 2015; Kamman, 2014). The measurements of these variables have also produced different results, thereby creating doubt about the best measurement and which variable constitutes short or long run in the dynamics of monetary policy. Some studies used global oil prices in their analysis (Basnet & Upadhyaya, 2015; Lamotte, Porcher, Schalck, & Silvestre, 2013; Valcarcel & Wohar, 2013), while others employed an individual country's crude oil price (Bala & Chin, 2018; Lamotte et al., 2013). For instance, Bala and Chin (2018) applied three different types of oil prices, namely the OPEC basket oil price, the oil price of an individual country and average of the Brent and WTI, and the Dubai oil price in their study and discovered that exchange rate, money supply and GDP have a positive relationship with inflation, while food production was negatively related to inflation. Also, Gao, Kim, and Saba (2014) applied monthly data in their study, while Basnet and Upadhyaya (2015) employed quarterly data and observed that shocks to oil prices did not have any long-term impact on economic growth.

Furthermore, opinions differ about the relationship between monetary policy dynamics and other economic variables, such as inflation, output, exchange rate and fiscal policy. The reason for this could be as a result of differences in the methods of approach, measurement of variables, and time frame, which are fundamental (see Chaudhry, Qamber, & Farooq, 2012; Davoodi, Dixit, & Pinter, 2013; Dele, 2007; Fasanya, Onakoya, & Agboluaje, 2013; Jawaid, Qadri, & Ali, 2011; Milani & Treadwell, 2012). For instance, the study by Davoodi et al. (2013) on East Africa Community produced different results from the two different approaches employed in the study. Their study discovered that the monetary policy transmission effect is generally weak if the standard statistical inferences are employed on economic variables but somehow stronger if the non-standard inference method is applied (also see (Kamman, 2014; Lashkary & Kashani, 2011).

Monetary and economic blocs have historical linkage not only in developed economies such as the Northern Atlantic Trade Organization (NATO), the Association of Southeast Asian Nations (ASEAN) and the European Union (EU), but also in less developed and developing economies of Africa, such as the East African Community (EAC), the Economic Community of West African States (ECOWAS), and the Southern African Development Community (SADC) as well as CEMAC, which is the focus of this study. However, the origin of today's CEMAC can be traced back to 1964 when the L'Union des États d'Afrique Centrale was established. In 1994 however, it was changed to the Communauté Économique et Monétaire de l'Afrique Centrale (CEMAC) as a result of reforms aimed at not only harmonizing indirect forms of taxation but also creating a common external tariff for the zone apart from the Central African Republic, Cameroon, Chad, Equatorial Guinea, the Republic of the Congo, and Gabon who are net oil exporters.

In this study, we examined the short run and long run relationships using autoregressive distributed lag between monetary policy, oil price volatility, economic growth and other control variables of inflation rate, money supply, growth rate, exchange rate, government expenditures and commodity price volatility. We chose CEMAC because almost 70% of the countries in the region are net oil income earners. This makes their economies susceptible to oil price volatility, which had led to the depletion of the reserves of member countries in recent decades (African Development Bank, 2018). Additionally, shocks to oil prices have made it impossible for member countries to implement vital structural monetary policies to enhance sustainable and all-inclusive growth of the region. Available statistics show that in 2015, CEMAC recorded a trade deficit of -6.6% of the GDP resulting from low commodity prices. Between 2016 and 2017, the inflation rate in these countries rose from 2.6% to 10.1%. Therefore, this study will shed more light on the subject matter at hand.

2. DATA AND METHODOLOGY

In this study, GDP is used as proxy for economic growth for the period between 1980 and 2018, while monetary policy (MPR) is the dependent variable. The data were sourced from the World Development Indicator. The panel unit root tests used for the study are the popular Im–Pesaran–Shin (IPS) and augmented Dickey–Fuller (ADF) tests. The need to test for the presence of a unit root is to ensure that each of the variables used is stationary to avoid spurious regression. Hence, a panel unit root test is known for taking into consideration the features of the data in the panel before advancing to test the panel cointegration. A variable, as noted by Engle and Granger (1987), may not be stationary, but the linear combination of the non-stationary variables may be stationary and is the reason to test for cointegration. Apart from the fact that it is suitable to establish the stationarity of variables in panel data, the IPS test is also preferred generally due to its small sample property (Maddalla & Wu, 1999; Pesaran, Im, & Shin, 2003). The IPS test is computed as the average augmented Dickey–Fuller statistics, and its basic specification is given as per equation (1):

$$\Delta y_{i,t} = \alpha y_{i,t-1} + \sum_{j=1}^{p_i} \gamma_{ij} \Delta y_{i,t-j} + \beta_0 + \beta_1 t + \beta_1 x_{i,t} + \varepsilon_{i,t} \qquad (1)$$

Where β_o is the intercept; $\Delta y_{i,t}$ is the regressand; $x_{i,t}$ represents the regressors; ρ_i is the needed lag length; and $\beta_i t$ is time trend. The required null hypothesis under the IPS is expressed as H_0: $\alpha_1 = 0$ for every 'i' and H_1: $\alpha_1 < 0$ for the alternative hypothesis. The Akaike information criterion (AIC) is used for lag length selection. The variables to be tested for and considered in this study are monetary policy rate (MPR), gross domestic product growth rate (GDPGR), inflation (INF), exchange rate (EXR), money supply (MSGR), government expenditure (GE), capital formation (K), net domestic credit (NDC), commodity price (COMPVOL) and oil price (OILPVOL).

3. DISCUSSION OF RESULTS

Based on the results obtained in Table 1, *NDC, EXR, MPR, K and GE* are not stationary in levels, but are converted and made stationary after their first differencing, that is I(1) and none is I(2).

Table-1. IPS and ADF - Fisher chi-square unit root tests.

Variable	IPS unit root test			ADF - Fisher chi-square unit root test		
	t* Statistics	P-Value	Order of Integration	t* Statistics	P-Value	Order of Integration
MPR	-5.9188	0.000***	I(1)	246.0289	0.000***	I(1)
GDPGR	-4.3266	0.000***	I(0)	143.2281	0.000***	I(0)
EXR	-4.5302	0.000***	I(1)	142.3679	0.000***	I(1)
INF	-4.3807	0.006***	I(0)	130.1516	0.000***	I(0)
GE	-4.8905	0.000***	I(1)	169.4340	0.000***	I(1)
K	-5.7102	0.000***	I(1)	237.1776	0.000***	I(1)
MSGR	-4.5133	0.000***	I(0)	158.3744	0.000***	I(0)
NDC	-4.8641	0.000***	I(1)	194.0180	0.000***	I(1)
DUM	-5.8310	0.000***	I(1)	294.7543	0.000***	I(1)
OILPVOL	-3.9879	0.000***	I(0)	104.3020	0.000***	I(0)
COMPVOL	-3.6001	0.000***	I(0)	82.5095	0.000***	I(0)

Note: "***" "**" and "*" represent statistical significance at 1%, 5%, and 10%, respectively. Each model includes trend and constant terms.
MPR is the monetary policy rate, GDPGR is the GDP growth rate, EXR is the exchange rate, INF is inflation rate, GE is government expenditure, K is capital formation, MSGR is money supply growth rate, NDC is net domestic credit, OILPVOL is oil price volatility and COMPVOL is commodity price volatility.
Source: Authors' computation using data from World Bank Indicators.

As shown in the table, the dependent variable is I(1), which satisfies the Pesaran et al. (2003) condition for testing and running an ARDL model in order to achieve a better estimate. The P-values are shown at the 1%, 5% and 10% significance levels, which show that all the variables are statistically significant and stationary.

Having ascertained the nature of the panel data regarding all the series used in this study, all variables were treated as I(1) and I(0). This result paves the way for a panel cointegration test using the ARDL approach. This approach further requires that the dependent variable should be non-stationary in levels, hence MPR, which is the dependent variable, is non-stationary in level but stationary after the first difference. It is clear that the results of the unit root tests indicate that the panel ARDL (P-ARDL) approach is more suitable than any other method, such as the Engle-Granger and Johansen cointegration method, not only because it does not require series to be order of one, but also because of its fitness for both large and small sample sizes (Bahmani-Oskooee & Hegerty, 2009).

3.1. Panel ARDL Cointegration Results

The panel ARDL comprises the dynamic regression results for both short and long run relationships between monetary policy dynamics as approximated by MPR and other identified variables.

Table-2. Panel ARDL dynamic regression for short run and long run estimates.

Dependent variable: (Differenced MPR) DMPR				
Method: ARDL				
Sample: 1980-2018				
Model selection method: Akaike Info Criterion (AIC)				
Selected model: ARDL (2, 2, 2, 2, 2, 2, 2, 2)				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.***
Long Run Equation				
GDPGR	0.062433	0.018483	3.377818	0.0009
EXR	0.006932	0.002074	3.341740	0.0011
MSGR	0.009243	0.022647	0.408151	0.0438
COMPVOL	0.056647	0.047620	1.189552	0.2361
OILPVOL	0.117125	0.066384	1.764357	0.0497
DUM	-0.015046	0.005553	-2.709457	0.0076
Short Run Equation				
COINTEQ01	-0.229335	0.084409	-2.716962	0.0074
D(MPR(-1))	0.040331	0.115738	0.348469	0.7280
D(GDPGR)	-0.025729	0.013368	-1.924608	0.0562
D(GDPGR(-1))	-0.016008	0.016813	-0.952110	0.3426
D(EXR)	0.005408	0.002647	2.043327	0.0428
D(EXR(-1))	-0.000790	0.003091	-0.255435	0.7987
D(MSGR)	0.212445	0.144027	1.475032	0.1423
D(MSGR(-1))	0.111829	0.086992	1.285515	0.2006
D(COMPVOL)	-0.001412	0.009019	-0.156557	0.8758
D(COMPVOL(-1))	0.017810	0.009335	1.907795	0.0584
D(OILPVOL)	-0.008586	0.017887	-0.480021	0.6319
D(OILPVOL(-1))	-0.027544	0.015364	-1.792738	0.0751
K	0.315287	0.675951	0.466434	0.6416
GE	0.884937	2.423264	0.365184	0.7155
NDC	-5.98E-13	1.22E-12	-0.490247	0.6247
INF	-0.007620	0.027546	-0.276629	0.7825
DUM	-0.015046	0.005553	-2.709457	0.0076
C	3.076532	1.428749	2.153305	0.0329
Error Correction Coefficient				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
ECT (-1)	-0.229335	0.084409	-2.716962	0.0074

The results in Table 2 show the short and long run dynamics between oil price volatility, monetary policy and economic growth. According to the results, GDP growth rate, exchange rate, money supply growth rate and oil price volatility are the main influencing variables. Specifically, the results indicate that all these variables have a significant long-run impact on monetary policy dynamics. Other variables that were missing from the table were not considered to be significant and therefore did not form part of the influencing policy variables within the bloc. Furthermore, the estimated default parameter of the short run value (COINTEQ01), which is negative and statistically significant, is another indication that this model is appropriate and cointegrated.

However, exchange rate and GDP growth rate have significant short-term impacts on monetary policy dynamics in the region. The implication of these results is that the impacts of exchange rate and GDP growth rate on the monetary policy dynamics is sustained from the short run through to the long run period. This means that the findings from this analysis have underscored the importance of exchange rate, output, money supply, oil price and financial crisis as important variables that are responsible for monetary policy dynamics in CEMAC.

A further test to confirm the cointegration among the variables is the error correction term (ECT) (Engle & Granger, 1987). As shown in Table 2, the negative coefficient sign of the ECT shows that there was disequilibrium in the past and the adjustment helped it to move in the right direction. Not only that, the ECT value of 0.229 suggests the relatively low speed of adjustment from the short run deviation to the long run equilibrium of the monetary policy rate. More precisely, it indicates that about 23% deviation from the long run monetary policy rate in CEMAC is corrected in the dynamic model annually, or that the system is being adjusted towards long run equilibrium at the speed of about 23% per year. In addition, the ECT is statistically significant at the 5% level, indicating that long run equilibrium can be attained. These results are consistent with those found by Rabbi and Waliullah (2011) and Banerjee, Dolado, and Mestre (1998) where it was argued that a well signed and significant error correction term is further proof of the existence of a stable long run relationship. This result further confirms that there will be convergence (steady state) of the system and attainment of stable monetary policy rates in CEMAC in the long run.

3.2. Measuring the Strength of the Panel ARDL Regression Model

To further lend credence to the strength of the Akaike information criterion (AIC) model over others, such as the Schwarz information criterion (SIC) and the Hannan–Quinn information criterion (HQC), in the regression and also when determining the long and short run relationships in this study, the criteria table was employed to determine the top panel ARDL models.

Table-3. Summary of Lag selection and Wald tests.

Model	LogL	AIC*	BIC	HQ	Specification
4	-287.213834	3.148631	5.017815	3.899044	ARDL (2, 2, 2, 2, 2, 2)
2	-299.448799	3.179771	4.942902	3.887606	ARDL (1, 2, 2, 2, 2, 2)
1	-353.984488	3.286651	4.519517	3.781604	ARDL (1, 1, 1, 1, 1, 1)
3	-346.176512	3.288063	4.626982	3.825592	ARDL (2, 1, 1, 1, 1, 1)
	Wald test for the dynamic panel cointegration				
	Test Statistics	**Value**	**Df**	**Probability**	
	F-statistics	10.24504	(2, 147)	0.0001	
	Chi-square	20.49007	2	0.0000	
	Null Hypothesis: C(1)= 0, C(3) = 2*C(4) Null Hypothesis Summary:				
	Normalized Restriction (= 0)		**Value Std. Err.**		
	C(1)		0.062433 0.018483		
	C(3) – 2*C(4)		0.122536 0.101231		

Based on the benchmark analysis for the model that says the lower the value, the better the model, the fourth one is the most suitable for the estimation, since it has the lowest AIC value of 3.148631.

Table 3 also shows the result of the Wald test. Apart from the fact that the Wald test is necessary to support the existence of cointegration among the variables, it also investigates the validity of the panel ARDL dynamic regression. The result also confirmed the existence of cointegration among the variables in the regression model. Since the p-value is less than 0.05, the null hypothesis of no cointegration can be rejected in favor of the existence of a long run relationship. In addition, the value of the F-statistic (10.24) is not only positive but also larger than the Pesaran upper band critical value of 4.09, even at less than the required 5% level. Consequently, it can be concluded that there is a long run relationship between monetary policy rate and other variables.

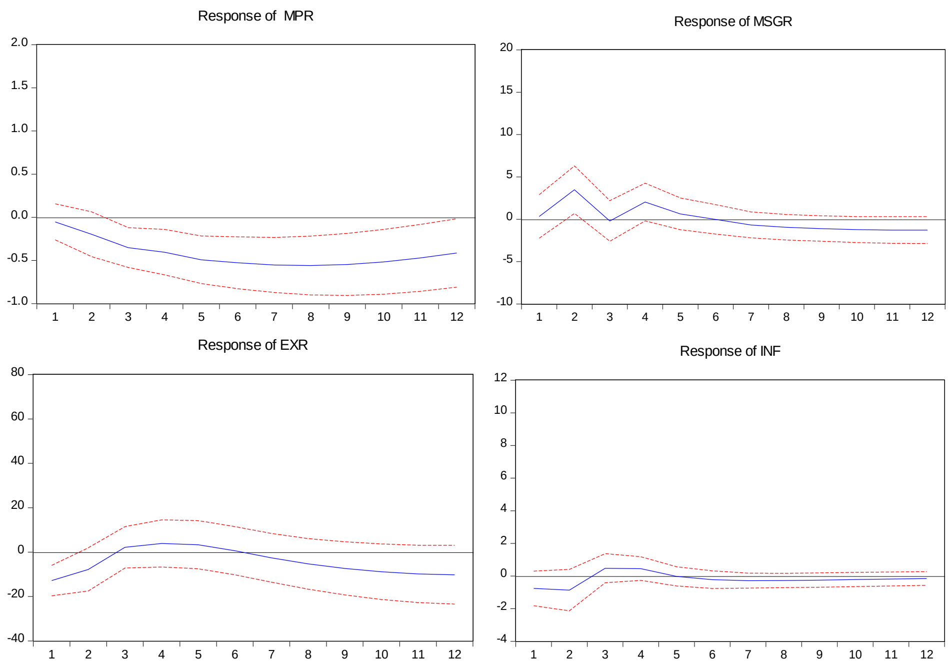
3.3. Impulse Response Analysis

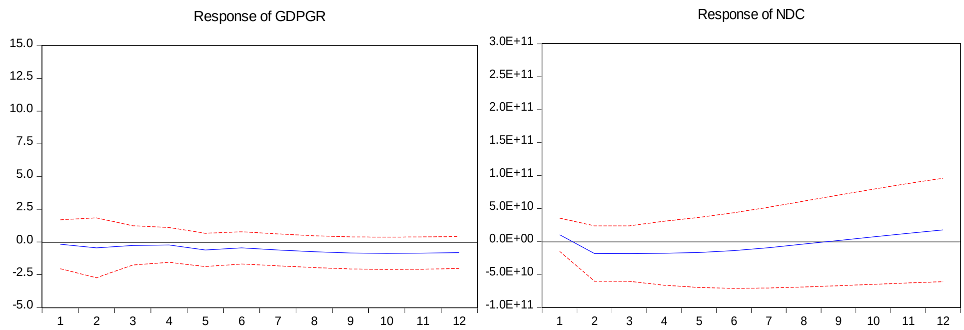
The impulse response function describes the short run interaction among the macroeconomic variables and MPR. It shows the behavior of the variables to a 1% standard deviation in oil price. The analysis is purely based on a short run since many of the previous conclusions were mostly based on long runs. The horizontal axis represents a time scale of twelve months, while the vertical axis shows the degree of responsiveness of the variable to possible shocks. The dotted lines indicate the analytical confidence intervals derivable from variance-covariance matrices.

The results from Figure 1 indicate that all the variables behave differently to the shocks from oil price and monetary policy. For instance, the response of MPR is significant and contemporaneous. Shocks in oil price caused it to fall initially and started rising after the eighth period. The impact of money supply was only significant towards the end of the period with an undulating response between the first and the sixth period, and for exchange rate, the effect was not significant after the earliest period until the ninth period.

However, other variables such as NDC, GDPGR and INF failed to show noticeable significant responses to oil price shock in the short run. Their responses were sluggish, especially in the early periods, with inflation showing no response up to the later period. Notwithstanding, the long run effect has been shown to be significant, especially for the GDPGR in the previous analysis.

Response to oil price shock





Response to monetary policy rate shock

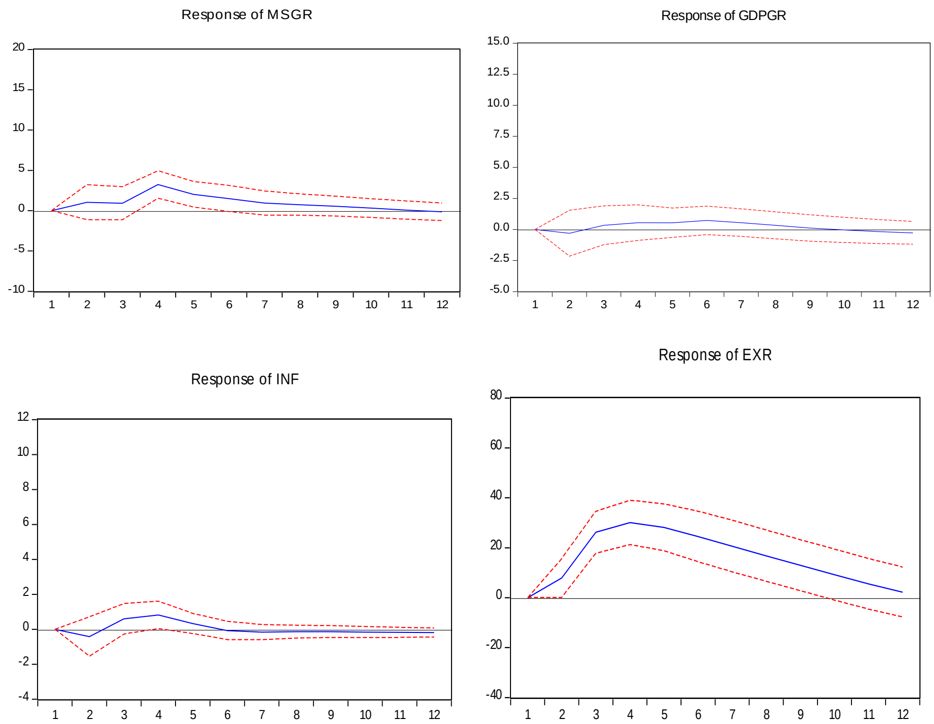


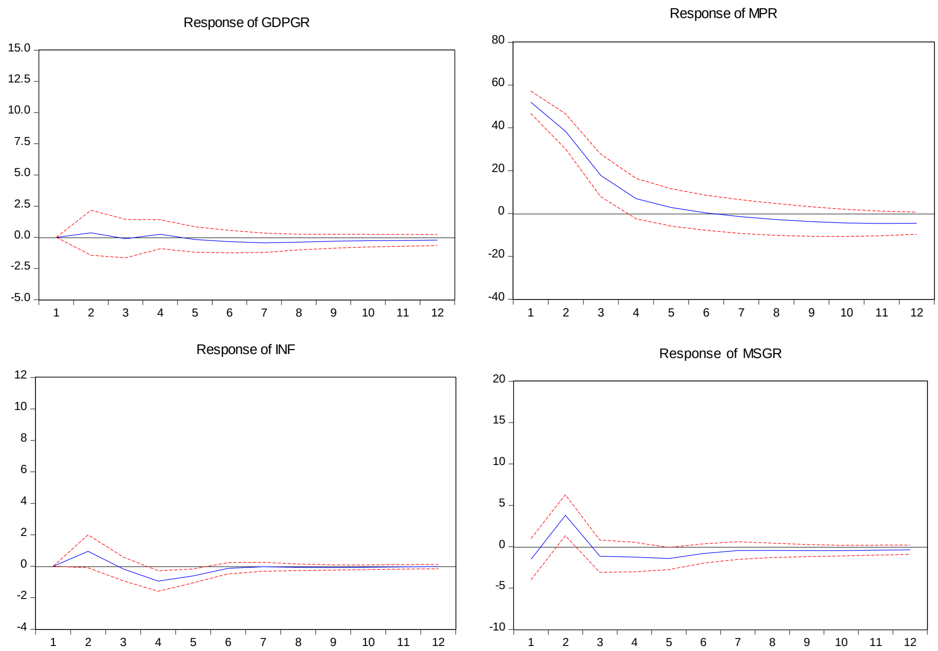
Figure-1. Response to oil price and monetary policy rate shocks.

Again, the results have further given priority to oil price as an important factor that can affect policy dynamics in the short run in the CEMAC region.

In response to the monetary policy rate, which is the key variable in this analysis, its responses to other variables and to shock are also relevant to this study.

The behavior of the variables to a 1% standard deviation in MPR shows that exchange rate demonstrates the most significant response, followed by money supply growth rate and inflation rate. The implication is that monetary policy plays a significant role in the exchange rate policy of the CEMAC region. The exchange rate responds significantly to shock from MPR more than any other variable in the model. The response shows that the positive shock caused the exchange rate to first depreciate and later appreciate significantly. However, the shock caused money supply to fall significantly; the interaction shows that the fall in money supply as a result of the positive shock to MPR leads to currency appreciation. The result has shown that exchange rate and money supply are significantly affected whenever there is a shock to the MPR.

Response to exchange rate shock



Response to commodity price shock

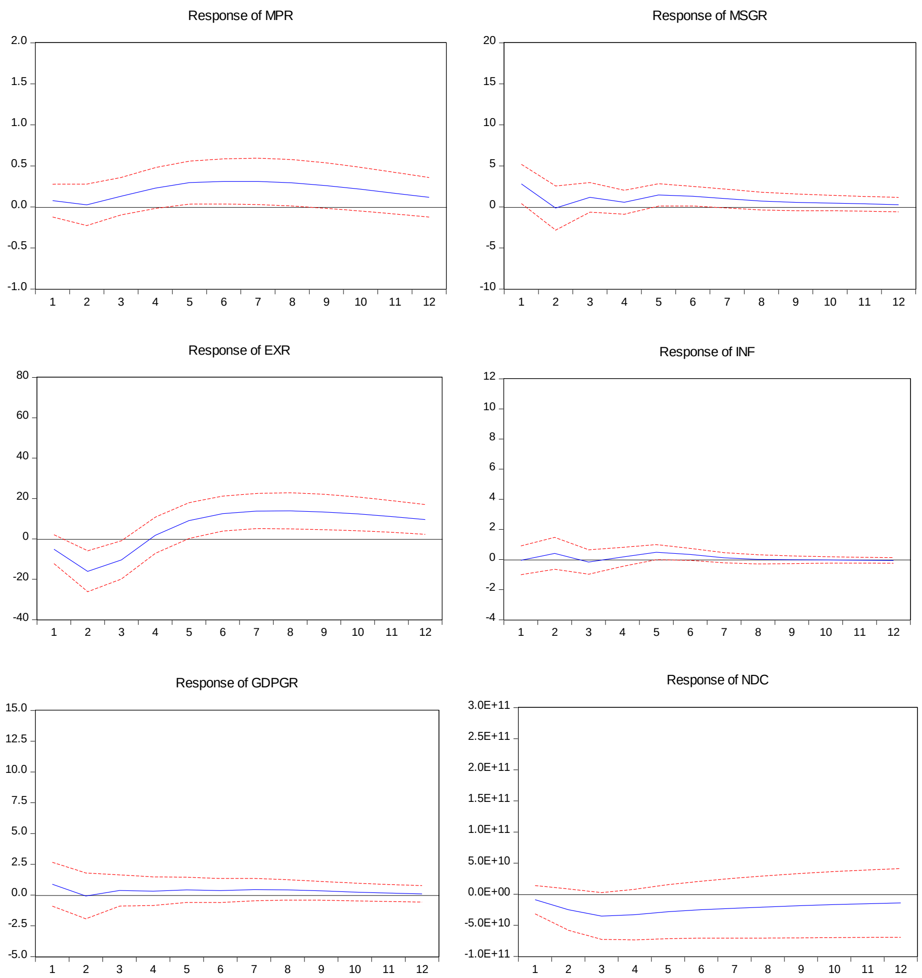


Figure-2. Response to exchange rate and commodity price shocks

Figure 2 demonstrates the responses of the variables to a 1% standard deviation in exchange rate and commodity price variation. The result replicated what was obtained for MPR shock. The response of MPR to exchange rate shock was the most pronounced and the most significant. This was followed by money supply and inflation rate, respectively. The situation in the impulse response function is that a sharp currency depreciation is a result of a significant fall in the MPR, and money supply and inflation rise. However, the GDPGR appears to fall as a result of this trend, but not significantly.

One exogenous variable used in this study was commodity price and the responses of the variables to its shock are also contained in Figure 2. It explains the responses of the variables to a 1% standard deviation in commodity price. The result is similar to what was obtained for oil price shock. The response of MPR to the shock was the most pronounced, followed by exchange rate and money supply. The responses of GDPGR and INF were also sluggish for the larger part of the period. The response of NDC was on the downward trend in the early period before it started rising almost unnoticeably thereafter. The shock caused the MPR and exchange rate to rise significantly. This result again underscores the importance of commodity price changes in the determination of monetary policy dynamics in this economic region.

3.4. Variance Decomposition

Variance decomposition explains the contributions of each shock to the behavior of a particular variable in the SVAR model. Here, shocks by variables relevant to this study are reported, starting with the variance decomposition of MPR and EXR.

Table-4. Variance Decomposition of MPR.

Period	S.E.	OILP	COMP	NDC	GDPGR	INF	EXR	MSGR	MPR
3	2.051322	3.921662	0.562226	0.090548	2.244474	0.235722	5.122908	1.229890	86.59257
6	2.567185	12.89685	3.959389	0.975066	2.988635	1.034591	3.382283	0.948110	73.81508
9	2.855632	21.66313	6.277719	2.351454	3.098184	1.126406	3.382109	0.874960	61.22604
12	3.029279	26.43405	6.539292	3.450214	2.792105	1.048995	3.529960	0.786696	55.41868
Variance Decomposition of EXR									
3	77.50067	3.834241	6.528161	0.323722	0.640405	1.096875	74.63449	0.504091	12.43801
6	93.68880	2.925293	7.218503	0.600908	1.303432	1.077170	51.70904	0.487237	34.67842
9	102.5553	3.284982	11.35162	0.526985	2.415215	1.178762	43.38883	0.594028	37.25958
12	107.0244	5.452243	13.63812	0.656824	2.761270	1.200870	40.38040	0.655395	35.25488

Table 4 is an affirmation of the influence of oil price volatility on the behavior of monetary policy in this region. From the table, apart from its own shock, oil price had the largest influence on the dynamics of monetary policy, as stated earlier. The reason for this might be connected with the fact that six of the eight countries that belong to this economic bloc are net oil exporters. In the first quarter of the period, oil accounted for a 3.92% fluctuation in monetary policy and increased to 12.89% in the second half of the period. By the end of the period however, the fluctuation was more than double its mid-period response. This result supports the findings under the impulse response function where a sharp and significant response to oil price shock was shown by MPR. Other noticeable responses ware those from exchange rate, GDPGR and commodity prices. Within the first period, there was a quick response from exchange rate of 5.12%, but later fell to 3.53% at the end of the period. GDPGR accounted for 2.24% in the first period and maintained that range until the end of the period. Also, commodity prices had a 6.54% response to shock at the end of the period.

Regarding exchange rate, the table shows that apart from its own shock, MPR dictated the behavior of exchange rate, thus supporting the findings under the impulse response function. The result showed that MPR contributed more shock to the behavior of exchange rate than oil price. The implication of this result, if compared with the previous result, is that the medium through which oil price affects the economies of the CEMAC region, is MPR and from MPR to exchange rate. Within the first period, there was a response of 12.44% from MPR and by the end of the period it had almost tripled with a 35.25% fluctuation. Following MPR is the commodity price with a 6.53% response in the early period, but more than double by the end of the period at 13.64%, and 4.45% was accounted for by oil price at the end of the period.

Table-5. Variance Decomposition of GDPGR.

Period	S.E.	OILP	COMP	NDC	GDPGR	INF	EXR	MSGR	MPR
3	14.02095	0.153164	0.467139	0.053101	92.22335	0.268841	6.655496	0.074230	0.104682
6	14.51175	0.445333	0.626769	0.082237	89.68645	1.028282	7.333962	0.168563	0.628407
9	14.69305	1.191977	0.836143	0.157987	88.16731	1.060219	7.411092	0.366286	0.808986
12	14.79845	2.151562	0.867264	0.211376	87.04155	1.069567	7.368642	0.444120	0.845922
Variance Decomposition of OILP									
3	18.01798	89.11240	7.152259	1.376543	0.011445	0.268542	0.610103	0.220885	1.247824
6	23.17097	88.29474	7.187707	1.803698	0.024741	0.420070	0.372952	0.145024	1.751066
9	25.67080	85.18269	7.180699	1.818516	0.164726	0.384141	0.309697	0.130728	4.828804
12	26.88582	81.25100	7.618365	1.694445	0.493181	0.352969	0.284609	0.167269	8.138159

Table 5 shows the behavior of economic growth as represented by GDPGR. The results indicate that, apart from its own shock, exchange rate contributes the largest shock to the behavior of GDPGR in the short run, with 6.66% in the early period and 7.37% by the end of the period. This further shows that the mediums through which the exogenous shock affects the CEMAC economies are MPR and EXR. All other variables did not account for any noticeable fluctuation, with oil price accounting for a paltry 0.15% at the beginning of the period and 2.15% by the end of the period. Inflation's contribution was 1.07% at the end of the period.

The table further shows that apart from their own shock, commodity price and MPR were the two variables that showed signs of responses to shock from oil price. The response from oil price maintained almost the same degree throughout the period, while MPR became pronounced after the third quarter. Other variables' responses were not significant throughout the period.

4. CONCLUSION

The main preoccupation of this study was to investigate the short and long run relationships between monetary policy dynamics, oil price volatility, and economic growth, in the oil producing CEMAC countries. The results identified GDP growth rate, exchange rate, money supply, financial crisis and oil price volatility as major influencing variables of monetary policy dynamics within the region. By implication, exchange rate and GDP growth rate only had significant short-run impacts on monetary policy dynamics, while the analysis further underscored the importance of exchange rate, output, money supply, oil price volatility and financial crisis as important variables that affect monetary policy dynamics.

This suggests that the impacts of exchange rate and GDP growth rate on monetary policy dynamics are sustained from the short-run through to the long-run period. While appropriate monetary policy will reduce importation of foreign goods into these countries and boost growth potential, efforts should be intensified to diversify the economic base of each of the countries. This will strengthen the local currencies against any external shock in oil prices in the international market. With the exception of Cameroon, all of the countries under consideration had a weak diversification status. The current business reforms being undertaken by many of the countries in the region, such as the Gabon's new industrial policy, should be sustained.

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REFERENCES

African Development Bank. (2018). Central Africa economic utlook 2018. Macroeconomic developments and poverty, inequality, and employment. Managing Forestry's Potential.

Al-Ezzee, I. (2011). *Real influences of real exchange rate and oil price changes on the growth of real GDP: Case of Bahrain*. Paper presented at the International Conference of Management and Service Science IPEDR 8, Wuhan, China, August. 12–14.

Assoumou-Ella, G. (2018). Forecasting CEMAC's foreign exchange reserves in presence of unanticipated changes in oil prices: An interrupted time series modelling. *Journal of Central Banking Theory and Practice*, *8*(2), 65-83.

Bahmani-Oskooee, M., & Hegerty, S. W. (2009). The effects of exchange-rate volatility on commodity trade between the U.S. and Mexico. *Southern Economic Journal*, *75*(4), 1019-1044.

Bala, U., & Chin, L. (2018). AsymmAsymmetric impacts of oil price on inflation: An empirical study of African OPEC member countries. *Energies*, *11*(11), 1-21.

Banerjee, A., Dolado, J., & Mestre, R. (1998). Error-correction mechanism tests for cointegration in a single-equation framework. *Journal of Time Series Analysis*, *19*(3), 267-283.

Basnet, H. C., & Upadhyaya, K. P. (2015). Impact of oil price shocks on output, inflation and the real exchange rate: Evidence from selected ASEAN countries. *Applied Economics*, *47*(29), 3078-3091.

Belke, A., & Awad, J. (2014). On the pass-through of food prices to local inflation in MENA countries. *WSEAS Trans. Business Economics*, *38*, 307–316.

Chaudhry, I. S., Qamber, Y., & Farooq, F. (2012). Monetary policy, inflation and economic growth in Pakistan: Exploring the co-integration and causality relationships. *Pakistan Journal of Commerce and Social Science*, *6*(2), 332-347.

Davoodi, M. H. R., Dixit, M. S., & Pinter, G. (2013). Monetary transmission mechanism in the East African community: An empirical investigation. (No. 13-39). International Monetary Fund.

Dele, B. E. (2007). Monetary policy and economic performance of West African monetary zone countries. Munich Personal RePEc Archive. No. 4308.

Engle, R. F., & Granger, C. W. (1987). Co-integration and error correction: Representation and testing. *Econometrica*, *55*(2), 251-276.

Fasanya, I., Onakoya, A., & Agboluaje, M. A. (2013). Does monetary policy influence economic growth in Nigeria? . *Asian Economic and Financial Review*, *3*(5), 635-646.

Gao, L., Kim, H., & Saba, R. (2014). How do oil price shocks affect consumer prices? *Energy Economics*, *45*, 313-323.

Gershon, O., Ezenwa, N. E., & Osabohien, R. (2019). Implications of oil price shocks on net oil-importing African countries. *Heliyon*, *5*(8), 1-12.

Ianchovichina, E., Loening, J., & Wood, C. (2015). How vulnerable are Arab countries to global food price shocks? World Bank Policy Research Working Paper No. 6018; World Bank: Washington, DC, USA.

Jawaid, S. T., Qadri, F. S., & Ali, N. (2011). Monetary-fiscal-trade policy and economic growth in Pakistan: Time series empirical investigation. *International Journal of Economics and Financial Issues*, *1*(3), 133-138.

Johansen, S. (1988). Statistical analysis of cointegration vectors. *Journal of Economic Dynamics and Control*, *12*(2-3), 231-254. Available at: https://doi.org/10.1016/0165-1889(88)90041-3.

Kamman, C. K. (2014). The effects of monetary policy on economic growth in Kenya. *International Journal of Business and Commerce*, *3*(8), 11-24.

Lamotte, O., Porcher, T., Schalck, C., & Silvestre, S. (2013). Asymmetric gasoline price responses in France. *Applied Economics Letters*, *20*(5), 457-461. Available at: https://doi.org/10.1080/13504851.2012.714063.

Lashkary, M., & Kashani, B. H. (2011). The impact of monetary variables on economic growth in Iran: A monetarists' approach. *World Applied Sciences Journal*, *15*(3), 449-456.

Maddalla, G., S., & Wu, S. (1999). A comparative test of unit root with panel data. *Oxford Bulletin of Economics and Statistic*, *19*(9), 0305-9049.

Milani, F., & Treadwell, J. (2012). The effects of monetary policy "news" and "surprises". *Journal of Money, Credit and Banking, 44*(8), 1667-1692. Available at: https://doi.org/10.1111/j.1538-4616.2012.00549.x.

Olayungbo, D. (2019). Effects of global oil price on exchange rate, trade balance, and reserves in Nigeria: A frequency domain causality approach. *Journal of Risk and Financial Management, 12*(1), 1-14. Available at: https://doi.org/10.3390/jrfm12010043.

Omolade, A., & Ngalawa, H. (2017). Monetary policy transmission mechanism and growth of the manufacturing sectors in Libya and Nigeria: Does exchange rate regime matter? *Journal of Entrepreneurship, Business and Economics, 5*(1), 67–107.

Pesaran, M. H., Im, K. S., & Shin, Y. (2003). Testing for unit roots in heterogeneous panels. *Journal of Econometrics, 115*(2), 53-74.

Rabbi, F., & Waliullah, W. (2011). Effectiveness of monetary policy in Pakistan: Empirical evidences based on bound test approach. *International Journal of Business and Social Science, 2*(1), 190-199.

Schubert, S. F., & Turnovsky, S. J. (2011). The impact of oil prices on an oil-importing developing economy. *Journal of Development Economics, 94*(1), 18-29.

Valcarcel, V. J., & Wohar, M. E. (2013). Changes in the oil price-inflation pass-through. *Journal of Economic Business, 68*, 24–42.