

Monetary Policy and Financial Deepening in Nigeria: A VECM and Impulse Response Analysis

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<https://doi.org/10.56201/wjfir.v10.no9.2026.pg12.26>

Abstract

This study investigates the dynamic relationship between monetary policy and financial deepening in Nigeria using annual data (1995–2024) from the Central Bank of Nigeria (CBN) statistical bulletin. Employing Vector Error Correction Model (VECM), and impulse-response analysis, the paper identifies a long-run equilibrium linking Cash Reserve Ratio (CRR), Liquidity Ratio (LQR) and the Monetary Policy Rate (MPR) with financial deepening (measured as ratio of credit to private sector to gross domestic product) and traces how shocks to these instruments affect credit depth over time. Results acknowledge cointegration between the variables, and persistent negative effects of reserve and liquidity tightening on credit, while MPR shocks produce more complex short-run responses. Furthermore, a significant error-correction term (-0.144) was also found, implying partial adjustment to equilibrium. The study recommends: prioritizing easing of binding reserve and liquidity constraints to deepen finance while applying phased adjustments to reserve requirements, among others.

Key Words: Monetary Policy, Financial Deepening, VECM, Impulse Response Function

Introduction

Financial deepening, which refers to the expansion in size, diversity and efficiency of financial markets, intermediaries and instruments, is widely recognized as a cornerstone of sustained economic development. By broadening access to savings, credit, payment and risk-management services, deeper financial systems mobilize idle resources, lower transaction and information costs, and channel capital to higher-return investments; these functions raise aggregate investment, support entrepreneurship and smooth consumption over time (Levine, 2005; Shaw, 1973). Empirical work on developing economies repeatedly links measures of depth (broad money, private-sector credit, market capitalization) to higher growth and greater resilience, while also showing that the distributional benefits of depth depend on whether access expands alongside aggregate liquidity (Nzotta & Okereke, 2019; Joseph et al., 2021). Thus, financial deepening increases the economy's capacity to absorb shocks, supports productive risk-taking, and creates the plumbing through which monetary and fiscal policies affect real activity. Nigeria's banking system has experienced sustained efforts at deepening through regulatory reform, consolidation, and technological innovation. Since the structural-adjustment era and especially after the 2004–2005 consolidation, the Nigerian banking sector has become larger, more capitalized and more interconnected, while the Central Bank of Nigeria (CBN) has introduced a sequence of instruments and frameworks – from reserve requirements and open-market operations to the Monetary Policy Rate (MPR) and targeted interventions – to manage liquidity and support intermediation (Ajisafe,

Odejide, & Ajide, 2021; Bulus, Okorie, & Adedeji, 2024). At the same time, the rise of electronic payments, agent banking and mobile money has extended basic financial services to previously excluded populations, with FinTech playing an increasingly important role in broadening access (Joseph et al., 2021). Recent empirical studies document that these structural and policy changes altered the composition of bank assets, the relative attractiveness of government securities versus private lending, and the channels through which policy impulses transmit to credit and asset markets (Ademokoya, Sanni, Oke, & Abogun, 2020; Edori, Ogbulu, & Okanta, 2024).

Monetary policy and financial deepening are tightly linked. While monetary policy influences the incentives for financial intermediation and market development, the structure and depth of the financial system shape how monetary actions (policy-rate changes, reserve requirements, OMOs) pass through to lending, asset prices and aggregate demand. In bank-dominated systems like Nigeria's, the bank-lending channel is a central conduit: changes in policy rates and liquidity conditions affect banks' funding costs and balance-sheet capacity, which in turn influence credit supply to firms and households (Bulus et al., 2024; Yunusa, Williams, & Adegbenle, 2020). Simultaneously, deeper capital markets and more liquid securities markets strengthen interest-rate and asset-price channels, enabling policy to affect wealth, investment and exchange-rate dynamics (Chukwuemeka, 2018; Edori et al., 2024).

Monetary policy regimes and strategic targeting of financial depth have evolved in Nigeria as authorities sought to reconcile price stability with financial-sector development. The CBN's toolkit has shifted from direct controls toward market-based instruments and a greater reliance on the MPR as the operational anchor, while complementary measures: reserve requirements, liquidity ratios, and targeted credit programmes, have been used to influence intermediation and inclusion (Ajisafe et al., 2021; Bulus et al., 2024). At the same time, policy design increasingly recognizes that promoting financial depth requires sequencing: strengthening prudential frameworks and bank capitalization before liberalizing interest rates, and developing market infrastructure (payment systems, custody, repo markets) in parallel with efforts to expand access (Joseph et al., 2021; Olumo & Muritala, 2023). It is believed that policies that encourage private-sector credit while maintaining market liquidity and bank resilience can improve monetary transmission and broaden the benefits of financial development, but only when accompanied by sound regulation and macroprudential safeguards (Bulus et al., 2024; Akobundu & Alugbuo, 2024).

Despite the progress in measurement and policy, important empirical gaps remain. Several Nigerian studies document long-run associations among monetary variables, credit and asset-market outcomes, but questions persist about the dynamic adjustment process and the relative importance of competing channels under different regimes and shocks. In particular, there is a need for analyses that combine long-run cointegration with explicit dynamic identification of responses to shocks – for example, Vector Error Correction Models (VECM) augmented by impulse-response functions – to trace how a monetary or liquidity shock propagates through credit, exchange-rate and asset-price channels over time. Existing work often uses ARDL, FM-OLS or single-equation ECMs to estimate long-run links (Ademokoya et al., 2020; Yunusa et al., 2020; Bulus et al., 2024), but fewer studies exploit VECM frameworks with impulse responses to decompose short-run dynamics and speed of adjustment across channels. Thus, the present study focuses on a VECM approach and impulse-response analysis to fill this methodological and policy-relevant gap.

Accordingly, this study estimates the long-run equilibrium relationships among monetary policy instruments, and measures of financial deepening (private-sector credit) using cointegration and a

VECM framework, thereby capturing both equilibrium linkages and short-run dynamics. Furthermore, it uses impulse-response functions and variance decompositions to identify the dynamic effects of monetary and liquidity shocks on credit, to assess the relative strength of bank-lending channels in Nigeria's evolving financial structure. This study is justified by the policy need to understand not only whether monetary policy and financial deepening are associated, but how shocks transmit over time and which instruments or structural features amplify or dampen transmission, which is essential for designing monetary and macroprudential policies that promote inclusive, stable financial deepening in Nigeria.

2.0 Literature Review

2.1.1 Monetary Policy

Monetary policy is a central pillar of macroeconomic management, especially in developing economies where financial markets and institutional frameworks are still evolving. In such contexts, the central bank's decisions about the supply and price of money have outsized effects on investment, consumption, exchange-rate dynamics and the allocation of credit across sectors (Taylor, 2004). By influencing interest rates, liquidity and market expectations, monetary policy shapes the cost of capital and the incentives for saving and borrowing; these channels are particularly important in countries like Nigeria where bank credit and domestic financial intermediation remain the dominant sources of funding for firms and households (Bulus, Okorie, & Adedeji, 2024; Chukwuemeka, 2018). In short, an effective monetary policy framework is not only about stabilizing prices but also about creating the conditions for sustainable, inclusive growth through well-functioning financial intermediation.

At its core, monetary policy comprises the deliberate actions taken by a central bank to regulate the quantity, cost and availability of money and credit in the economy. Operationally, this involves setting a policy stance and using instruments — such as the Monetary Policy Rate (MPR), Cash Reserve Ratio (CRR), statutory Liquidity Ratio (LR), and Open Market Operations (OMO) — to steer short-term interest rates, manage system liquidity and influence the broader monetary aggregates (Ajisafe, Odejide, & Ajide, 2021; Mbonu, 2025). Canonical definitions emphasize that monetary policy is a package of measures designed to align money supply and its price with the desired level of economic activity (Nnanna, 2001), and the Central Bank of Nigeria (CBN) explicitly frames monetary policy as the deliberate use of these tools to influence the quantity, cost and availability of credit in pursuit of macroeconomic objectives (CBN, 2011). Recent empirical work on Nigeria underscores the practical importance of these instruments: studies find that OMOs and money-supply dynamics often have measurable effects on bank lending and market liquidity, while reserve and liquidity requirements shape banks' capacity to intermediate (Ademokoya, Sanni, Oke, & Abogun, 2020; Mbonu, 2025).

The objectives of monetary policy are conventionally stated as price stability, external balance and the promotion of sustainable output and employment; in Nigeria these goals remain central to the CBN's mandate (Nnanna, 2001; CBN, 2011). Price stability preserves the purchasing power of money and reduces uncertainty for savers and investors, while a stable balance of payments helps to protect foreign reserves and maintain exchange-rate credibility — both of which are critical for an economy that is heavily exposed to commodity price swings and external shocks (Gbosi, 2002; Chukwuemeka, 2018). Monetary policy therefore acts as a countervailing force against undesirable macroeconomic trends such as persistent inflation, rising unemployment or chronic external

deficits; the choice and calibration of instruments are intended to offset these trends without unduly constraining productive activity (Gbosi, 2002; Ajisafe et al., 2021).

Monetary policy can be expansionary or contractionary, and the choice between them depends on macroeconomic conditions and policy objectives. An expansionary stance increases the money supply or lowers policy rates to stimulate aggregate demand, ease credit conditions and support investment and consumption when output is below potential; conversely, a restrictive stance tightens liquidity or raises rates to cool demand and rein in inflation (Taylor, 2004; Nnanna, 2001). The transmission of these stances to the real economy operates through multiple channels — interest-rate, bank-lending, asset-price and exchange-rate channels — and the net effect on output and prices depends on the responsiveness of banks, firms and households to changes in rates and liquidity. Empirical studies in Nigeria show that the quantity channel (money supply and OMOs) has often been a powerful determinant of credit growth, while the pass-through from policy rates to lending rates can be incomplete because of banks' portfolio preferences and regulatory constraints (Ademokoya et al., 2020; Yunusa, Williams, & Adegbenle, 2020).

To implement policy, the CBN and other central banks deploy a mix of instruments. In Nigeria the toolkit includes the Monetary Policy Rate (MPR) as the operational policy rate, Open Market Operations (OMO) to inject or absorb liquidity, the Cash Reserve Ratio (CRR) and statutory Liquidity Ratio (LR) to influence banks' reserve holdings and eligible assets, and standing facilities or discount windows for short-term liquidity support (Udude, 2015; Ajisafe et al., 2021). The effectiveness of any instrument depends on the broader operating environment — the depth and liquidity of money and government-securities markets, the health and capitalization of banks, the quality of payment and settlement infrastructure, and the credibility of the central bank's communications. Recent Nigerian evidence suggests that OMOs and money-supply management have been particularly effective at influencing short-term liquidity and lending, whereas blunt changes in reserve ratios or headline policy rates sometimes have muted effects when banks prefer government securities or when regulatory targets (e.g., loan-to-deposit ratios) counteract tightening (Mbonu, 2025; Bulus et al., 2024).

2.1.2 Financial Deepening

Financial deepening describes the widening and sophistication of a country's financial system — an expansion in the range, volume and liquidity of financial services and assets available to households, firms and governments. Scholars emphasize that deepening is not merely larger balance sheets but a richer set of instruments and intermediation channels: as Yobo and Ezirim (2023) note, financial deepening “denotes the availability of a broad range of financial assets in an economy” and “generally implies more liquidity,” meaning that markets and intermediaries can more readily transform savings into productive uses. Empirically it is captured by indicators such as broad money (M2) relative to GDP, domestic credit to the private sector, and measures of physical and institutional access like bank branches per 100,000 adults (Levine, 2005; Shaw, 1973; Nzotta & Okereke, 2019).

The economic significance of financial deepening lies in the mechanisms through which it raises productivity and welfare. By mobilizing savings and pooling risks, a deeper financial system channels funds to higher-return investments and reduces the frictions that impede transactions and information flows; this improves resource allocation and lowers the cost of intermediation (Chami et al., 2009). Greater liquidity, both in markets and on intermediaries' balance sheets, amplifies these effects: it expands the supply of credit, supports market liquidity for trading and price

discovery, and enables households and firms to smooth consumption and invest in human and physical capital. These economic gains often generate social spillovers as well, including broader financial inclusion, poverty reduction and more resilient livelihoods, a dynamic emphasized in the classical and contemporary literature on financial development (Shaw, 1973; Deema & Buthiena, 2016).

2.2 Theoretical Review

In developing the theoretical foundation for this study, two complementary strands of monetary thought: the classical (quantity) view of money and the fractional-reserve theory of banking, are employed. The classical perspective, rooted in early political-economy (Smith, 1776) and formalized in later quantity-theory treatments (Fisher, 1911), posits a proportional relationship between the nominal money stock and the general price level. Under this view, an increase in money supply raises aggregate liquidity, stimulates spending, and bids up prices; higher nominal incomes and prices then transmit into real activity through wage and demand channels, encouraging firms to expand output and employment toward full employment. Applied to Nigeria, the classical mechanism implies that expansionary monetary actions (for example, liquidity injections or lower policy rates) can enlarge deposit bases and formal financial claims, thereby increasing measured financial depth—though the strength of this channel depends on inflation expectations, market depth, and institutional frictions (Olumo & Muritala, 2023; Bulus et al., 2024). Complementing the quantity view, fractional-reserve theory (Gurley & Shaw, 1955) explains how prudential rules and reserve practices determine the banking system's capacity to create credit. In a fractional-reserve system, banks retain only a mandated fraction of deposits as reserves and lend out the remainder; consequently, reserve and liquidity requirements mechanically constrain the volume of loans that deposit-funded banks can extend. In the case of Nigeria, where deposit-funded intermediation remains central, higher cash reserve ratios (CRR) or liquidity ratios (LQR) reduce lendable funds and, absent offsetting market funding, compress private-sector credit and other measures of financial deepening (Ademokoya et al., 2020; Yunusa, Williams, & Adegbenle, 2020). This supply-side logic helps explain why prudential tightening can have persistent contractionary effects on intermediation.

2.3 Empirical Review

Quite a handful of empirical literatures on monetary policy and financial deepening exists in the literature. For example, Mbonu (2025) examined the impact of monetary policy on deposit money bank lending in Nigeria for 2005–2022 using ex-post facto design and OLS regression on CBN data. The study reports that conventional policy tools: monetary policy rate (MPR), cash reserve ratio (CRR) and liquidity ratio, showed inverse but statistically insignificant relationships with commercial bank lending, while open market operations (OMO) had a positive and significant effect. Also, cointegration/ECM diagnostics indicated a long-run relationship among the variables. Bulus et al. (2024) used quarterly data (2000–2022) and an ARDL/bounds testing framework to assess the bank-lending channel in Nigeria. They found cointegration between credit to the private sector and monetary policy variables (MPR, M2), as well as a significant negative and meaningful error-correction term and a moderate speed of adjustment ($\approx 33\%$ per quarter), evidencing that the bank-lending channel exists but is relatively weak and sensitive to banking-sector stability. Edori et al. (2024) investigated the impact of monetary policy on Nigerian stock-market performance (1985–2021) using ECM/VECM techniques with market capitalization as the

dependent variable and MPR, loan-to-deposit ratio and liquidity ratio as key regressors. They report that monetary policy variables significantly relate to market performance and recommend consistent review of policy variables to deepen the capital market. Akobundu and Alugbuo (2024) applied OLS to annual data (1981–2022) to test how fiscal instruments affect financial deepening and found mixed effects – capital expenditure negatively and significantly associated with financial deepening, government borrowing positively and significantly associated, while recurrent expenditure and tax revenue showed insignificant relationships – concluding that fiscal composition matters for financial sector depth and long-run cointegration exists.

Olumo and Muritala (2023) explored monetary policy and financial development in Nigeria (2004–2023) using panel cointegration and dynamic fixed-effects models with deposit interest rate, broad money and Global Financial Development indicators (bank Z-score, domestic credit to private sector, bank branches per 100,000 adults, net interest margin). They found that deposit interest rate is positively associated with bank Z-score and that different dimensions of financial development (depth, access, stability, efficiency) show heterogeneous and sometimes weak responses to interest-rate movements, leading to policy advice about measured, lag-aware rate adjustments. Ajisafe et al. (2021) constructed a financial stability index via principal component analysis and used a VECM framework for 1986–2017 to examine monetary policy transmission channels' effects on financial stability in Nigeria. They find that exchange-rate channel is the dominant transmission channel for financial stability and that interest-rate, credit and exchange channels all matter dynamically, implying that monetary policy changes have significant effects on financial stability but that channel effectiveness depends on institutional and structural features. Joseph et al. (2021) investigated whether monetary policy is effective in promoting financial inclusion in Nigeria (2009–2019) and whether FinTech strengthens that link, using Johansen cointegration and FMOLS. They show that lending and inflation rates significantly affect financial inclusion (measured by deposits and private-sector credit), and that accounting for mobile-money (FinTech) improves monetary policy's effectiveness on inclusion, contradicting the view that FinTech necessarily impedes policy transmission. Ademokoya et al. (2020) studied the impact of monetary policy on bank credit in Nigeria using monthly data (2007–2019) and fully modified OLS. Their results indicate that money supply (M2) positively and significantly influences bank credit while liquidity ratio negatively and significantly affects credit creation, whereas MPR and maximum lending rate were not significant.

Lateef Adewale Yunusa, Tolulope Williams, and Oluwatosin Adegbenle (2020) applied ARDL and ECM to 1980–2018 time series to investigate monetary variables' effects on bank lending and found that inflation and interest rate significantly and negatively affect loans and advances, exchange rate positively affects lending, while liquidity ratio and money supply had negative but insignificant effects; Granger causality tests suggested inflation Granger-causes lending rate but not vice versa. Chukwuemeka (2018) analyzed monetary policy and capital-market performance using annual CBN data and applied unit-root, cointegration, VECM and Granger causality techniques to model market capitalization and turnover as functions of interest rate, exchange rate, monetary aggregates, MPR and T-bill rate. The study found significant long-run relationships and directional causality consistent with monetary policy materially influencing capital-market outcomes.

3.0 Methodology

This study uses quasi-experimental research design, which combines theoretical consideration (a prior criterion) with the empirical observation to draw inferences on relationships between variables. The study relied on annual time series data collected from the statistical bulletin of the CBN from 1995 to 2024, which were analysed using the Vector Error Correction Model (VECM) and Impulse Response Function (IRF) analytical techniques. The model employed expresses the relationship between monetary policy and financial deepening, as follows:

$$\text{FDN} = f(\text{CRR}, \text{LQR}, \text{MPR}) \quad (1)$$

The functional models are translated into the following econometric models:

$$\text{FDN} = \alpha_0 + \alpha_1\text{CRR} + \alpha_2\text{LQR} + \alpha_3\text{MPR} + \mu \quad (2)$$

Where FDN = Financial Deepening measured as ratio of Credit to Private Sector to GDP, CRR = Cash Reserve Ratio, LQR= Liquidity Ratio, MPR = Monetary policy Rate, α_0 = Constant, $\alpha_1 - \alpha_3$ = Coefficients of independent variables, μ = Error Term.

The a priori expectations are: $\alpha_1, \alpha_2, \alpha_3 < 0$

4.0 Results and Discussion

Table 1: Descriptive Statistics

	FDN	CRR	LQR	MPR
Mean	14.25700	14.81000	32.66667	13.62500
Median	17.58500	10.00000	30.00000	13.50000
Maximum	22.75000	50.00000	40.00000	27.50000
Minimum	5.810000	1.000000	25.00000	6.000000
Std. Dev.	5.998944	11.27494	5.040069	4.104114
Observations	30	30	30	30

Source: Author's Computation

Table 2: Augmented Dickey-Fuller (ADF) Unit Root Test

Variables		t-statistic	Critical value (0.05)	Prob.	Order of Integration
CRR	Level	1.848629	-2.967767	0.9996	I(1)
	1 st Difference	-3.551196	-2.971853	0.0138	
LQR	Level	-1.828549	-2.971853	0.3596	I(1)
	1 st Difference	-3.675308	-2.976263	0.0106	
MPR	Level	-0.708149	-2.967767	0.8293	I(1)
	1 st Difference	-5.224976	-2.971853	0.0002	
CPS/GDP	Level	-1.102590	-2.976263	0.6998	I(1)
	1 st Difference	-4.962783	-2.976263	0.0004	

Source: Researcher's Computation with EViews

Table 3: Johansen Cointegration Test

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	Max-Eigen Statistic	0.05 Critical Value
None *	0.680616	53.96786*	30.81673*	47.85613
At most 1	0.437645	23.15113	15.54178	29.79707
At most 2	0.218925	7.609357	6.671262	15.49471
At most 3	0.034148	0.938095	0.938095	3.841466

Source: Author's Computation

Note: *denote significance at 5%

Table 4: Vector Autoregressive Regression

Cointegrating Eq:	CointEq1
FDN(-1)	1.000000
CRR(-1)	-1.336172 (0.25462)*
LQR(-1)	-2.892570 (0.69917)*
MPR(-1)	8.252442 (1.23923)*
C	-8.190809
Error Correction:	D(FDN)
CointEq1	-0.144191 (0.04007)*
D(FDN(-1))	-0.088800 (0.20669)
D(FDN(-2))	-0.632360 (0.24080)**
D(CRR(-1))	-0.151154 (0.15878)
D(CRR(-2))	-0.318827 (0.15297)**
D(LQR(-1))	0.005114 (0.23634)
D(LQR(-2))	0.453228 (0.20955)**
D(MPR(-1))	1.050508 (0.36072)
D(MPR(-2))	0.483800 (0.21787)**
C	1.003782

	(0.42242)**
R-squared	0.655194
Adj. R-squared	0.472649
F-statistic	3.589227

Source: Author's Computation

Note: *, ** denote significance at 1%, and 5%, respectively.

In Table 1, the results show that FDN (Mean = 14.26; Median = 17.59; Std. Dev. = 5.999; Range = 5.81–22.75) is moderately dispersed with the median exceeding the mean, indicating a slight left skew. CRR (Mean = 14.81; Median = 10.00; Std. Dev. = 11.27; Range = 1.00–50.00) is the most volatile variable: a large standard deviation and a mean well above the median point to strong right skew driven by high outliers. LQR (Mean = 32.67; Median = 30.00; Std. Dev. = 5.04; Range = 25.00–40.00) is fairly concentrated around its mean (low relative dispersion); and distribution is approximately symmetric and stable. MPR (Mean = 13.63; Median = 13.50; Std. Dev. = 4.10; Range = 6.00–27.50) is the most stable and nearly symmetric variable, with the smallest standard deviation and mean $\approx$ median. The results presented in Table 2 indicates that all the variables are stationary at their first differences. None of the variables have unit root and therefore suitable for econometric analyses. The results in Table 3 indicate the presence of at least 1 cointegrating equation in the series, confirming that the variables have a dynamic long run relationship. The VECM in Table 4 shows a stable long-run relationship: CRR (−1.336), LQR (−2.893) and MPR (+8.252) are all significant at 1%. The error-correction term (−0.144, 1%) indicates about 14.4% of disequilibrium is corrected each period. Short-run dynamics are driven by significant second-lag effects: $D(\text{FDN}(-2)) = -0.632$ (5%), $D(\text{CRR}(-2)) = -0.319$ (5%), $D(\text{LQR}(-2)) = +0.453$ (5%), and $D(\text{MPR}(-2)) = +0.484$ (5%), whereas most first-lag differences are insignificant. The model explains a substantial portion of short-run variation in FDN ($R^2 = 0.655$; adj. $R^2 = 0.473$) and the overall F-test is significant.

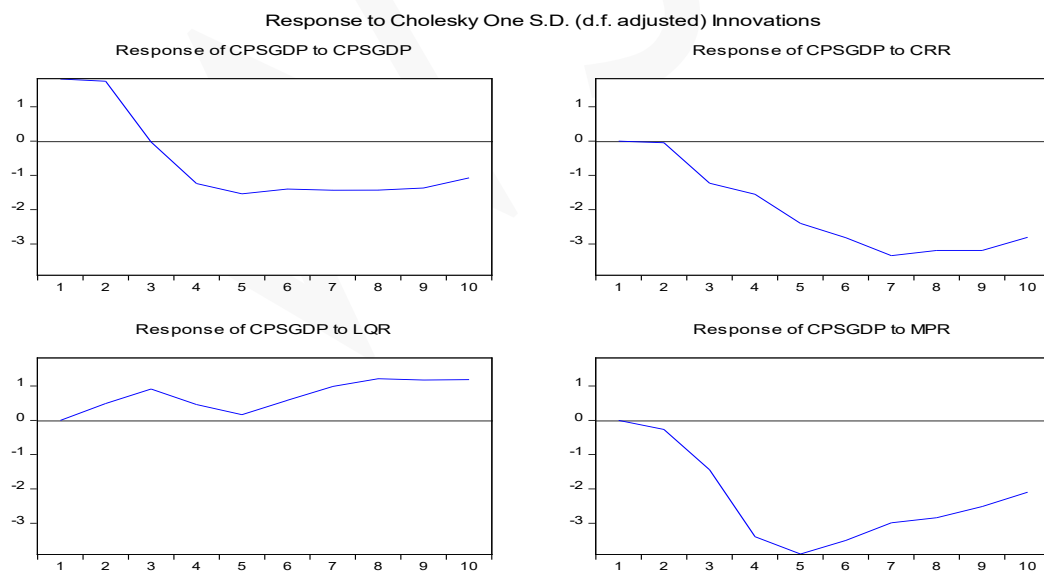


Figure 1: Response of FDN to own, CRR, LQR, and MPR shocks.

Source: Author's Computation

Figure 1 shows that CRR and MPR shocks exert the clearest and economically meaningful impacts (CRR negative and persistent; MPR negative short-to-medium run), FDN shows internal persistence, while LQR effects are muted and less robust.

4.1 Discussion of findings

The VECM results reveal a long-run equilibrium linking FDN (financial deepening) with monetary policy instruments. From the results, FDN adjusts to disequilibrium with an error-correction coefficient of -0.144 , and shows significant short-run mean reversion at the second lag ($D(FDN(-2)) = -0.632$, 5%). Theory predicts that financial depth responds slowly to shocks because institutional and balance-sheet adjustments take time. Empirical studies for Nigeria report similar long-run links and gradual adjustment: Bulus et al. (2024) document cointegration and a moderate speed of adjustment in credit dynamics, while Mbonu (2025) and Chukwuemeka (2018) also find long-run relationships between monetary policy and financial sector outcomes. The 14.4% per period correction implies persistent but not immediate convergence, consistent with frictions in credit allocation, regulatory lags, and slow portfolio rebalancing. The negative second-lag coefficient suggests overshooting or corrective dynamics after shocks: when FDN jumps, part of the adjustment reverses over the next two periods as banks and firms rebalance.

Cash Reserve Ratio (CRR) has statistically significant negative long-run and short-run coefficients (-1.336 (1%); $D(CRR(-2)) = -0.319$ (5%)). Theory predicts higher reserve requirements reduce banks' lendable funds and thus constrain private credit and financial deepening. Empirical evidence is mixed: some studies find CRR constrains credit (Ademokoya et al., 2020; Yunusa et al., 2020), while Mbonu (2025) reports an inverse but statistically insignificant relationship for commercial bank lending. The strong negative long-run coefficient here supports the theoretical channel: sustained higher CRR mechanically reduces deposit-based intermediation and, over time, lowers FDN. The significant second-lag negative effect indicates transmission is not instantaneous – banks may initially absorb reserve changes via liquidity management or interbank borrowing, but lending contracts after a short delay. Liquidity Ratio (LQR) show mix results: long-run coefficient = -2.893 (1%); short-run $D(LQR(-2)) = +0.453$ (5%). Like CRR, higher liquidity requirements are expected to restrict banks' ability to transform deposits into loans, implying a negative long-run effect on depth. Mbonu (2025) found an inverse but insignificant relationship for liquidity ratio and lending; Ademokoya et al. (2020) reported negative effects of liquidity ratio on credit creation. Olumo and Muritala (2023) highlight heterogeneous responses across financial development dimensions. The strong negative long-run coefficient confirms the a priori expectation that binding liquidity rules reduce long-run FDN. The positive short-run second-lag effect may reflect temporary portfolio adjustments or regulatory arbitrage: when LQR is tightened, banks may initially shift toward on-balance sheet instruments counted as liquid or draw on short-term market funding, producing a transient small increase in measured FDN before the constraint reduces lending. Lastly, Monetary Policy Rate (MPR) shows long-run coefficient (8.252 , 1%) and short-run 2-period lag (0.484 , 5%), but impulse responses show initial contraction followed by recovery. Theory often predicts higher policy rates dampen credit demand and can reduce financial deepening in the short run; however, the effect on measured financial depth (FDN) is contrasting because higher rates raise returns on financial assets. Olumo and Muritala (2023) and Edori et al. (2024) document heterogeneous and sometimes positive links between interest rates and financial sector indicators (e.g., bank stability, market capitalization). However, Mbonu (2025) found an inverse but insignificant relationship between MPR and bank lending; while

Ademokoya et al. (2020) and Yunusa et al. (2020) report negative short-run effects of interest rates on lending. The positive and large long-run coefficient could be attributed to risk-pricing and bank profitability linkage, as higher rates can improve net interest margins and bank Z-scores, supporting credit supply in the long run (Olumo & Muritala, 2023). The short-run impulse response showing initial contraction is consistent with conventional demand effects – rate hikes depress borrowing immediately – while the long-run positive association reflects slower supply-side or valuation adjustments. This duality is echoed in the literature: Ajisafe et al. (2021) and Edori et al. (2024) find that interest-rate channels matter dynamically and can have different signs across horizons.

Conclusion

The VECM evidence points to a robust long-run relationship between financial deepening and conventional monetary policy instruments. Cash reserve and liquidity ratios exert clear contractionary long-run effects on FDN (large, negative, and statistically significant coefficients), while MPR shows a positive long-run association with FDN despite producing short-run contractionary responses. The error-correction term (≈ -0.144) implies gradual adjustment – shocks to the system persist and are only partly corrected each period, so policy actions have both immediate and protracted consequences. Consequently, the following policy recommendations are offered:

- 1.) The MPC should prioritise easing binding reserve and liquidity constraints to deepen finance by gradually lowering the effective burden of reserve requirements where macro-prudential risks permit, or introduce targeted exemptions and tiered reserve requirements for lending to productive sectors.
- 2.) Adjustments, especially those that apply to reserve requirements should be phased and clear timelines and conditionality communicated to reduce uncertainty and allow banks to reallocate funding without abrupt credit contraction.
- 3.) Policy increases in the MPR should be paired with measures that protect credit access (targeted liquidity windows, credit guarantees) while monitoring bank profitability and deposit mobilization. Conversely, periods of policy easing should clearly capture inflation expectations.
- 4.) Develop interbank, repo, and wholesale funding markets and deepen capital markets so banks can manage reserve and liquidity needs without curtailing lending. More so, instruments that convert illiquid assets into usable liquidity should be encouraged.

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Appendix

Appendix 1: Residual Normality Test

VEC Residual Normality Tests

Orthogonalization: Cholesky (Lutkepohl)

Null Hypothesis: Residuals are multivariate normal

Date: 05/04/26 Time: 09:38

Sample: 1995 2024

Included observations: 27

Component	Skewness	Chi-sq	df	Prob.*
1	0.261518	0.307764	1	0.5791
2	0.265043	0.316115	1	0.5740
3	0.447527	0.901264	1	0.3424
4	-0.039840	0.007143	1	0.9326
Joint		1.532284	4	0.8209

Component	Kurtosis	Chi-sq	df	Prob.
1	2.620045	0.162412	1	0.6869
2	2.552225	0.225565	1	0.6348
3	3.186394	0.039085	1	0.8433
4	2.243631	0.643606	1	0.4224
Joint		1.070668	4	0.8989

Component	Jarque-Bera	df	Prob.
1	0.470175	2	0.7905
2	0.541680	2	0.7627
3	0.940349	2	0.6249
4	0.650748	2	0.7223
Joint	2.602952	8	0.9568

*Approximate p-values do not account for coefficient estimation

Appendix 2: Serial Correlation Test

VEC Residual Serial Correlation LM Tests

Date: 05/04/26 Time: 09:38

Sample: 1995 2024
Included observations: 27

Null
hypothe
sis: No
serial
correlati
on at lag
h

Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	10.31339	16	0.8498	0.604374	(16, 31.2)	0.8562
2	14.43298	16	0.5665	0.895258	(16, 31.2)	0.5805

Null
hypothe
sis: No
serial
correlati
on at
lags 1 to
h

Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	10.31339	16	0.8498	0.604374	(16, 31.2)	0.8562
2	36.15372	32	0.2807	1.144466	(32, 23.7)	0.3712

*Edgeworth expansion corrected likelihood ratio statistic.

Appendix 3: Heteroskedasticity Test

VEC Residual Heteroskedasticity Tests (Levels and Squares)

Date: 05/04/26 Time: 09:39

Sample: 1995 2024

Included observations: 27

Joint test:

Chi-sq	df	Prob.
182.5981	180	0.4320

Individual components:

Dependent	R-squared	F(18,8)	Prob.	Chi-sq(18)	Prob.
res1*res1	0.731114	1.208463	0.4102	19.74007	0.3476
res2*res2	0.881606	3.309508	0.0445	23.80337	0.1616
res3*res3	0.362394	0.252607	0.9927	9.784636	0.9387
res4*res4	0.517659	0.476987	0.9084	13.97679	0.7306
res2*res1	0.734657	1.230538	0.3991	19.83575	0.3421
res3*res1	0.377991	0.270086	0.9900	10.20575	0.9250
res3*res2	0.894856	3.782565	0.0303	24.16111	0.1498
res4*res1	0.562632	0.571735	0.8455	15.19107	0.6488
res4*res2	0.837987	2.298828	0.1155	22.62566	0.2054
res4*res3	0.368641	0.259505	0.9917	9.953309	0.9334