

The effect of monetary policy on the balance of payments vulnerability in the CEMAC zone



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ABSTRACT

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The main objective of this study was to examine the effects of monetary policy on the vulnerability of balance of payments in the CEMAC zone. Data for this study was obtained from the World Development Indicators (WDI) and World Governance Indicators (WGI) databases which are World Bank databases and also from IMF country reports spanning from 1996 to 2020. The ARIMA model used to generate the balance of payments vulnerability while the Panel Tobit model was used to estimate the model. The results revealed that monetary policy has a negative and significant effect on balance of payments vulnerability in the CEMAC zone. This finding was consistent with the results of the correlated panels corrected standard errors (PCSES) regression model for robustness which also revealed that monetary policy has a negative and significant effect on the balance of payments vulnerability in the CEMAC zone. It was recommended that the monetary authority should make policies that would give viable balance of payments for the CEMAC countries, such as increasing the country's international competitiveness; that is, investing on projects that are productive in order to increase productivity. Secondly, we also recommended that more efforts be put in order to abandon the Franc de la Communauté Financière Africaine (Franc CFA) and move to a currency that will provide the region with some level of autonomy in the financial sector.

Contribution/ Originality: This study contributes to the literature by using a unique dimension of the balance of payments (BOP) and employing the ARIMA model to generate vulnerability of BOP and consequently using the Tobit panel technique to examine the effect of monetary policy on the BOP vulnerability in the CEMAC zone. Consequently, its reliability and contemporariness cannot be questioned.

1. INTRODUCTION

Monetary policy is particularly significant in developing economies such as those in the CEMAC zone because it is a key driver of economic growth (Tailor, 2004). Monetary policy, in general, refers to a set of measures designed to regulate the quantity, quality, and value of money in an economy based on the expected level of economic activity (Nnanna, 2001). For most economies; including those in the CEMAC zone; the main objectives of monetary policy are output growth, job creation, price stability, and maintaining the equilibrium of the balance of payments. According to Gbosi (2002) controlling the money supply is the aim of monetary policy in order to counteract any unfavorable trends in the economy. These unfavorable trends may include imbalances in the balance of payments, poor economic development, unemployment, and inflation.

Crisis involving currencies and balances of payments has become more common in emerging nations in recent years. Even more concerning, the crises have spread to other emerging nations, disrupted their economies severely, and even had an impact on developed nations. Certain crises have also struck nations with robust economies in ways that were surprisingly unexpected (Borensztein, Milesi-Ferretti, Pattillo, & Berg, 2000).

As stated by Ajisafe and Folorunso (2002) the objectives of monetary policy are to increase the gross domestic product (GDP) growth rate, decrease the rates of unemployment and inflation, enhance the balance of payments, increase external reserves and financial savings, and preserve exchange rate stability. Furthermore, monetary expansions have an immediate impact on real variables like output and employment, but they have a longer-term impact on nominal variables like nominal national income, interest rates, and prices. This is the conclusion from monetarism. On the other hand, Keynesian theory suggests that adjustments to the money supply impact overall spending, production, and the balance of payments by altering interest rates. As such, the mechanism functions in an indirect manner. Macroeconomic projections are generally positive, with an anticipated rise in real GDP of 4.3% compared to 4% in 2010, based on trends seen in the first half of 2011. While the current account balance became positive and settles at GDP 3.8% in 2014, versus GDP 0.6% deficit inches in 2010, the price of inflation fell to 2.8% from 3.6% in 2010 and the optional gifts base commitment budget surplus evolved from GDP 4.2% in 2013 to 10% individual year later (Fiess et al., 2018). The Bank of Central African States (BEAC) only made five adjustments to its intervention rate, or discount rate, between 1963 and 1985; as a result, the real difference in interest rates between the CEMAC and France stayed mostly negative. Durable economic expansion is the defining feature of this era, with localized GDP growth averaging above 6% yearly. According to Nachegea (2001) the wide funds to GDP ($M2/GDP$) ratio grew from 15% in 1963–1964 to almost 20% in 1984–1985.

Many African nations have implemented a number of policies to improve their balance of payments accounts, including tax breaks, subsidy provision, and local currency devaluation. Nevertheless, these initiatives were not successful, and as a result, these nations have continued to occupy relatively low positions in the global economy (Ashraf, 2021). Even with the different fiscal and monetary policy approaches that the CEMAC zone's authorities have taken to address the challenges posed by BOP fluctuations, the issue still exists and continues to be a significant barrier to the inflow of desperately needed foreign capital because it primarily fluctuates in the direction of a deficit.

This study therefore seeks to examine the effects of monetary policy and institutional quality on the balance of payments vulnerability in the CEMAC zone. The study is also based on the null hypothesis that monetary policy does not have a significant effect on the balance of payments vulnerability in CEMAC zone.

2. LITERATURE REVIEW

The Mundell-Fleming model, created in the 1960s by Robert Mundell and Marcus Fleming, examines the effects of capital mobility in small open economies with fixed or flexible exchange rates. The investment-saving and liquidity preference-money supply (IS-LM) model is expanded to include the balance of payments, making it an open economy variant. The Mundell-Fleming model demonstrates how the exchange-rate mechanism affects monetary and fiscal policy's capacity to affect aggregate income. Only monetary policy has the ability to affect income under floating exchange rates, whereas only fiscal policy has the ability to do so under fixed exchange rates. But this model is incredibly important to the study because it gives a theoretical foundation for the floating exchange rate regime—the one in which monetary policy can significantly influence the stability of the balance of payments.

Imoughele and Ismaila (2015) investigated the connection between monetary policy and Nigeria's balance of payments (BOP). In the study, time-series data spanning from 1986 to 2013 were employed. The impacts of random shocks on each of the endogenous variables are examined using the Error Correction Model (ECM). The investigation demonstrated the long-term link between BOP and monetary policy parameters. The study's major finding is that loans to the private sector, the broad money supply, and exchange rates are the main monetary factors impacting BOP in Nigeria. The results of the study show that the Nigerian economy greatly depends on monetary policies and

their capacity to be executed. This is so because interest rates, which impact the balance of payments and overall economic growth, are set by these policies, which are in turn dependent on the private sector, which exports goods. Furthermore, the monetary authority can utilize monetary policy to stabilize and improve Nigeria's performance in the international market because the balance of payments is a monetary issue.

Furthermore, [Onyeiwu \(2012\)](#) examined the impact of monetary policy on the Nigerian economy by using the Ordinary Least Squares Method (OLS) to evaluate data from 1981 to 2008. The analysis's result shows that the money supply and monetary policy support each other well, which benefits GDP growth and the balance of payments. The money-prices-output hypothesis of the Nigerian economy is further supported by the study's findings.

A study of [Danjuma \(2013\)](#) investigated if an overabundance of money was a major factor in the disequilibrium that Nigeria's balance of payments experienced between 1986 and 2010. The findings show that there is more to Nigeria's balance of payments than just money. The nation's monetary authority ought to keep a careful eye on the budget deficit because it also fuels a rise in domestic credit. Johansen Cointegration, Vector Error Correction Mechanism, Impulse Response Function, and Variance Decomposition are used to arrive at these conclusions.

Researchers [Imoisi, Olatunji, and Ekpenyong \(2013\)](#) looked into how effective monetary policy is at achieving stability in Nigeria's balance of payments. This investigation's primary objective was to examine the connection between Nigeria's monetary policy and balance of payments status. In the study, multiple regression models and the Ordinary Least Squares (OLS) method were applied to statistical time series data spanning the years 1980 to 2010. The estimated result showed a positive relationship between the dependent variable, balance of payments, and the independent variables, money supply, exchange rate, and interest rate. Specifically, there was a significant correlation between the money supply and interest rate and the balance of payments, but there was no statistical significance observed for the exchange rate. The government should encourage Nigerian product exports, especially those unrelated to oil, as they will boost foreign exchange profits, encourage economic growth, and improve the country's standing in the balance of payments, according to the findings. According to [Proso, Salubi, and OkoyeI \(2016\)](#) one stylization tactic employed by the Nigerian government to manage the economy is monetary policy. One of the macroeconomic objectives that is usually pursued in the development of Nigerian monetary policy is equilibrium in the country's balance of payments (BOP). This research used multiple regression models with the Ordinary Least Square (OLS) technique to investigate the relationship between the nation's monetary policy and balance of payments using statistical time series data from 1980 to 2015. The calculated result shows a positive relationship between the dependent variable, balance of payments, and the independent variables, money supply, interest rate, and exchange rate. Specifically, the exchange rate had no statistically significant correlation with the balance of payments, although the money supply and interest rate did. Based on the results, we recommend that the government encourage Nigerian product exports, especially those unrelated to oil, as this will boost foreign exchange profits, promote economic expansion, and improve the country's standing in the balance of payments.

Mexico's balance-of-payments crisis is caused by the current high level of capital mobility and financial globalization, according to research by [Calvo and Mendoza \(1996\)](#). Changes in foreign capital flows and the prospect of a banking system rescue may pose a danger to the longevity of currency pegs in these circumstances, and this could lead to notable imbalances between foreign reserves and financial asset stocks. Econometric research suggests that these occurrences could account for half of Mexico's reserve losses. Devaluations and severe recessions can result from self-fulfilling prophecy issues, which are also brought on by significant financial imbalances.

3. METHODOLOGY

3.1. Data and Sources

This study is limited to countries of the CEMAC zone and the time spans from 1996 to 2020 giving a time period of 25years. Moreover, the research design employed in this study is the ex-post facto and the causal research designs. This is mainly because the researcher is to make use of already existing data in which there is no possibility of

influence the nature of the data. The data used in this study is to be obtained from three major sources which include the World Development Indicators (WDI), the IMF country reports and the Worldwide Governance Indicators (WGI) 2020 version which is a World Bank Database. This data spans from the year 1996 to 2020 thus covering period of 25years for the six countries of the CEMAC zone.

3.2. Model

In generating balance of payments vulnerability, the Autoregressive Integrated Moving Average (ARIMA) estimation technique was employed and the residuals for balance of payments for each panel was used to capture the vulnerable component of the balance of payments. In applying the ARIMA model, inspiration was drawn from the study of Ariyo, Adewumi, and Ayo (2014) who examined stock price prediction using the ARIMA model.

In ARIMA model, the future value of a variable is a linear combination of past values and past errors, expressed as follows:

$$Y_t = \phi_0 + \phi_1 Y_{t-1} + \phi_2 Y_{t-2} + \dots + \phi_p Y_{t-p} + \epsilon_t - \theta - \theta_1 t - 1 - 2t - 2 - \dots - q t - q \quad (1)$$

Where:

Y_t is the actual value and ϵ_t is the random error at t, ϕ_i and θ_j are the coefficients, p and q are integers that are often referred to as autoregressive and moving average, respectively.

After generating the balance of payments vulnerability of all the panels, the histogram proved that the data was truncated as seen below:

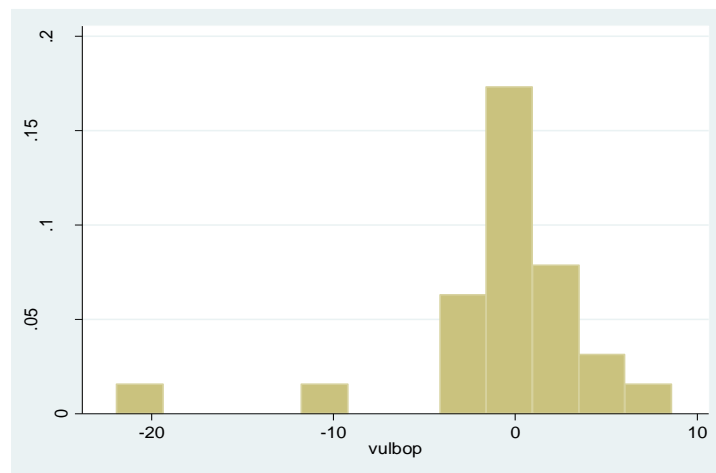


Figure 1. Truncated balance of payments vulnerability.

Figure 1 shows the histogram of balance of payments vulnerability in the CEMAC zone and from the histogram, it is observed that balance of payments vulnerability is highly truncated. For this reason, the balance of payments vulnerability was censored using the boundaries of -19 and 9 to represent the lower and upper boundaries respectively.

In order to analyse the effect of monetary policy on balance of payments, inspiration was drawn from the study of Guris, Sacildi, and Genc (2015) who carried out a study on The Impact of the 2008 Crisis on Foreign Direct Investments in Turkey using the Panel Tobit Approach.

Stating the model in a functional form we obtain;

$$VULBOP = f(MP) \quad (2)$$

$$VULBOP = f(LBMSPGDP, REEXR, DUM2008, LBMSPGDP * DUM2008, POPGR, CPI, LTOP, LFDI) \quad (3)$$

Transforming the above equation into an econometric form, we obtain;

$$VULBOP_{it} = \alpha_0 + \alpha_1 LBMSPGDP_{it} + \alpha_2 REEXR_{it} + \alpha_3 DUM2008_{it} + \alpha_4 LBMSPGDP * DUM2008_{it} + \alpha_5 POPGR_{it} + \alpha_6 CPI_{it} + \alpha_7 LTOP_{it} + \alpha_8 LFDI_{it} + \epsilon_{it} \quad (4)$$

Where;

VULBOP= Balance of Payments Vulnerability.

MP=Monetary Policy.

LBMSPGDP =Broad Money Supply.

REEXR= Real Effective Exchange Rate.

DUM2008= Structural Break of 2008.

LBMSPGDP*DUM2008 = Interaction between Broad Money Supply and the Structural Break of 2008.

POPGR= Population Growth Rate.

CPI= Current Price Index.

LTOP= Log of Trade Openness.

LFDI= Log of Foreign Direct Investment.

ϵ_{it} = The error term.

α_0 = The intercept.

$\alpha_1, \alpha_2, \alpha_3, \alpha_4, \alpha_5, \alpha_6, \alpha_7, \text{ and } \alpha_8$ are the parameters.

The panel Tobit model is one of the non-linear panel data model estimation methods. The latent variable y_{it}^* in the panel Tobit model is expressed as follows:

$$y_{it}^* = \alpha_i + x'_{it}\beta + u_{it} \quad i = 1, 2, \dots, N, \quad t = 1, 2, \dots, T \quad (5)$$

$$u_{it} = v_i + \epsilon_{it}, \quad (v_i \sim N(0, \sigma_v^2)), \quad (\epsilon_{it} \sim N(0, \sigma_\epsilon^2)) \quad (6)$$

Here, the observed variables are indicated as:

$$y_{it} = \begin{cases} y_{it}^* & \text{if } y_{it}^* > 0 \\ 0 & \text{if } y_{it}^* \leq 0 \end{cases} = \beta x_{it} + u_{it} \quad (7)$$

The error term u_{it} must be time independent. In this study, the case of the error term components model dividing into the two groups: one being individual random effects v_i in accordance with time and the other being random error ϵ_{it} that is changing with time.

As the fixed effect estimator is inconsistent, a generally random effect estimator is used. On the assumption that $\alpha_i \sim N(0, \sigma_\alpha^2)$ the random effect logarithmic likelihood function of $\beta, \sigma_u^2, \sigma_\alpha^2$ is specified as follows:

$$f(y_i|X_i, \beta, \sigma_u^2, \sigma_\alpha^2) = \int f(y_i|X_i, \alpha_i, \beta, \sigma_u^2) \frac{1}{\sqrt{2\pi\sigma_\alpha^2}} \text{antilog} \left(\frac{-\alpha_i}{2\sigma_\alpha^2} \right)^2 d\alpha_i \quad (8)$$

Table 1. Summary of descriptive statistics.

Variable	Obs.	Mean	Std. dev.	Min.	Max.
BOP vulnerability	150	-0.593	5.584	-21.921	8.567
Broad money supply	150	15.933	3.4	12.151	22.264
2008 structural break	150	0.52	0.501	0	1
Broad money supply*2008 structural break	150	9.614	9.489	0	22.264
Current price index	149	95.993	21.422	47.882	154.381
Population growth rate	150	3.04	0.858	-0.077	4.885
Real effective exchange rate	150	97.947	6.709	84.153	109.469
Log FDI	133	19.121	1.806	14.452	22.209
Log trade openness	150	15.435	1.146	13.348	17.217

4. RESULTS AND DISCUSSION

4.1. Results

4.1.1. Summary of Descriptive Statistics

Table 1 above presents the summary of descriptive statistics of all the variables used in this study with the first being balance of payments vulnerability. It is observed that the mean of balance of payments vulnerability (VULBOP) stands at -0.593 with an overall standard deviation of 5.584 and a minimum and maximum value of -21.921 and 8.567 respectively. This result shows a great deviation from the mean and also that the overall balance of payments of

CEMAC countries was highly vulnerable over the period under study. Furthermore, the mean of broad money supply (LBMSPGDP) stands at 15.933 with a standard deviation of 3.4 and a minimum and maximum value of 12.151 and 22.264 respectively. This result shows a high deviation from the mean and also that the overall broad money supply of CEMAC countries was relatively moderate over the period under study as the mean falls almost at the middle of the minimum and maximum values. The mean of the dummy variable for 2008 as a result of structural breaks stands at 0.52 with a standard deviation of 0.501 and a minimum and maximum value of 0 and 1 respectively. This result indicates that there was very low deviation of the dummy from the mean from the mean.

The mean of the interaction between broad money supply and dummy variable for 2008 stands at 9.614 with a standard deviation of 9.489 and a minimum and maximum value of 0 and 22.264 respectively. This result indicates that there was very low deviation of the interactive variable from the mean.

In the same light, mean of current price index (CPI) stands at 95.993 with a standard deviation of 21.422 and a minimum and maximum value of 47.882 and 154.381 respectively. This result also indicates that there was a high deviation from the mean and also, the current price index of the CEMAC zone as whole during the period under study was relatively high as the mean falls more towards maximum value.

Again, the mean value of population growth rate (POPGR) from the result is 3.04 and this is accompanied by a standard deviation of 0.858 indicating low fluctuations in population growth rate in CEMAC as a whole. The minimum and maximum values of -0.077 and 4.885 respectively show that population growth rate in CEMAC during the period of study was relatively high as the mean fall closer to the maximum value.

Furthermore, the mean of real effective exchange rate stands at 97.947 with a standard deviation of 6.709 and a minimum and maximum values of 84.153 and 109.469 respectively. This result shows a high deviation of real effective exchange rate from the mean towards the lower bound and also that the exchange rate fluctuations in the CEMAC countries was relatively high. It also shows that real effective exchange rate over the period under study was high as the mean falls more towards maximum value. Again, the mean value of the log of foreign direct investment (LFDI) from the result is 19.121 and this is accompanied by a standard deviation of 1.806 indicating high fluctuations in foreign direct investment in CEMAC as a whole over the period under study. The minimum and maximum values of 14.452 and 22.209 respectively show that foreign direct investment in CEMAC during the period of study was relatively high as the mean is closer to the maximum value. Finally, the log of trade openness (LTOP) was found to have a mean value of 15.435 with a standard deviation of 1.146 indicating a very high deviation from the mean thus showing that trade openness of the entire CEMAC was relative volatile during the period under study. The minimum and maximum values of 13.348 and 17.217 respectively show that trade openness in CEMAC during the period of study was relatively moderate as the mean is midway between the minimum and maximum values.

Table 2. Correlation matrix.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) BOP vulnerability	1.000								
(2) Broad money supply	0.038	1.000							
(3) 2008 structural break	0.170*	0.785*	1.000						
(4) Broad money supply*2008 structural break	0.165*	0.895*	0.977*	1.000					
(5) Current price index	0.185*	0.739*	0.831*	0.849*	1.000				
(6) Population growth rate	0.001	-0.189*	-0.128	-0.153	-0.339*	1.000			
(7) Real effective exchange rate	-0.016	0.608*	0.806*	0.777*	0.811*	-0.119	1.000		
(8) Log FDI	0.097	0.183*	0.321*	0.294*	0.170	0.480*	0.356*	1.000	
(9) Log trade openness	-0.028	0.013	-0.006	-0.003	0.090	-0.453*	-0.004	-0.505*	1.000

Note: * p<0.1.

4.1.2. Correlation Analysis

Table 2 above represents the pairwise correlation matrix which shows the correlation which exists among the variables included in model one. The correlation coefficients of the leading diagonals stand at 1.0000 which indicates that each variable is perfectly collinear to itself. The results indicate a very weak positive correlation between balance of payments (BOP) vulnerability and broad money supply alongside a series of variables which include the dummy for 2008, the interaction of broad money supply and the dummy for 2008, current price index, population growth rate and the log of foreign direct investment. On the other hand, BOP vulnerability was found to have a very weak negative correlation with real effective exchange rates and the log of trade openness. Furthermore, strong positive correlations were found between broad money supply and some variables such as the dummy for 2008, the interaction of broad money supply and the dummy for 2008, current price index and real effective exchange rate while broad money supply maintained very weak positive and negative correlations with the rest of the variables. Finally, we observe that there were very weak and strong positive and negative correlations amongst the control variables included in the study and these relatively low correlation coefficients are indications of the absence of multicollinearity.

Table 3. Summary of the Im-Pesaran-Shin test statistic for unit roots.

Variables	Im-Pesaran-Shin test		Test of critical values (CV)			Conclusion
	Level	Difference	CV at 1%	CV at 5%	CV at 10%	
BOP vulnerability	-6.7988	-	-2.320	-2.080	-1.950	I(0)
Broad money supply	-1.1777	-2.4322	-2.320	-2.080	-1.950	I(1)
2008 structural break	-1.0000	-4.7958	-2.320	-2.080	-1.950	I(1)
Broad money supply*2008 structural break	-1.0752	-3.6675	-2.320	-2.080	-1.950	I(1)
Current price index	-0.3941	-4.4722	-2.320	-2.080	-1.950	I(1)
Population growth rate	-1.2341	-3.0444	-2.320	-2.080	-1.950	I(1)
Real effective exchange rate	-0.6933	-5.0051	-2.320	-2.080	-1.950	I(1)
Log FDI	-2.9031	-	-2.320	-2.080	-1.950	I(0)
Log trade openness	-2.3372	-	-2.320	-2.080	-1.950	I(0)

4.1.3. Unit Roots Test

Tables 3 represent the results of the unit roots test for stationarity of all variables in the various model one of this study. From the Im-Pesaran-Shin test, a variable is said to be stationary if the value of the Z-statistic is more negative than the critical value at a particular level of significance which for this study we used the 5% critical value. It is conventional that non-stationary time series data always yields spurious regression results in econometrics and therefore it is always of essence to ensure that all variables are stationary either at level or the first difference. Based on the results of the stationarity tests, it is observed that balance of payments vulnerability, log of foreign direct investment and log of trade openness are all stationary at level.

Furthermore, it was also found that broad money supply, real effective exchange rate, current price index, the dummy variable for the year 2008 and the interaction between broad money supply and the dummy are all stationary at after first difference.

It is worth noting that the empirical and theoretical requirement is for a variable to be stationary either at level or at most after the first difference, a condition which all variables of this study have fulfilled. These results guarantee to a great extent the suitability and quality of the results that shall be obtained and therefore the results will be suitable for forecasting.

Table 4. Panel Tobit regression on the effect of monetary policy on balance of payments vulnerability.

Variables	(1) Vulbop
Broad money supply	-5.871*** (0.00441)
2008 structural break	-70.82*** (0.0584)
Broad money supply*2008 structural	5.804*** (0.00448)
Current price index	0.00105*** (0.000144)
Population growth rate	0.00123 (0.00200)
Real effective exchange rate	-0.326*** (0.000393)
Log FDI	0.00234** (0.000956)
Log trade openness	0.000524 (0.00133)
Constant	105.9*** (0.0731)
sigma_u	4.216*** (0.613)
sigma_e	0.0140*** (0.000872)
Wald chi2(8)	2.80e+06
Prob>chi2	0.0000
Observations	133
Number of year	25

Note: Standard errors in parentheses.
** p<0.05 and *** p<0.01.

4.1.4. Panel Tobit Regression on the Effect of Monetary Policy on Balance of Payments Vulnerability

Table 4 presents the findings from the panel Tobit regression about the impact of monetary policy on the vulnerability of the balance of payments within the CEMAC region. The coefficient of the constant term is positive, as can be seen from the findings. In particular, the outcome shows that the balance of payments vulnerability in the CEMAC zone will be positive to the extent of 105.7 if all other model variables are kept constant or set to zero. At the 1% level of significance, the constant term has additional statistical importance. An additional finding that supports the a priori expectation is the negative correlation between money supply and balance of payments vulnerability, as indicated by the coefficient of broad money supply (Lbmospdp), which is negative. The findings indicate that a 1% increase in the total money supply will result in a 5.871% decrease in the vulnerability of the balance of payments. Our conclusion is that monetary policy significantly affects the vulnerability of the balance of payments in the CEMAC zone, rejecting the null hypothesis. This result is statistically significant at the 1% level of significance.

Furthermore, at the 1% level of significance, the structural break is represented by a negative and statistically significant coefficient of the dummy (dum2008). The findings show that the 2008 structural rupture, which was linked to the global financial crisis, had a major effect on the CEMAC zone's sensitivity to balance of payments.

Fascinatingly, the broad money supply and dummy interaction coefficient (inter_lbmospdp_dum2008) is positive, indicating that the interactive variable and balance of payments vulnerability are positively correlated. In particular, the outcome shows that, in comparison to the money supply prior to 2008, the broad money supply following that year had the capacity to raise the balance of payments vulnerability by 5.804%. Since this result is statistically significant at the 1% level of significance, we can draw the conclusion that the CEMAC zone's sensitivity to balance of payments was significantly impacted by the expansion of the money supply following 2008. Furthermore, it is noted that the current price index (CPI) has a positive coefficient, indicating that the general price level and balance

of payments vulnerability have a positive association that is consistent with the apriori expectation. In particular, the outcome shows that the vulnerability of the balance of payments will grow by 0.001% for every 1% increase in the present price index. The general price level has a considerable impact on the balance of payments vulnerability in the CEMAC zone, since this conclusion is statistically significant at the 1% level of significance.

The population growth rate and balance of payments vulnerability are positively correlated, as seen by the positive coefficient of population growth rate (POPGR). In particular, the outcome shows that the sensitivity of the balance of payments will increase by 0.001% for every 1% increase in the population growth rate. Since this result is statistically insignificant, it can be said that the vulnerability of the balance of payments in the CEMAC zone is not much impacted by the pace of population growth. In keeping with the apriori expectation, the real effective exchange rate coefficient is also negative, indicating a negative correlation between the real effective exchange rate and balance of payments vulnerability. In particular, the outcome shows that the sensitivity of the balance of payments will decrease by 0.326% for every 1% increase in the actual effective exchange rate. It may be inferred from this result—which is statistically significant at the 1% level of significance—that the real effective exchange rate significantly affects the vulnerability of the balance of payments in the CEMAC region. It was discovered that the log of foreign direct investment (LFDI) had a positive coefficient, indicating a positive correlation between foreign direct investment and balance of payments vulnerability. The findings indicate that there will be a 0.002% increase in the sensitivity of the balance of payments for every 1% increase in foreign direct investment. The conclusion that foreign direct investment has a considerable impact on the balance of payments vulnerability in the CEMAC zone may be drawn from this result, which is statistically significant at the 5% level of significance.

The trade openness and balance of payments vulnerability were shown to be positively correlated, as indicated by the positive coefficient of the log of trade openness (LTOP). In particular, the outcome shows that the sensitivity of the balance of payments will grow by 0.0005% for every 1% increase in trade openness. Given that this conclusion is statistically insignificant, it can be said that trade openness has little bearing on the fragility of the balance of payments in the CEMAC region. Lastly, the Wald Chi2(8) value for the model's overall fitness is 2.80e+06, and the p-value that corresponds to it indicates that the result is statistically significant at the 1% level of significance. This outcome also shows that forecasting can be done using the 99% reliable overall result.

Table 5. Correlated panels corrected standard errors (PCSEs) regression results on the effect of monetary policy on balance of payments vulnerability.

Variables	(1) Vulbop
Broad money supply	-5.367*** (0.403)
2008 structural break	-61.18*** (5.802)
Broad money supply*2008 structural	5.092*** (0.442)
Current price index	0.0761** (0.0330)
Population growth rate	-0.364 (0.475)
Real effective exchange rate	-0.537*** (0.0780)
Log FDI	0.236 (0.221)
Log trade openness	-0.289 (0.352)
Constant	114.2*** (9.040)
Observations	133
Number of years	25
R-squared	0.429

Note: Standard errors in parentheses.
** p<0.05 and *** p<0.01.

4.1.5. Correlated Panels Corrected Standard Errors (PCSEs) Regression for Robustness on the Effect of Monetary Policy on Balance of Payments Vulnerability

Table 5 shows that results of the correlated panels corrected standard errors (PCSES) regression on the effect of monetary policy of balance of payments vulnerability for robustness. It is observed from the results that the effect of monetary policy on the balance of payments vulnerability is consistent with the results of the panel Tobit in Table 4. The results are equally consistent with respect to other variables in the model in terms of signs and levels if statistical significance. This indicates that the results are robust enough, thus making the global results reliable.

4.2. Discussion

The objective of this study was to examine the effect of monetary policy on the vulnerability of balance of payments in the CEMAC zone. The results revealed that monetary policy has a negative and significant effect on balance of payments vulnerability in the CEMAC zone. That is, an increase in money supply has the tendency of reducing balance of payments vulnerability in the CEMAC zone.

The finding is in accordance with the empirical findings of Imoughele and Ismaila (2015); Onyeiwu (2012); Imoisi et al. (2013) and Proso et al. (2016) which all revealed that monetary policy is an important determining factor of the balance of payments in the Nigerian context. The finding is in opposition to that of Danjuma (2013) who examined whether or not excess money supply has played a significant role in the disequilibrium of balance of payment in Nigeria and found that disequilibrium of balance of payment in Nigeria is not purely a monetary issue.

Furthermore, BEAC lacks full autonomy over its monetary policy and therefore it is like for money supply to be in excess of demand which causes individuals to increase their expenditures on imports and therefore making imports more expensive relative to locally produced goods and thereby causing balance of payments deficits.

Once more, it was discovered that in an economy with a lower stock of external debt, monetary policy; that is, a large money supply has the propensity to lessen balance of payments vulnerability. This is true in the sense that a rise in the money supply will inevitably lead to higher levels of investment when there is a low stock of external debt. A rise in investment opportunities would result in a rise in the nation's productive activities. A favorable position in the nation's balance of payments will result from this increase in productive activities since they will boost exports of goods and services to other nations, raising the amount of foreign exchange profits into the nation.

Furthermore, it was discovered that the CEMAC zone's sensitivity to balance of payments might be decreased using the actual effective exchange rate as a monetary policy indicator. This may be explained by the fact that if the CEMAC's exchange rate rises relative to other global currencies, the economy of the region will likewise see a decrease in its vulnerability to imbalances of payments, which will result in a favorable position in the balance of payments. This is feasible because the country's exports would command better prices on the international market as the CEMAC Franc CFA's exchange rate rises relative to other foreign currencies, strengthening the balance of payments and lowering vulnerability.

5. CONCLUSION

This study looks at how monetary policy affected the stability of balance of payments (BOP) vulnerabilities in the CEMAC region between 1996 and 2020. Any nation's balance of payments situation is a key indicator of its economic progress; thus, nations work hard to achieve a favorable balance of payments position. According to the report, monetary policy is a crucial part of any pro-growth economic plan that aims to achieve a positive balance of payments. Within the CEMAC region, the Bank of Central African States (BEAC) is in charge of formulating and carrying out monetary policy. Following the foregoing, the BEAC's use of monetary policy as an intervention tool aims primarily at important macroeconomic objectives, among which the equilibrium of the balance of payments (BOP) is not an exception.

6. RECOMMENDATIONS

The findings of this study revealed that monetary policy has a negative and significant effect on the balance of payments vulnerability in the CEMAC zone. On the basis of this finding, we recommend that the monetary authority should make policies that would give viable balance of payments for the CEMAC countries, such as increasing the country's international competitiveness; that is, investing on projects that are productive in order to increase productivity. Secondly, based on the fact that CEMAC countries lack financial autonomy which has greatly affected the monetary policy of the zone, we recommend that more efforts be put in order to abandon the Franc CFA and move to a currency that will provide the regions with some level of autonomy in the financial sector.

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