

Impact Of Liquidity Management On Inflation In Selected ECOWAS Countries

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Abstract

This study examined the impact of liquidity management on inflation in Nigeria, Ghana, and Côte d'Ivoire over the period 1990–2024. Guided by the Monetarist Theory and the Quantity Theory of Money, it investigated the effects of broad money supply, monetary policy rate, exchange rate, gross domestic product, and government expenditure on inflation using annual secondary data. The study employed the Panel Autoregressive Distributed Lag (Panel ARDL) model with the Pooled Mean Group (PMG) estimator, while the Augmented Mean Group (AMG) and Common Correlated Effects Mean Group (CCEMG) estimators were used for robustness analysis. The findings showed that none of the explanatory variables had a statistically significant long-run effect on inflation under the PMG model, although significant error-correction terms confirmed convergence to long-run equilibrium with varying adjustment speeds across countries. Robustness estimates generally supported the main findings despite some differences in coefficient significance. The study concludes that inflation dynamics are shaped more by country-specific macroeconomic conditions and regional interdependencies than by the long-run effects of conventional liquidity management instruments. It therefore recommends country-specific liquidity management strategies alongside stronger regional macroeconomic policy coordination to promote price stability across ECOWAS.

Keywords: Inflation, Liquidity Management, Monetary Policy, ECOWAS JEL Classification: E31, E58, E52, O55

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INTRODUCTION

Liquidity management is a fundamental component of macroeconomic management, influencing monetary policy effectiveness, financial stability, and overall economic performance. Central banks use liquidity management to regulate money supply, influence interest rates, and maintain appropriate credit conditions to achieve price stability and support economic growth (Central Bank of Nigeria [CBN], 2021). As the most liquid asset, money facilitates economic transactions and investment; however, excessive or poorly managed liquidity can fuel inflation, weaken growth, and increase financial vulnerabilities. Consequently, liquidity management serves as a key policy tool for maintaining macroeconomic stability (Vaish, 2005; Ukeje, 2012).

The relationship between liquidity management and inflation has long been examined in economic literature. Friedman and Schwartz (1963) established the importance of money supply in determining price levels, while later studies by Svensson (1999); Romer and Romer (2004) and Bernanke (2009) explored the channels through which liquidity affects inflation. Although some studies find a direct relationship between money supply and inflation, others suggest that the relationship is nonlinear and influenced by institutional and macroeconomic conditions (Blanchard & Galí, 2009; Shin & Greenwood-Nimmo, 2014).

Evidence from Economic Community of West African States (ECOWAS) and the wider West African region confirms that liquidity management significantly influences inflation, though the magnitude of its effects differs across countries. Studies by Obi and Uzodigwe (2015); Ozekhome (2017); Ilyas et al. (2022) and Olusegun (2022) found that money supply, interest rates, and exchange rate movements are key determinants of inflation. More recent research by Tucker (2023) and Unekwu et al. (2025) further highlights asymmetries in monetary policy transmission, indicating that liquidity conditions and policy interventions produce varying inflation outcomes across countries.

Despite these findings, existing studies have largely focused on regional groupings such as ECOWAS, West African Economic Monetary Union (WAEMU) and West African Monetary Zone (WAMZ) with limited comparative evidence on individual countries operating under different monetary policy frameworks. In particular, there is insufficient research comparing the effects of liquidity management on inflation in Côte d'Ivoire, Ghana, and Nigeria. This study addresses this gap by providing a country-specific comparative assessment of how liquidity management influences inflation across these three strategically important ECOWAS economies.

Inflation remains a persistent policy challenge in Nigeria, Ghana, and Côte d'Ivoire despite the adoption of different monetary policy frameworks and liquidity management measures. Existing studies are often country-specific or focus on broader macroeconomic outcomes, while relatively few jointly examine the effects of key liquidity management instruments money supply, interest rates, and exchange rates on inflation across the three countries using comparative panel techniques (Tobi & Dibiah, 2021; Kajola et al., 2021; Kure et al., 2021; Okotori & Eze, 2020). A comparative analysis is therefore necessary to better understand how differences in monetary policy frameworks contribute to variations in inflation performance.

This study contributes to both theory and practice by advancing the monetarist–Keynesian debate on liquidity management and inflation while providing empirical evidence on the relevance of the Phillips Curve in developing economies. The findings will offer valuable insights for policymakers, central banks, investors, and the private sector by demonstrating

how interest rates, money supply, and exchange rate management influence inflation under different monetary policy environments.

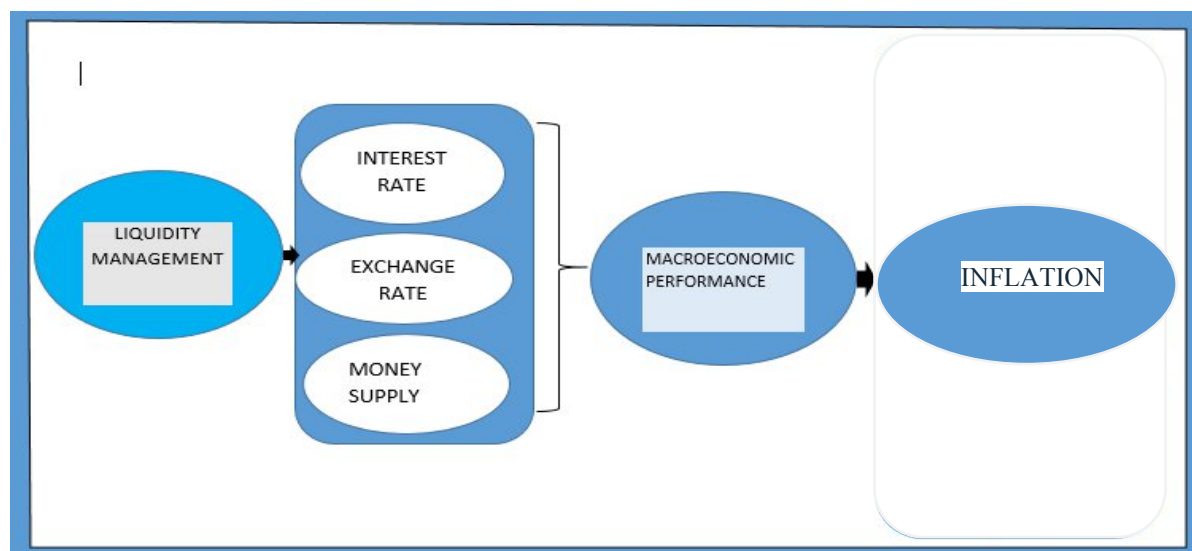
The study focuses on Nigeria, Ghana, and Côte d'Ivoire over the period 1990–2024. These countries were selected because they are among the largest ECOWAS economies and represent the region's two major monetary systems: Côte d'Ivoire belongs to the WAEMU monetary union, while Ghana and Nigeria operate independent monetary policies within the WAMZ. This selection enables a meaningful comparison of liquidity management under different institutional arrangements while avoiding the heterogeneity associated with studying all ECOWAS countries. Accordingly, the study seeks to assess the impact of liquidity management on inflation in Nigeria, Ghana, and Côte d'Ivoire.

LITERATURE REVIEW

Conceptual Clarifications

This section clarifies the principal concepts underpinning the study and establishes the relationships represented in the conceptual framework. The framework is informed by the Quantity Theory of Money, the Monetarist Theory, and the Monetary Transmission Mechanism, which collectively explain how changes in monetary and financial conditions can influence prices, output, employment and external-sector performance. The framework therefore provides the conceptual link between liquidity management, represented by interest rate, exchange rate and money supply, and the broader dimensions of macroeconomic performance examined in the study.

Figure 2.1: Conceptual Clarification of the Study



Source: Author's conceptualisation based on Fisher (1911), Friedman (1956) and Mishkin (1996).

The framework illustrates liquidity management as the explanatory construct, operationalised through interest rate (INT), exchange rate (EXR), and broad money supply (M2). These indicators represent monetary and financial channels through which changes in liquidity conditions can influence macroeconomic performance. The latter is reflected in price stability, economic growth, employment and trade balance, with inflation constituting the principal

outcome of interest. The framework is therefore consistent with the theoretical proposition that monetary conditions affect economic activity and the general price level through money, interest-rate and exchange-rate channels.

Liquidity Management

In this study, liquidity management is defined from a macroeconomic perspective as the process through which central banks regulate the availability and cost of money to achieve monetary policy objectives, particularly price and financial system stability. According to the Central Bank of Nigeria (2020), this involves supplying or withdrawing liquidity to maintain the desired level of reserve money and short-term interest rates through continuous liquidity forecasting and balance sheet monitoring. The objective is to ensure sufficient liquidity for payment and settlement activities while avoiding inflationary or deflationary pressures.

Liquidity demand within the banking system arises from statutory reserve requirements, precautionary reserves, and autonomous factors such as changes in currency in circulation, government deposits, and net foreign assets. Effective liquidity management therefore seeks to maintain liquidity at a level that supports credit intermediation and economic activity while preventing shortages that constrain lending or excess liquidity that fuels inflation.

Liquidity is generally classified into three interrelated dimensions: central bank liquidity, market liquidity, and funding liquidity (CBN, 2021). Central bank liquidity refers to the reserves held by commercial banks for settlement purposes, while market liquidity denotes the ease with which financial assets can be traded without causing significant price changes. Funding liquidity, in contrast, reflects the ability of financial institutions to obtain cash through borrowing or the sale of assets. This study focuses on central bank liquidity because it is directly influenced by monetary policy and has a strong link to inflation dynamics.

Central banks manage liquidity using instruments such as open market operations, reserve requirements, monetary policy rates, repurchase and reverse repurchase agreements, and standing lending and deposit facilities. These operations influence reserve money, credit creation, and money supply, with their effectiveness commonly assessed through indicators such as interbank interest rates, banks' reserve balances, and standing facility transactions (Nnanna, 2001).

Following Cecchetti and Schoenholtz (2021), liquidity management is viewed as the calibration of liquidity conditions to maintain an optimal balance between liquidity shortages and surpluses. In this study, it is operationalized using three key monetary policy variables: broad money supply (M2), monetary policy rate (MPR), and exchange rate (EXR). Broad money supply measures the quantity of liquidity, the monetary policy rate represents the cost of liquidity, and the exchange rate captures external monetary conditions affecting domestic liquidity and inflation. Together, these variables provide a comprehensive framework for analysing the effects of liquidity management on inflation in Nigeria, Ghana, and Côte d'Ivoire.

Inflation

Inflation refers to a sustained increase in the general price level of goods and services over time, resulting in a decline in the purchasing power of money (International Monetary Fund [IMF], 2024). While classical economists viewed inflation primarily as a monetary phenomenon driven by excessive money supply, contemporary perspectives recognize that it may also arise from demand-side pressures and supply-side constraints (Barro, 1997; Jhingan,

2003). Oyigebe et al. (2024) describe inflation as a sustained increase in the general price level of goods and services, which reduces the purchasing power of money while Abah (2009) argues that prolonged inflation can hinder sustainable economic growth and development.

Inflation reduces households' purchasing power, raises the cost of living, creates uncertainty for businesses, discourages investment, and distorts resource allocation. Related concepts include deflation (a sustained fall in prices), disinflation (a decline in the inflation rate), stagflation (high inflation with weak growth and unemployment), and reflation (policies aimed at raising prices to counter deflation) (Abel et al., 2014). Inflation is commonly measured using the Consumer Price Index (CPI), the Gross Domestic Product (GDP) deflator, and the Personal Consumption Expenditures (PCE) Price Index. This study adopts the Consumer Price Index because it is the most widely used measure of changes in the cost of living and purchasing power in Nigeria, Ghana, and Côte d'Ivoire.

Maintaining low and stable inflation is essential for macroeconomic stability, as high and volatile inflation erodes real incomes, discourages savings and investment, weakens monetary policy effectiveness, and undermines economic growth. Accordingly, this study defines inflation as a sustained increase in the general price level, measured by the Consumer Price Index, and examines its relationship with key liquidity management variables broad money supply, monetary policy rate, and exchange rate to assess the impact of monetary policy on inflation in Nigeria, Ghana, and Côte d'Ivoire.

Theoretical Review

Monetarist Theory

The theoretical foundation of this study is anchored in the Monetarist Theory (1956), which posits that inflation is fundamentally a monetary phenomenon. Popularized by Milton Friedman, the theory argues that sustained inflation occurs when the growth of the money supply consistently exceeds the growth of real economic output. Accordingly, central banks are primarily responsible for maintaining price stability through prudent liquidity management using monetary policy instruments such as open market operations, reserve requirements, and policy interest rates. From the monetarist perspective, regulating the money supply influences aggregate demand and, ultimately, the general price level. This theoretical framework is particularly relevant to Nigeria, Ghana, and Côte d'Ivoire, where fluctuations in liquidity conditions have frequently been linked to inflationary pressures. It therefore provides a suitable basis for examining the influence of central bank liquidity management on inflation dynamics across the selected economies.

Quantity Theory of Money

Closely linked to Monetarism is the Quantity Theory of Money (QTM), propounded by Irving Fisher (1911) and encapsulated in his equation of exchange ($MV = PQ$), which illustrates the relationship among the money supply, the velocity of money, the price level, and real output. Under the simplifying assumption that the velocity of money and real output remain relatively stable in the short run, an increase in the money supply leads to a proportional rise in the price level, resulting in inflation. This reinforces the importance of prudent liquidity management: while an adequate money supply is necessary to support productive economic activities, excessive liquidity can erode purchasing power, fuel inflationary pressures, and undermine macroeconomic stability. In the West African context, the QTM underscores the delicate balance policymakers must maintain, ensuring sufficient liquidity to support economic growth

while avoiding excessive monetary expansion that could accelerate inflation. Together, the Monetarist Theory and the Quantity Theory of Money provide a robust theoretical framework for examining the impact of central bank liquidity management on inflation across the three selected economies.

Theoretical Framework

This study is anchored on the Monetarist Theory, popularized by Milton Friedman, which argues that inflation is fundamentally a monetary phenomenon arising when money supply grows faster than real economic output. The theory assigns central banks a central role in maintaining price stability through liquidity management instruments such as open market operations, reserve requirements, and policy interest rates. By regulating the supply of money, these instruments influence aggregate demand and the general price level. This framework is particularly relevant to Nigeria, Ghana, and Côte d'Ivoire, where periods of excess liquidity have often been associated with inflationary pressures.

The study is further supported by the Quantity Theory of Money (QTM), expressed through Irving Fisher's equation of exchange ($MV = PQ$). The theory posits that, assuming the velocity of money and real output remain relatively stable, changes in the money supply led to corresponding changes in the price level. This relationship highlights the need for monetary authorities to maintain an appropriate balance between supporting economic activity and containing inflationary pressures. Together, the Monetarist Theory and the Quantity Theory of Money provide a coherent theoretical framework for examining how central bank liquidity management influences inflation in Nigeria, Ghana, and Côte d'Ivoire.

Empirical Review

Bakouan et al. (2026) examined the effect of central bank independence on inflation volatility in WAEMU countries, including Côte d'Ivoire, using annual data for 2006–2023 and IV-2SLS and IVQR estimators. The findings showed that greater central bank independence reduced inflation volatility, while money supply expansion increased inflation instability. However, the study concentrated on institutional independence and inflation volatility, leaving limited evidence on the role of specific liquidity-management indicators in explaining broader dimensions of macroeconomic performance and across countries operating under different monetary-policy regimes. The present study extends this evidence by examining liquidity management beyond institutional independence and by assessing its implications across price, output, labour-market and external-sector outcomes in the three selected economies over a longer period.

Olumo (2025) investigated the effect of financial development on interest rates in Côte d'Ivoire, Ghana and Nigeria using panel data for 2004–2023 and the Random Effects Model. The findings showed that financial development and money supply significantly influenced interest-rate behaviour, with effects varying across countries. However, the study was concerned primarily with the determinants of interest rates, rather than the role of interest rate as a liquidity-management instrument and its consequences for macroeconomic performance. The present study builds on this evidence by repositioning interest rate within the broader liquidity-management framework and examining how monetary conditions transmit into key macroeconomic outcomes across the selected economies.

Garba et al. (2025) analysed the effects of macroeconomic variables on stock market growth in Nigeria, Ghana and Côte d'Ivoire using panel data for 1995–2024 and the Panel-Corrected Standard Error (PCSE) estimator. The findings showed that interest and exchange rates negatively affected stock market growth, whereas inflation was insignificant. However, the study focused on financial-market performance, providing limited insight into the broader macroeconomic consequences of liquidity-management conditions. The present study extends this line of evidence by moving beyond stock-market outcomes to assess the wider transmission of liquidity conditions to macroeconomic performance, thereby providing a more comprehensive assessment of the role of monetary conditions in the selected economies.

Aladejare (2023) examined the effects of trade, macroeconomic management and economic integration on external debt accumulation in West Africa using data for 1981–2020 and the Pooled Mean Group (PMG) estimator. The findings indicated that trade and regional integration increased external debt in the short run but reduced it in the long run, while macroeconomic management had a weak effect. Although the study provides useful evidence on debt dynamics and macroeconomic management, its focus on external debt accumulation leaves unexplored the extent to which liquidity-management conditions translate into price, output, labour-market and external-sector outcomes. The present study extends the evidence by shifting the analytical focus from debt accumulation to the broader macroeconomic consequences of liquidity management, while also providing a country-specific comparison of Nigeria, Ghana and Côte d'Ivoire over a longer period.

Okeke (2023) assessed the relationship between money supply and inflation in Nigeria using time-series econometric techniques. The findings established a significant long-run relationship between money supply and inflation, underscoring the importance of monetary liquidity for price stability. However, the study's single-country focus and concentration on money supply provide limited evidence on the combined influence of other liquidity-management channels. The present study extends this evidence by considering interest rate, broad money supply and exchange rate jointly, thereby providing a more comprehensive assessment of liquidity-management effects across the three selected ECOWAS economies.

Matthew et al. (2023) investigated inflation dynamics in Ghana within the monetary transmission mechanism, with particular emphasis on exchange-rate movements. Using econometric analysis, the study found that exchange-rate depreciation significantly increased inflation beyond a threshold level, highlighting Ghana's exposure to external price pressures. Its emphasis on exchange-rate pass-through, however, leaves the interaction of exchange-rate conditions with other liquidity-management instruments insufficiently addressed. This study responds by situating exchange rate alongside interest rate and broad money supply within a unified liquidity-management framework, allowing their relative implications for inflation to be examined comparatively.

Okechukwu et al. (2023) examined the determinants of inflation in Nigeria using time-series econometric techniques, focusing particularly on import prices and exchange-rate movements. The findings indicated that imported inflation exerted a stronger influence on domestic prices than exchange-rate fluctuations alone. Nevertheless, the emphasis on external price pressures leaves the monetary channels underlying inflation less fully explored. The present study complements this evidence by incorporating broad money supply and central bank policy rate alongside exchange rate, thereby linking external price pressures to domestic monetary conditions in explaining inflation.

Emmanuel et al. (2022) analysed the determinants of inflation in Ghana using macroeconomic data and econometric estimation techniques. The study found that both monetary and fiscal variables significantly influenced inflation, highlighting the importance of sound macroeconomic management. Although its broader specification captures several determinants of inflation, it does not isolate the contribution of specific central bank liquidity-management indicators. The present study provides this monetary-policy focus by distinguishing interest rate, broad money supply and exchange rate as separate liquidity-management channels and assessing their effects within a comparative panel of Nigeria, Ghana and Côte d'Ivoire.

Duodu et al. (2022) investigated the relationship between fiscal deficits and inflation in Ghana using time-series econometric techniques. The findings showed that persistent fiscal deficits increased inflation through their effects on aggregate demand and liquidity. While the study demonstrates the fiscal origins of inflationary pressure, its emphasis on fiscal imbalance provides limited insight into the independent role of monetary liquidity conditions. The present study addresses this dimension by shifting attention to central bank liquidity management and examining how its principal monetary and exchange-rate channels influence inflation and related macroeconomic outcomes.

Eggon and Sabo (2020) examined the effects of monetary policy instruments on inflation in Nigeria using time-series analysis. The findings indicated that money supply and policy interest rates significantly affected inflation, providing evidence of the relevance of monetary policy for price stability. However, the country-specific analysis does not establish whether these relationships are comparable across economies with different monetary-policy arrangements. The present study builds on these findings through a cross-country panel analysis of Nigeria, Ghana and Côte d'Ivoire, incorporating exchange rate with interest rate and broad money supply to provide wider comparative evidence.

Okotori and Gbalam (2020) investigated the effects of treasury bills and liquidity ratios on inflation in Nigeria using time-series econometric techniques. The results showed that both instruments significantly influenced inflation through their effects on liquidity conditions. The study nevertheless gives limited attention to broader monetary indicators, particularly the roles of broad money supply and exchange-rate conditions in the inflationary process. The present study broadens the measurement of liquidity management by incorporating interest rate, M2 and EXR, thereby capturing both monetary and exchange-rate channels of liquidity transmission.

Sampson et al. (2019) examined the relationship between money supply and inflation in Ghana using time-series analysis. The study found that increases in money supply significantly raised inflation, supporting the importance of monetary discipline in maintaining price stability. Its exclusive concentration on money supply, however, does not capture the complementary influence of interest-rate and exchange-rate channels. The present study therefore places money supply within a broader liquidity-management framework in which its inflationary effect can be considered alongside the central bank policy rate and exchange rate.

Amankwah and Sarfo (2019) investigated the effect of money supply on inflation in Ghana using econometric techniques. The findings showed that excessive monetary expansion contributed significantly to inflationary pressures, reinforcing the importance of monetary discipline. However, the analysis was limited to Ghana and did not account for other major channels through which monetary conditions can influence prices. By incorporating interest rate and exchange rate with broad money supply and extending the analysis to Nigeria and

Côte d'Ivoire, the present study provides a broader basis for evaluating the monetary determinants of inflation in the selected economies.

Keho (2016) examined the relationship among budget deficits, money supply and inflation in Côte d'Ivoire within the WAEMU framework. The findings indicated that budget deficits influenced inflation primarily through money-supply expansion, highlighting the interaction between fiscal and monetary conditions. Nevertheless, the analysis does not account for the additional influence of interest-rate and exchange-rate conditions within the monetary transmission process. The present study complements this WAEMU evidence by examining the central bank policy rate, broad money supply and exchange rate together, while also placing Côte d'Ivoire alongside Nigeria and Ghana for comparative analysis.

Hervé (2016) investigated the relationship between exchange-rate fluctuations and inflation in Côte d'Ivoire using time-series econometric techniques. The findings showed that exchange-rate depreciation significantly increased domestic prices through higher import costs, confirming the importance of exchange-rate pass-through in the Ivorian economy. The study's exclusive focus on exchange-rate dynamics, however, provides only a partial account of the monetary determinants of inflation. The present study develops this line of evidence by examining exchange rate together with interest rate and broad money supply, thereby capturing the complementary liquidity-management channels through which monetary conditions may influence inflation across the selected ECOWAS economies.

The reviewed empirical literature suggests that liquidity management plays a significant role in explaining inflation dynamics in West Africa. Existing evidence indicates that broad money supply, interest rates, and exchange rate movements are important determinants of inflation, although their effects vary across countries because of differences in economic structures and monetary policy transmission mechanisms. Despite broad support for the effectiveness of monetary policy in influencing inflation, most studies focus on individual countries or isolated monetary variables, with relatively few providing comparative evidence across economies operating under different monetary policy frameworks. Consequently, empirical evidence on the joint effects of broad money supply, interest rates, and exchange rates on inflation in Nigeria, Ghana, and Côte d'Ivoire remains limited. This study addresses this gap by providing a comparative panel analysis of liquidity management and inflation across these three major ECOWAS economies.

METHODOLOGY

This study adopts a quantitative research design based on panel econometric techniques to examine the impact of liquidity management on inflation in selected ECOWAS countries (Nigeria, Ghana and Côte d'Ivoire) over the period 1990–2024. The quantitative panel approach is appropriate because it combines the time-series and cross-sectional dimensions of the data, thereby enabling the analysis of country-specific effects, dynamic adjustments and long-run relationships among the variables. It also provides an empirical basis for drawing objective inferences from the observed macroeconomic relationships.

The empirical analysis begins with tests for cross-sectional dependence and slope homogeneity to determine the appropriate estimation procedures, given the possibility of common regional shocks and structural heterogeneity among the selected countries. The stationarity properties of the variables are then examined using panel unit root tests. Where cross-sectional independence exists, first-generation unit root tests, including Levin, Lin and Chu (2002), Im,

Pesaran and Shin (2003), Fisher-ADF, Fisher-PP, and Hadri (2000), are employed. Where cross-sectional dependence is detected, the study adopts the second-generation Cross-sectionally Augmented Dickey-Fuller (CADF) and Cross-sectionally Augmented IPS (CIPS) tests developed by Pesaran (2007).

After establishing the order of integration, the existence of a long-run relationship among the variables is examined using the Pedroni (1999; 2004), Kao (1999), and Westerlund (2007) panel cointegration tests. Upon confirming cointegration, the study estimates the short-run and long-run relationships using the Panel Autoregressive Distributed Lag (Panel ARDL) approach of Pesaran, Shin, and Smith (1999), which is appropriate for variables integrated of mixed orders, $I(0)$ and $I(1)$.

To account for structural heterogeneity, this study estimates the Mean Group (MG), Pooled Mean Group (PMG), and Dynamic Fixed Effects (DFE) estimators. The preferred model is selected using the Hausman specification test, which assesses whether the homogeneity assumption underlying the PMG estimator is valid. To further ensure the robustness of the findings, the Augmented Mean Group (AMG) and Common Correlated Effects Mean Group (CCEMG) estimators are employed. These estimators are well suited to heterogeneous panel data as they account for cross-sectional dependence and unobserved common factors affecting ECOWAS countries over time through different estimation approaches. Consistent results across AMG and CCEMG strengthen the reliability and robustness of the empirical findings.

Model Specification

The model for this study is anchored on the Quantity Theory of Money (QTM) developed by Irving Fisher (1911), which posits that changes in the quantity of money in circulation influence the general price level. The theory is expressed by Fisher's equation of exchange as:

$$MV=PQ \quad (1)$$

Where: M = Money supply, V = Velocity of money, P = General price level, Q = Real output (real GDP). The monetarist proposition advanced by Friedman (1968) further emphasizes that persistent changes in money supply constitute a major determinant of inflation. Guided by this theoretical framework, the study specifies inflation as a function of liquidity management and selected macroeconomic control variables. The general functional form of the model is expressed as:

$$INF = f(M2, GDP, GEX, EXR, INT) \quad (2)$$

Where: INF = Inflation rate, LMG = Liquidity management (proxied by broad money supply= $M2$) at current US\$, GD = Gross Domestic Product (GDP) at current US\$, $GEXP$ = Government expenditure, EXR = Official exchange rate (LCU per US\$, period average), and INT = Monetary Policy Rate (MPR). Taking the natural logarithm on liquidity management, gross domestic product and government expenditure, we have:

$$INF_{it} = b_0 + b_1 \ln M2_{it} + b_2 \ln GDP_{it} + b_3 \ln GEX_{it} + b_4 EXR_{it} + b_5 INT_{it} + h_i + v_{it} \quad (3)$$

Where h_i = Country-specific effects (fixed or random), v_{it} = An idiosyncratic error term, $i=1,2,3$ (Nigeria, Ghana, Côte d'Ivoire), and $t=1990\dots,2024$. This specification provides the

foundation for analysing both the short-run and long-run effects of liquidity management on inflation.

Building on the static panel specification in Equation (3), this study employs the Panel ARDL model to account for the dynamic nature of the relationship among the variables by incorporating appropriate lags of the dependent and independent variables. The resulting Panel ARDL specification is presented in Equation (4).

$$INF_{it} = \alpha_i + \sum_{j=1}^p \alpha_j INF_{i,t-j} + \sum_{l=0}^{q_1} \alpha_{1l} \ln(M2_{i,t-l}) + \sum_{l=0}^{q_2} \alpha_{2l} \ln(GDP_{i,t-l}) + \sum_{l=0}^{q_3} \alpha_{3l} \ln(GEX_{i,t-l}) + \sum_{l=0}^{q_4} \alpha_{4l} EXR_{i,t-l} + \sum_{l=0}^{q_5} \alpha_{5l} INT_{i,t-l} + v_{it} \quad (4)$$

where:

- p is the lag order of inflation (INF),
- $q_1, \dots, q_5$ are the lag orders of the explanatory variables,
- α_i represents the country-specific (panel) fixed effect, and
- v_{it} is the error term.

Following the specification of the Panel ARDL model in Equation (4), the study examines both the short-run dynamics and long-run relationships between inflation and its macroeconomic determinants. The model also facilitates the assessment of the speed of adjustment toward long-run equilibrium through the error-correction mechanism. With the empirical model established, Chapter Four presents the data analysis, estimation results, diagnostic tests, and interpretation of the findings in relation to the study's objectives and hypotheses.

RESULTS AND DISCUSSION

Table 1: Descriptive Statistics

Country	Statistic	N	INF (%)	M2 (\$ Billio n)	GDP (\$ Billi on)	GEXP (\$ Billio n)	EXR	INT (%)
All	Mean	105	14.185	6,860	111	29.6	243.130	18.206
	Std. Dev.	105	14.252	12,800	147	22.5	272.754	10.821
Côte d'Ivoire	Mean	35	3.480	5,290	34.8	34.5	528.065	5.863
	Std. Dev.	35	4.741	5,420	22.0	22.4	113.201	0.851
Ghana	Mean	35	20.369	44.4	32.2	34.3	2.457	30.250
	Std. Dev.	35	12.986	78.0	28.0	28.4	3.223	5.932
Nigeria	Mean	35	18.706	15,200	266	19.8	198.867	18.505
	Std. Dev.	35	15.869	18,700	167	9.62	263.658	4.002

Source: Researcher's Computation, 2026.

The descriptive statistics presented in Table 1 summarize the distribution of the study variables across the three selected ECOWAS countries over the study period. The panel consists of 105 observations. On average, inflation (INF) is 14.19%, with a relatively high standard deviation of 14.25%, indicating considerable variation in price levels across countries and over time. Broad money supply (M2) records a mean value of \$6,860 billion and a standard deviation of \$12,800 billion, reflecting substantial disparities in monetary aggregates among the countries. Similarly, gross domestic product (GDP) averages \$111 billion, with a standard deviation of \$147 billion, suggesting marked differences in economic size across the sample. Government expenditure (GEXP) has a mean of \$29.6 billion and a standard deviation of \$22.5 billion, indicating variations in fiscal spending, while the exchange rate (EXR) exhibits a mean of 243.13 and a relatively large standard deviation of 272.75, pointing to considerable exchange rate fluctuations. Interest rates (INT) average 18.21%, with a standard deviation of 10.82%, highlighting differences in monetary policy conditions across the panel.

At the country level, Côte d'Ivoire exhibits the lowest average inflation rate (3.48%) and relatively stable macroeconomic indicators, particularly in interest rates, suggesting a more stable macroeconomic environment over the study period. Ghana records the highest average inflation (20.37%) and interest rate (30.25%), indicating relatively tighter monetary conditions and greater price instability. Nigeria reports the largest average money supply (\$15,200 billion) and GDP (\$266 billion), consistent with its position as the largest economy in the sample, while also exhibiting substantial variability in inflation and exchange rates. Overall, the descriptive statistics reveal substantial cross-country heterogeneity in macroeconomic conditions among the selected ECOWAS countries, underscoring the need for heterogeneous panel estimation techniques such as MG, PMG, AMG, and CCEMG, while highlighting important implications for regional policy coordination and economic integration.

Table 2: Correlation Results of Multicollinearity

Variable	INF	lnM2	lnGDP	lnGEXP	EXR	INT
INF	1.000					
lnM2	-0.405	1.000				
lnGDP	-0.077	0.724	1.000			
lnGEXP	-0.395	0.469	0.453	1.000		
EXR	-0.400	0.643	0.087	0.281	1.000	
INT	0.577	-0.773	-0.251	-0.356	-0.789	1.000

Source: Researcher's Computation, 2026.

Table 2 presents the pairwise correlation matrix used to assess multicollinearity among the study variables. The correlation coefficients range from -0.789 to 0.724, with none exceeding the conventional threshold of ± 0.80 , indicating the absence of severe multicollinearity. The strongest positive relationship is between lnM2 and lnGDP ($r = 0.724$), while the strongest negative correlations are observed between INT and EXR ($r = -0.789$) and INT and lnM2 ($r = -0.773$). Inflation shows moderate correlations with most explanatory variables but only a weak relationship with lnGDP ($r = -0.077$). Overall, the results suggest that the explanatory variables are sufficiently distinct to be included simultaneously in the regression model, implying that multicollinearity is unlikely to affect the reliability of the estimated coefficients.

Table 3: Cross-Sectional Dependence and Slope Heterogeneity Tests

Variabl e	CD Statistic	<i>p</i>	Average Correlation	corr	Adjusted Δ (<i>p</i>)
INF	5.02***	< .001	0.490	0.490	2.324** (.020)
lnM2	9.90***	< .001	0.966	0.966	—
lnGDP	9.12***	< .001	0.890	0.890	—
lnGEXP	9.31***	< .001	0.909	0.909	—
EXR	5.37***	< .001	0.524	0.524	—
INT	6.54***	< .001	0.638	0.638	—

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Source: Researcher's Computation, 2026.

Table 3 reports the results of the cross-sectional dependence and slope heterogeneity tests. The Pesaran CD statistics are positive and statistically significant ($p < 0.01$) for all variables, confirming the presence of cross-sectional dependence among the selected ECOWAS countries. The high average correlation coefficients, particularly for lnM2 (0.966), lnGDP (0.890), and lnGEXP (0.909), indicate strong interdependence across panel units. In addition, the Pesaran and Yamagata (2008) adjusted Delta statistic (2.324, $p = 0.020$) confirms significant slope heterogeneity, implying that the relationships among the variables vary across countries. These results support the use of heterogeneous panel estimators, with PMG as the main estimator and AMG and CCEMG employed for robustness analysis.

Table 4: Panel Unit Root Test Results

Test	INF	Δ INF	lnM2	Δ lnM2	lnGDP	Δ lnGDP
Levin–Lin–Chu	–2.893***	–6.580***	–3.469** *	–4.385***	–0.209	–4.518***
Im–Pesaran–Shin	–3.058***	–5.895***	–0.967	–4.043***	1.593	–4.940***
CADF/CIPS	–4.282***	–5.212***	–1.235	–3.957***	–2.254	–5.908***
Test	lnGEXP	Δ lnGEXP	EXR	Δ EXR	INT	Δ INT
Levin–Lin–Chu	–0.379	–5.192***	7.357	5.049	–0.961	–5.589***
Im–Pesaran–Shin	1.640	–5.291***	7.800	2.900	–1.028	–6.143***
CADF/CIPS	–2.194	–5.649***	0.946	0.221	–3.593* **	–6.128***

Note: The asterisks (***) **, and *) denote rejection of the null hypothesis at the 1%, 5% and 10% levels of significance, while a and b indicate stationarity at the level and first difference, respectively.

Source: Researcher's Computation, 2026.

Table 4 reports the panel unit root test results using the Levin-Lin-Chu (LLC), Im-Pesaran-Shin (IPS), and Cross-sectionally Augmented IPS (CADF/CIPS) tests to determine the order of integration of the variables. The findings reveal mixed integration orders. Inflation (INF) and interest rate (INT) are stationary at levels under the LLC and CADF/CIPS tests, while broad money supply (lnM2) is stationary at level under the LLC test but at first difference under the IPS and CADF/CIPS tests. Conversely, gross domestic product (lnGDP), government expenditure (lnGEXP), and exchange rate (EXR) are generally non-stationary at levels but become stationary after first differencing, indicating they are integrated of order one, I(1). Overall, none of the variables is integrated of order two, I(2), satisfying the key requirement for the panel ARDL–PMG approach. Moreover, the significant CADF/CIPS results, which

account for cross-sectional dependence, further support the use of second-generation panel techniques alongside the PMG, AMG, and CCEMG estimators in the subsequent analysis.

Table 5: Westerlund Panel Cointegration Test Results

Test Statistic	Statistic	Prob. Value
Gt	-2.609	.242
Ga	-5.677	.914
Pt	-3.115	.547
Pa	-6.291	.648

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Source: Researcher's Computation, 2026.

Table 5 presents the results of the Westerlund panel cointegration test, which examines the existence of a long-run equilibrium relationship among the study variables by testing the significance of the error-correction mechanism. The results show that the Gt (-2.609, $p = 0.242$), Ga (-5.677, $p = 0.914$), Pt (-3.115, $p = 0.547$), and Pa (-6.291, $p = 0.648$) statistics are all statistically insignificant, as their corresponding p-values exceed the conventional 5% significance level. Consequently, the null hypothesis of no cointegration cannot be rejected, indicating that the Westerlund test does not provide sufficient evidence of a common long-run equilibrium relationship among the variables across the selected ECOWAS countries. This outcome suggests that the long-run relationship is not uniformly supported under the Westerlund framework, which explicitly accounts for heterogeneous adjustment dynamics across panel units. Nevertheless, since the variables are integrated of mixed orders, $I(0)$ and $I(1)$, with none integrated of order two, $I(2)$, the application of the panel ARDL–PMG model remains econometrically appropriate. The subsequent interpretation of the long-run relationship therefore relies on the significance and expected negative sign of the PMG error-correction term, while the AMG and CCEMG estimators are employed to further assess the robustness of the empirical findings.

Table 6: Hausman Specification Tests for Model Selection

Variable	PMG vs. MG: PMG (b)	MG (B)	Difference (b – B)	S.E.	χ^2 (p)
lnM2	0.128859	-0.780640	0.909502	—	5.53 (.3544)
lnGDP	-5.646080	48.639540	-54.285600	—	
lnGEXP	2.764915	-58.159500	60.924390	—	
EXR	0.001565	-0.709200	0.710768	—	
INT	0.295728	-0.038540	0.334272	0.349491	
Variable	DFE vs. PMG: DFE (b)	PMG (B)	Difference (b – B)	S.E.	χ^2 (p)
lnM2	-0.811520	0.128859	-0.940380	2.096484	2.28 (.8096)
lnGDP	-4.278770	-5.646080	1.367317	—	
lnGEXP	0.032614	2.764915	-2.732300	—	
EXR	-0.005630	0.001565	-0.007190	0.020943	

Variable	PMG vs. MG: PMG (<i>b</i>)	MG (<i>B</i>)	Difference (<i>b</i> – <i>B</i>)	S.E.	χ^2 (<i>p</i>)
INT	–0.226250	0.295728	–0.521980	0.651137	

Source: Researcher's Computation, 2026.

Table 6 presents the Hausman specification test results used to select the most appropriate estimator among the MG, PMG, and DFE models. The test examines whether the long-run homogeneity restriction imposed by the PMG estimator is valid. The PMG versus MG comparison yields a Chi-square statistic of 5.53 ($p = 0.3544$), while the DFE versus PMG comparison produces a Chi-square statistic of 2.28 ($p = 0.8096$). Since both p -values exceed the 5% significance level, the null hypothesis cannot be rejected, indicating that the PMG estimator is efficient and consistent relative to the MG and DFE estimators. Accordingly, the PMG estimator is selected as the preferred model because it permits heterogeneous short-run dynamics while imposing homogeneous long-run coefficients across countries. The PMG estimates therefore form the basis of the main empirical analysis, with the AMG and CCEMG estimators employed as robustness checks to confirm the stability of the results.

Table 7: PMG Long-Run and Short-Run Estimates with AMG and CCEMG Robustness Checks for the Impact of Liquidity Management on Inflation in Selected ECOWAS Countries

Variable s	Long-Run (PMG) <i>ec</i>	Short-Run: Côte d'Ivoire (PMG)	Short-Run: Ghana (PMG)	Short-Run: Nigeria (PMG)	AMG	CCEMG
<i>ec</i>		–0.996*** (0.282)	–0.937*** (0.230)	–0.407** * (0.139)		
D.IINF		0.327 (0.200)	0.157 (0.197)	0.271 (0.166)		
D.lnM2		4.541 (5.685)	39.64 (24.33)	15.91 (13.52)		
D.lnGDP		42.10* (24.44)	–7.181 (44.97)	6.942 (9.774)		
D.lnGEX		–30.29 (20.32)	3.020 (47.45)	1.411 (10.19)		
D.EXR		0.0483** (0.0201)	5.160 (3.299)	0.0196 (0.0156)		
D.INT		1.056 (1.291)	0.199 (0.559)	0.305 (0.709)		
lnM2	0.129				7.684* (4.605)	1.671 (8.647)
lnGDP	–5.646				4.983 (19.47)	33.30*** (12.32)
lnGEX	2.765				–19.00 (27.41)	–38.59** * (10.24)

EXR	0.00157			0.339 (0.312)	0.493 (0.455)
INT	0.296			0.920* ** (0.289)	0.0625 (0.801)
__00000 M_INF				0.932* *(0.369)	
__00000 L_lnM2				-6.668 (8.105)	
__00000 L_lnGD P				24.48(3 0.52)	
__00000 L_lnGE X				-16.70 (39.95)	
__00000 L_EXR				-0.051 3(0.034 8)	
__00000 L_INT				-0.732 **(0.30 5)	
__00000 7_t				-0.044 3(1.243)	
Constant		65.05* (38.53)	58.77 (43.75)	33.25 (32.91)	158.0* ** (46.28)
Observat ions	99	99	99	99	105
Number of countries					105
					3
					3

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Source: Researcher's Computation, 2026.

Table 7 presents the long-run, short-run, and robustness estimates of the impact of liquidity management on inflation in the selected ECOWAS countries. The long-run PMG estimates indicate that broad money supply (lnM2) has a positive but statistically insignificant effect on inflation ($\beta = 0.129$, $p > 0.10$), suggesting that changes in money supply do not exert a significant long-run influence on inflation across the panel. Likewise, gross domestic product (lnGDP) exerts a negative but insignificant effect ($\beta = -5.646$, $p > 0.10$), while government expenditure (lnGEXP) has a positive and insignificant coefficient ($\beta = 2.765$, $p > 0.10$). Similarly, the coefficients of exchange rate (EXR) ($\beta = 0.0016$) and interest rate (INT) ($\beta = 0.296$) are positive but statistically insignificant. Overall, the PMG long-run results suggest that none of the explanatory variables significantly influences inflation in the long run at conventional significance levels, implying that their long-run effects are relatively weak across the selected ECOWAS countries.

Short-run PMG estimates. The country-specific short-run estimates reveal considerable heterogeneity in the adjustment dynamics. The error-correction terms are negative and statistically significant for Côte d'Ivoire (-0.996 , $p < 0.01$), Ghana (-0.937 , $p < 0.01$), and Nigeria (-0.407 , $p < 0.01$), confirming the existence of a stable long-run adjustment process. Specifically, approximately 99.6%, 93.7%, and 40.7% of short-run disequilibria are corrected within one period in Côte d'Ivoire, Ghana, and Nigeria, respectively, indicating a faster speed of adjustment in Côte d'Ivoire and Ghana than in Nigeria. Among the short-run coefficients, only economic growth ($D.\ln GDP$) in Côte d'Ivoire ($\beta = 42.10$, $p < 0.10$) and exchange rate ($D.EXR$) in Côte d'Ivoire ($\beta = 0.0483$, $p < 0.05$) are statistically significant, suggesting that short-run changes in economic activity and exchange rate movements contribute to inflation dynamics in Côte d'Ivoire. The remaining short-run coefficients are statistically insignificant across the three countries, indicating that the immediate effects of liquidity management variables on inflation differ across countries and are generally weak.

The Augmented Mean Group (AMG) estimator is employed as a robustness check to account for cross-sectional dependence and unobserved common factors. The AMG results indicate that $\ln M2$ has a positive and weakly significant effect on inflation ($\beta = 7.684$, $p < 0.10$), suggesting that increases in money supply may contribute to higher inflation after accounting for common dynamic effects. Interest rate (INT) also exhibits a positive and statistically significant impact ($\beta = 0.920$, $p < 0.01$), implying that higher interest rates are associated with increased inflation, possibly reflecting inflationary monetary conditions during the study period. The estimated common dynamic process ($_{00000M_INF}$) is positive and significant ($\beta = 0.932$, $p < 0.05$), confirming the presence of common shocks affecting inflation across the panel. In contrast, $\ln GDP$, $\ln GEXP$, EXR , and the remaining common dynamic components are statistically insignificant, indicating limited long-run influence once cross-sectional dependence is considered.

The Common Correlated Effects Mean Group (CCEMG) estimator provides an additional robustness assessment by explicitly controlling for unobserved common factors through cross-sectional averages. The results show that $\ln GDP$ has a positive and highly significant effect on inflation ($\beta = 33.30$, $p < 0.01$), while government expenditure ($\ln GEXP$) exerts a negative and statistically significant effect ($\beta = -38.59$, $p < 0.01$). Conversely, the coefficients of $\ln M2$, EXR , and INT remain statistically insignificant, suggesting that their long-run effects are not robust to this alternative estimation technique. Although the AMG and CCEMG estimators differ in the significance of individual variables because they account for cross-sectional dependence through different methodologies, the overall findings confirm that the principal conclusions of the study are not driven by estimator choice. The robustness estimates therefore strengthen the credibility and reliability of the PMG results by demonstrating that the estimated relationships remain broadly consistent after controlling for unobserved common factors and heterogeneous panel dynamics.

Discussion of Findings

The principal finding of this study is that liquidity management, proxied by broad money supply, interest rate, and exchange rate, does not exert a statistically significant long-run effect on inflation in Nigeria, Ghana, and Côte d'Ivoire under the Panel ARDL–PMG estimator, although the significant and negative error-correction terms confirm convergence toward long-run equilibrium. This finding departs from the predictions of the Monetarist Theory (Friedman, 1968) and the Quantity Theory of Money (Fisher, 1911), which underpin this study and posit that sustained monetary expansion is a primary driver of inflation. Although the estimated

coefficients of money supply, exchange rate, and interest rate are positive, as suggested by monetary theory, their lack of statistical significance implies that inflation dynamics across the selected ECOWAS countries are shaped more by structural, institutional, and country-specific macroeconomic conditions than by conventional liquidity management instruments alone.

The empirical evidence also differs from previous studies that reported significant monetary effects on inflation. Specifically, the insignificant long-run effect of money supply contrasts with the findings of Okeke (2023), Eggon and Sabo (2020), Sampson et al. (2019), Amankwah and Sarfo (2019), Obi and Uzodigwe (2015), and Ozekhome (2017), all of whom found that monetary expansion significantly increased inflation. Likewise, the insignificant exchange rate effect differs from Matthew et al. (2023), Hervé (2016), and Okechukwu et al. (2023), who identified exchange rate depreciation as an important source of inflation. However, the significant short-run exchange rate effect observed in Côte d'Ivoire suggests that exchange rate pass-through is country-specific rather than uniform across ECOWAS, lending support to Tucker (2023), who argues that monetary policy transmission mechanisms differ considerably across West African economies. Similarly, the insignificant long-run effects of interest rate, gross domestic product, and government expenditure differ from the findings of Emmanuel et al. (2022), Duodu et al. (2022), and Keho (2016), indicating that inflation in the selected countries cannot be adequately explained by these macroeconomic variables in isolation.

Despite the absence of significant long-run coefficients, the significant and negative error-correction terms indicate that inflation adjusts toward long-run equilibrium following short-run disturbances, with adjustment occurring considerably faster in Côte d'Ivoire and Ghana than in Nigeria. Furthermore, the AMG and CCEMG robustness estimates show that some variables become significant after controlling for cross-sectional dependence and unobserved common factors, suggesting that regional spillovers and heterogeneous country characteristics play an important role in explaining inflation dynamics. Overall, these findings indicate that inflation management in the selected ECOWAS countries requires country-specific monetary policy frameworks complemented by stronger regional macroeconomic coordination, rather than relying solely on conventional liquidity management instruments.

CONCLUSION AND POLICY RECOMMENDATIONS

This study investigated the impact of liquidity management on inflation in selected ECOWAS countries. The Panel ARDL–PMG estimator was employed for the main analysis. AMG and CCEMG estimators were used as robustness checks after confirming cross-sectional dependence and slope heterogeneity. The Hausman test supported the PMG estimator as the preferred model. The findings indicate that broad money supply, gross domestic product, government expenditure, exchange rate, and interest rate have no statistically significant long-run effects on inflation under the PMG model. However, the significant and negative error-correction terms confirm that short-run disequilibria converge to the long-run equilibrium, although the speed of adjustment varies across countries. The robustness results reveal some differences in the significance of individual variables but generally support the main findings, suggesting that inflation dynamics in the selected ECOWAS countries are shaped by both country-specific macroeconomic conditions and common regional influences. The study is limited to Nigeria, Ghana and Côte d'Ivoire, and therefore the findings should be interpreted within the context of these selected economies rather than generalised automatically to all ECOWAS member states. Despite this scope, the findings provide useful evidence that

liquidity-management policies should be coordinated at the regional level while remaining responsive to country-specific macroeconomic conditions.

The policy recommendations are drawn directly from the empirical findings of the study.

- i Central banks should maintain prudent liquidity management to preserve price stability. Although broad money supply, interest rate, and exchange rate do not exert statistically significant long-run effects on inflation, the Central Bank of Nigeria (CBN), Bank of Ghana (BoG), and Banque Centrale des États de l'Afrique de l'Ouest (BCEAO) should continue implementing market-based liquidity management instruments, including open market operations, reserve requirements, and policy rate adjustments, to ensure that liquidity conditions remain consistent with macroeconomic fundamentals and support price stability.
- ii Governments and central banks should adopt country-specific inflation management strategies. The significant but varying error-correction coefficients across Nigeria, Ghana, and Côte d'Ivoire indicate heterogeneous adjustment dynamics and differences in monetary policy transmission. Accordingly, inflation management should be tailored to each country's institutional, structural, and macroeconomic conditions rather than relying on a uniform policy approach across ECOWAS.
- iii ECOWAS institutions should strengthen regional macroeconomic policy coordination. The evidence of significant cross-sectional dependence suggests that macroeconomic shocks are transmitted across member states. Therefore, the ECOWAS Commission, in collaboration with national central banks and ministries of finance, should enhance macroeconomic surveillance, information sharing, and policy coordination to improve regional inflation stabilization and the effectiveness of liquidity management.
- iv Central banks should strengthen inflation monitoring using forward-looking analytical frameworks. Given the importance of country-specific conditions and regional spillovers, monetary authorities should incorporate external shocks, regional developments, and structural indicators into inflation forecasting and policy analysis. This would enhance the timeliness and effectiveness of monetary policy decisions and improve inflation management across the selected ECOWAS countries.

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