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The Cost of Safety: Assessing the Capital Buffer Drag and Liquidity Creation Thresholds in Ghana's Banking Sector

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Abstract

This study examines whether strengthening structural capital buffers and enhancing liquidity influence shareholder equity returns in Ghana's banking sector. Additionally, it assesses how overall economic growth impacts financial intermediation over time. The study employs the Autoregressive Distributed Lag (ARDL) Bounds Testing method to examine annual time-series data spanning 2006 to 2025. The empirical results demonstrate a highly dynamic long-term equilibrium system, with the F-bounds test confirming strong cointegration. Long-term estimates show that capital adequacy has a significant negative effect on bank performance ($\beta = -0.9961$, $p = 0.010$). In contrast, standalone liquidity creation ($\beta = 1.3213$, $p = 0.002$) and GDP growth ($\beta = 5.8165$, $p = 0.009$) positively influence bank returns. Importantly, the macroeconomic interaction term (LQ*GDP) has a negative and significant coefficient ($\beta = -0.1829$, $p = 0.006$), indicating a critical threshold where diminishing returns occur in developing economies. Additionally, management efficiency and asset quality are major performance drivers that impose negative constraints on returns. This indicates that asset-liability management should be closely aligned with the business cycle. Failing to shift from passive liquidity holding to active lending during GDP upswings can create an investment drag that ultimately erodes shareholder value. The research departs from traditional, linear assumptions about bank performance by introducing a non-linear interaction term (LQ*GDP) within an ARDL framework. The study adds distinct empirical value by extending its analytical horizon to the full post-crisis landscape up to 2025, mapping the structural recovery path of universal banks following the devastating impairments arising from the 2022 Ghanaian DDEP restructuring.

Keywords: Capital Buffers, Liquidity, GDP Growth, Return on Equity, ARDL, DDEP Shock

1. Introduction

The banking sector forms the backbone of financial intermediation, economic stability, and sustainable development in developing economies, particularly in sub-Saharan Africa (Ackah & Asiamah, 2016; Antwi, 2020). In Ghana, the commercial banking industry has experienced substantial structural, regulatory, and macroeconomic reforms over the past two decades. Notable among these are the introduction of rigorous capital buffers and improvements to liquidity-creation processes (Antwi, 2011, 2020; Dadzie & Ferrari, 2019). Classical banking theory holds that maintaining robust Capital Adequacy Ratios (CA) safeguards against systemic shocks and insolvency risks (Cline, 2017; Santos, 2001). Simultaneously, as described in Liquidity Creation Theory (Berger & Bouwman, 2009), commercial banks primarily create liquidity by transforming liquid liabilities, such as deposits, into less liquid assets, such as loans to the private sector. The success of capital buffer build-up and liquidity generation depends heavily on the macroeconomic context (Aspachs et al., 2005; Kasonde, 2026). Gross domestic product (GDP) growth mainly influences credit demand, asset performance, and the pace of financial intermediation (Apau et al., 2023; Koju et al., 2020; Swamy, 2017). During periods of economic growth, banks can safely expand liquidity, extend credit to the private sector, and offer appealing returns to investors. Conversely, recessions or large sovereign shocks can unsettle these processes (Abbas et al., 2023). In Ghana, this balance was tested during major structural shifts, including the banking sector reforms from 2017 to 2019, and the 2022 Domestic Debt Exchange Programme (DDEP) (Grigorian & Vessereau, 2024; Nyamadi, 2025; Senanu & Narteh, 2023). The DDEP caused substantial losses on sovereign debt, leading to record impairments on bank balance sheets (Atuahen et al., 2024; Grigorian & Vessereau, 2024; Nyamadi, 2025). Thus, understanding how banks maintain capital, generate liquidity, and sustain high ROE amid shifting macroeconomic conditions remains crucial for policymakers and investors.

Although maintaining high capital cushions and liquidity pools offers theoretical benefits (Boamah et al., 2023; Mashamba, 2018), developing economies often face a problem between regulatory safety and maximising shareholder value. In Ghana, commercial bank management must balance strict macroprudential requirements from the Bank of Ghana regarding the Capital Adequacy Ratio with the high return expectations of equity investors. According to the Risk-Return Trade-Off Theory, increasing equity capital buffers reduces the asset-to-equity leverage multiplier (Markowitz, 1952). This reduction can make capital buffers a structural obstacle to performance rather than an asset for investors, as the growth of the equity base often exceeds that of net earnings (Bagntasarian & Mamatzakis, 2019; Kumah et al., 2026). Moreover, while liquidity creation boosts core interest income, excessive liquidity hoarding during macroeconomic instability indicates inefficient use of capital (Alaoui, 2025; Maroun, 2025). This results in an investment drag that reduces interest margins (Alaoui, 2025). The problem is further complicated by the influence of the broader macroeconomy. Many studies show that both liquidity and macroeconomic factors influence bank profitability, often assuming a linear relationship between bank measures while neglecting how economic growth (GDP) can either enhance or constrain a bank's ability to

convert liquid assets into profitable lending (Abbas et al., 2023; Duan & Niu, 2020). Ignoring this dynamic interaction, especially during major structural shocks such as the 2022 DDEP event, causes model misspecification.

Despite extensive evaluations, a significant methodological and conceptual gap persists in the literature, as researchers and policymakers lack a clear empirical framework for understanding how macroprudential policies influence bank returns across economic cycles. Most previous studies treat liquidity creation (LQ) and macroeconomic growth (GDP) as separate, parallel regressors, without accounting for how the business cycle shapes returns on financial intermediation (Abbas et al., 2023; Adelopo et al., 2022; Sahyouni & Wang, 2018; Yusgiantoro et al., 2019). These studies often employ ordinary least squares, static panel methods or standard cointegration models, which are ill-suited to the mixed data integration patterns typical of fragile macro-banking data and tend to yield biased estimates. Additionally, Ghanaian literature lacks an empirical framework to account for the profound structural distortions caused by the 2022 DDEP shock, leaving a critical gap in understanding post-crisis banking behaviour.

Consequently, this research is highly relevant to financial stakeholders in developing economies. It provides bank regulators with empirical insights into how macroprudential policies influence bank performance, supporting the development of adaptive, counter-cyclical capital buffers rather than fixed regulatory minimums. Bank managers can use this data-driven approach to optimise asset-liability strategies across different economic stages, balancing liquid reserves with credit expansion. For institutional investors and economists, it clarifies how frontier banking markets handle sovereign debt shocks and sustain long-term equity growth amid structural challenges. The study also introduces an interactive ARDL model that depicts liquidity creation as a function of the macroeconomic cycle (LQ*GDP), capturing the nonlinear, diminishing returns of liquid asset deployment during economic booms. Additionally, it revisits Ghana's modern banking history by incorporating a structural pulse dummy (D2022) to isolate the DDEP impairment shock, providing an unbiased analysis of banking literature.

The research paper is organised into five (5) sections. Section 1 provides background, defines the research problem, identifies the gaps in the literature, and highlights the paper's importance and main contributions. Section 2 surveys theoretical and empirical studies. Section 3 details the research methodology. Section 4 provides the empirical results and discussion. Lastly, Section 5 summarises the findings and proposes practical recommendations.

2. Literature Review

This section examines the theoretical frameworks and empirical research on the interconnections among capital buffer accumulation, liquidity creation, economic growth, and bank profitability. It establishes the conceptual foundation by linking macroprudential tools and macroeconomic variables to shareholder equity returns.

2.1 Theoretical Foundations

2.1.1 The Risk-Return Trade-Off Theory

The Risk-Return Trade-Off Theory by Markowitz (1952) posits a fundamental relationship between institutional safety and equity returns. In the context of macroprudential banking regulation, equity capital is the most expensive form of bank funding because of its high cost of capital and its tax-disadvantaged status relative to debt (Markowitz, 1952). Maintaining robust Capital Adequacy Ratios provides an essential risk-mitigation cushion that absorbs unexpected loan losses and insulates depositors from insolvency (Aronoff et al., 2026; Cline, 2017; Santos, 2001). However, from a performance perspective, holding large capital cushions compresses the equity-to-asset leverage multiplier (Berger & Bouwman, 2013). Since Return on Equity is the product of Return on Assets (ROA) and the equity multiplier, expanding the capital base directly increases the denominator in the ROE equation. If net income does not grow at the same rate, this regulatory capital buildup acts as a structural drag, depressing returns on shareholder equity (Bagntasarian & Mamatzakis, 2019; Kumah et al., 2026).

2.1.2 Liquidity Creation Theory

The Liquidity Creation Theory, introduced by Berger and Bouwman (2009), explains that the main role of commercial banks is to provide systemic liquidity. They do this through balance sheet transformation: consolidating liquid, short-term liabilities, such as demand deposits, into long-term, illiquid assets, such as corporate and consumer loans. The theory suggests banks create value and improve interest margins by actively taking on liquidity risk (Chen et al., 2018; Mashamba, 2018). When a bank's liquidity-generating capacity increases, it can grow its asset base and develop multiple revenue streams, potentially boosting profitability (Abbas et al., 2023). However, maintaining large amounts of static liquid assets such as cash reserves or low-yield government securities, rather than generating new liquidity through credit, can create an investment drag, narrowing interest margins and diminishing returns for investors (Marozva, 2015).

2.1.3 Financial Intermediation Theory and the Business Cycle

The Financial Intermediation Theory explains how banks reduce transaction costs (Benston & Smith, 1976) and mitigate informational asymmetries between savers and borrowers (Diamond, 1984). Modern extensions of this theory emphasise that the efficiency of this intermediation process depends heavily on the business cycle (Ajello, 2016; Berger & Sedunov, 2017; Konstantakopoulou, 2023). Macroeconomic growth (GDP) serves as an external catalyst that conditions the financial intermediation loop (Marshal & Harcourt, 2016). During economic expansions, informational asymmetries decline as the probability of business defaults fall, allowing banks to convert liquid assets into productive private-sector credit safely and efficiently (Bianco & Sardoni, 2018). This study uses an interaction model to capture this relationship, testing whether macroeconomic growth amplifies the profitability of liquidity creation or whether high volatility limits these returns.

2.2 Empirical Literature Review

2.2.1 Capital Adequacy and Bank Performance

Empirical evidence on the relationship between capital adequacy and bank profitability remains divided. Globally, researchers such as Abbas et al. (2023), Alhalabi (2021) and Amuah et al. (2026) observed a positive relationship, arguing that well-capitalised banks enjoy lower default risk premiums, reduce their overall cost of borrowing, and capture higher net margins. However, studies focusing on frontier and emerging markets often tell a different story. In sub-Saharan Africa, Muturi (2017) documented a negative relationship between capital adequacy ratios and performance across universal banks in Kenya. The study concluded that strict regulatory capital minimums reduce asset capacity and compress profitability by expanding the equity base. Similarly, Nsanyan-Sandow et al. (2021) and Tutu (2020) examined regulatory shifts in Ghana and found that, while higher minimum capital requirements improve structural safety, they significantly reduce returns on assets and equity beyond a threshold.

2.2.2 Liquidity Creation and Macroeconomic Shifts

The effect of liquidity on bank performance largely depends on whether researchers focus on static liquid assets or active liquidity creation. Berger and Bouwman (2009) and Berger and Sedunov (2017) showed that active liquidity creation enhances bank profitability, especially when the financial system isn't in a severe systemic crisis. Moreover, Abbas et al. (2023) found that liquidity creation improves bank profitability, with economic growth as a mediator. In emerging markets, Bashiru et al. (2023) and Mashamba and Chikutuma (2023) confirmed that liquidity creation is a crucial source of revenue for commercial banks, though these profits are highly affected by credit cycles and overall economic stability. This reveals a clear trade-off between maintaining institutional liquidity and actively creating liquidity.

2.2.3 Asset Quality (AQ) and Bank Equity Performance

Empirical studies consistently show a strong inverse relationship between asset quality and profitability indicators. Berger and Sedunov (2017), in their review of global systemic banking frameworks, found that variations in asset quality directly affect capital adequacy: poor asset quality reduces capital reserves, raises risk premiums, and lowers long-term Return on Equity (ROE). In sub-Saharan Africa, Kutsienyo (2011) and Tijjani et al. (2025) show that asset quality is significantly and negatively associated with bank performance, suggesting that declining asset quality harms bank profitability. Orando et al. (2025) and Wanjiru et al. (2024) show that credit risk, regulatory forbearance measures, and limited lending conditions constrained equity returns.

2.2.4 Management Efficiency (ME) and Bank Equity Performance

Empirical studies identify management efficiency as essential for the survival of commercial banks. Highly efficient banks leverage economies of scale and advanced financial technology to reduce operating costs, thereby increasing the share of gross interest margins that translates into net profits for shareholders (Berger & Bouwman, 2009). Yang and Liu (2012) show that management efficiency improves profitability among private banks, while diminishing profitability in state-owned banks. Chowdhury and Akhtar (2017) also show that operational

efficiency is positively correlated with profitability, while expense management significantly harms bank profits. In Sub-Saharan Africa, internal factors, such as operational efficiency, are key to long-term bank viability, as Nyakieni et al. (2022) found that management efficiency positively correlates with bank profitability in Kenya over the long run. However, Kutsienyo (2011) found a strong negative correlation between operating expenses and bank performance in Ghana.

2.2.5 The Interactive Conditioning of the Business Cycle

Macroeconomic shocks, such as recessions and large sovereign shocks, can destabilise banks' performance (Abbas et al., 2023). Other studies show that the impact of bank credit on profitability varies significantly across stages of the business cycle (Nyamadi, 2025; Ter-Minassian, 2023; Togo et al., 2025). According to Togo et al. (2025), sovereign debt restructuring can lead to severe asset impairments, disrupting the usual channels through which bank liquidity, economic growth, and shareholder returns are transmitted. Mustapha and Prizzon (2015) also found that sovereign debt restructuring can have a strong negative effect on banks' performance in developing economies. Moreover, Guzman and Stiglitz (2016) suggested developing a comprehensive debt restructuring framework that effectively safeguards assets and supports business growth.

3. Research Methodology

This section outlines the empirical framework used to investigate whether building capital buffers (CA) and liquidity creation (LQ), enabled by gross domestic product (GDP) growth, drive shareholder equity returns (ROE) in the Ghanaian banking sector.

3.1 Research Design and Data Sources

This study adopts a quantitative, non-experimental, causal-comparative research design. It uses annual secondary time-series data spanning 2006 to 2025. The data represent the macroeconomic aggregates of Ghana's banking sector. The primary variables are drawn from the Bank of Ghana (BoG) Financial Stability Reports and the Ghana Statistical Service (GSS) macroeconomic databases.

3.2 Variables Operationalization

To capture the complex interplay among balance sheet indicators, macroeconomic realities, and equity performance, the variables are operationalised as detailed in Table 1.

Table 1. Variable Definitions and Operationalization

Variable Type	Variable Name	Operational Definition / Proxy	Expected Sign	Source
Dependent	Return on Equity (ROE)	Net Income / Total Shareholders' Equity (Industry Average %)	*Baseline*	Bank of Ghana (2025)
Independent	Capital Adequacy (CA)	Capital Adequacy Ratio (CAR %)	-	Bank of Ghana (2025)
Independent	Liquidity (LQ)	Liquid Assets / Total Assets (%)	+	Bank of Ghana (2025)
Independent	GDP Growth (GDP)	Gross Domestic Product Annual Growth Rate (%)	+	Bank of Ghana (2025)
Interaction	Interaction Term (LQ*GDP)	Product of Liquidity Creation and GDP Growth Rate (LQ x GDP)	-	Bank of Ghana (2025)
Control	Asset Quality (AQ)	Non-Performing Loans (NPL) Ratio (%)	-	Bank of Ghana (2025)
Control	Management Efficiency (ME)	Cost-to-Income Ratio (%)	-	Bank of Ghana (2025)
Structural Dummy	D2022 (D_{2022})	Pulse Dummy (2022 = 1; other years = 0) to capture DDEP shock	-	Ghana Statistical Service (2025)

3.3 Econometric Specification

To assess whether the impact of structural liquidity creation on bank equity returns depends on the state of aggregate economic growth, an interaction term (LQ_GDP) is included in the model. This makes the Autoregressive Distributed Lag (ARDL) Bounds Testing approach by Pesaran et al. (2001) highly appropriate. The ARDL framework handles variables with mixed integration, stationary at levels (I(0)) or at first differences (I(1) and is exceptionally robust for small sample sizes (N=20).

The Unrestricted Error Correction Model (UECM) under the interactive ARDL structure is specified as:

$$\Delta ROE_t = \alpha_0 + \sum_{i=1}^{p} \beta_i \, \Delta ROE_{t-i} + \sum_{i=0}^{q_1} \gamma_i \, \Delta CA_{t-i} + \sum_{i=0}^{q_2} \delta_i \, \Delta LQ_{t-i} + \sum_{i=0}^{q_3} \theta_i \, \Delta GDP_{t-i} + \sum_{i=0}^{q_4} \pi_i \, \Delta LQ_{GDP_{t-i}}$$
$$+ \sum_{i=0}^{q_5} \mu_i \, \Delta AQ_{t-i} + \sum_{i=0}^{q_6} \phi_i \, \Delta ME_{t-i} + \lambda_1 ROE_{t-1} + \lambda_2 CA_{t-1} + \lambda_3 LQ_{t-1} + \lambda_4 GDP_{t-1}$$
$$+ \lambda_5 LQ_GDP_{t-1} + \lambda_6 AQ_{t-1} + \lambda_7 ME_{t-1} + \omega D_{2022} + \varepsilon_t$$

Where Δ is the first difference Delta operator; p, q_1, …….q_6 are the optimal lengths; β, γ, δ, θ, π, μ, ϕ are short-run dynamic coefficients; λ_1…….λ_7 are long-run multipliers; D_{2022} is the 2022 DDEP pulse dummy variable; and ε_t is the white-noise stochastic error term.

3.4 Estimation Diagnostic

To ensure statistically robust, reliable, and non-spurious results, the empirical analysis follows a well-defined four-step estimation process. Step 1 involves Unit Root Testing (Stationarity Check), where the ARDL model requires that no variables are integrated at order I(2) or higher, as this would invalidate the F-bounds critical thresholds (Pesaran et al., 2001). Both the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests are used to confirm

that all variables are either I(0) or I(1). Step 2 involves selecting the optimal lag length. Step 3 conducts the Cointegration F-Bounds Test to determine whether a long-term stable relationship exists among the variables, following Pesaran et al. (2001). Finally, Step 4 involves diagnostic checks and parameter stability tests to verify that the final model parameters are consistent and dependable (Arunachalam, 2024; Du et al., 2026; Ojiako, 2020), as detailed below.

a. Breusch-Godfrey ARDL Residual LM Test: To confirm the absence of serial correlation (Target: $p > 0.05$).

b. Jarque-Bera Normality Test: To verify that the error terms are normally distributed, ensuring the (D_{2022}) dummy has effectively isolated outlier variance (Target: $p > 0.05$).

c. ARDL Residual Heteroskedasticity (ARCH) Test: To establish that variance among the residuals is constant (Target: $p > 0.05$).

d. CUSUM and CUSUM of Squares Tests: Plotted against a 5% significance level to confirm that structural parameters remain stable over the analytical horizon.

4. Results and Discussion

This section presents the empirical findings from the quantitative evaluation of the Ghanaian banking sector for the period 2006-2025.

4.1 Descriptive Statistics

Before conducting the econometric modelling, a descriptive profile of the data was generated to evaluate the mean tendencies, variations, and structural properties of the aggregate Ghanaian banking metrics in Table 2 below.

Table 2. Descriptive Statistics of System Variables

Variables	Mean	Std. Dev.	Minimum	Maximum	Observations
Return on Equity (ROE)	21.68	12.35	-25.48	34.16	N = 20
Capital Adequacy (CA)	17.11	1.85	13.84	19.6	N = 20
Liquidity (LQ)	33.48	4.3	25.92	46.32	N = 20
Gross Domestic Product (GDP)	5.81	2.97	0.5	14	N = 20
Asset Quality (AQ)	14.95	4.33	6.91	21.79	N = 20
Management Efficiency (ME)	83.88	9.64	74.35	120.82	N = 20

Table 2 indicates that Ghana's banking sector had an average Return on Equity (ROE) of 21.68%. Nonetheless, the significant standard deviation (12.35) and a low minimum value (-25.48%) highlight periods of severe financial difficulty. These downturns are mainly linked to the 2022 macroeconomic shock from the Domestic Debt Exchange Programme (DDEP), which reduced economic growth to just 0.5%. During this period, Management Efficiency (ME) also deteriorated to a record high of 120.82%, driven by substantial asset impairment charges. The sector's average Capital Adequacy Ratio (CA) stood at 17.11%, well above the regulatory minimum. Asset Quality (AQ), assessed through the non-performing loans ratio,

averaged 14.95%, indicating the high credit risk typical of a frontier market.

4.2 Preliminary Diagnostics

4.2.1 Unit Root Integration Properties

The ARDL model can accommodate a mix of stationary (I(0)) and first-difference stationary (I(1)) variables. However, it requires that no variable be integrated of order I(2) or higher (Pesaran et al., 2001). Table 3 presents the unit root results from the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests (Dickey & Fuller, 1981; Phillips & Perron, 1988).

Table 3. Augmented Dickey-Fuller and Phillips-Perron Test

Variables	ADF (Levels)	ADF (1st Diff)	PP (Levels)	PP (1st Diff)	Integration Order
ROE	-2.145 (0.228)	-4.851 (0.001)	-2.091 (0.248)	-6.120 (0.000)	I(1)
CA	-2.310 (0.179)	-4.920 (0.001)	-2.441 (0.141)	-4.855 (0.001)	I(1)
LQ	-1.942 (0.309)	-5.102 (0.000)	-1.884 (0.334)	-5.094 (0.000)	I(1)
GDP	-3.851 (0.004)	—	-3.910 (0.003)	—	I(0)
AQ	-1.542 (0.501)	-4.112 (0.002)	-1.611 (0.465)	-4.098 (0.002)	I(1)
ME	-1.104 (0.702)	-4.618 (0.001)	-1.149 (0.685)	-4.591 (0.001)	I(1)

Note: Test values are displayed with p-values in parentheses.

The integration test matrix indicates a mixed integration order. Standalone GDP growth is stationary at its baseline level (I(0)). In contrast, the financial metrics (ROE, CA, LQ, AQ, ME) are non-stationary at levels but become stationary after first differencing (I(1)). Since no level (I(2)) series are present, the data meet the prerequisites for the ARDL estimation technique (Dickey & Fuller, 1981; Phillips & Perron, 1988).

4.2.2 Lag Structure and Cointegration Bounds Focus

To establish a long-run equilibrium relationship among the variables, the model's lag lengths were first determined. Given the small annual sample size (N=20), minimising the number of parameters is essential to preserve degrees of freedom. The results are summarised in Table 4.

Table 4. ARDL Cointegration F-Bounds Test Results

Test Statistic	Value	Significance Level	Lower Bound I(0)	Upper Bound I(1)	Empirical Decision
F-Statistic	5.64	10%	2.26	3.35	Cointegration Confirmed
		5%	2.62	3.79	Reject H_0 at 5%
		1%	3.41	4.68	Cointegration Confirmed

Table 4 above shows that the calculated F-statistic of 5.64 lies well above the 5% upper-bound critical threshold of 3.79 (and exceeds the strict 1% upper-bound of 4.68). This leads to a strong rejection of the null hypothesis (H_0), confirming that a highly stable, valid cointegration vector binds the model variables together (Alehile & Ejima, 2026; Pesaran et al., 2001).

4.3 Main Empirical Results: Long-Run and Short-Run Horizons

Once cointegration was established, the structural ARDL equation, including the interaction term with the conditioning variable (LQ*GDP), was estimated.

Table 5. Estimated Long-Run and Short-Run ARDL Matrix (Dependent: ROE)

Long-Run Regressor	Coefficient	Std. Error	t-Statistic	p-Value	Significance
Capital Adequacy (CA)	-0.9961	0.3241	-3.078	0.010	*Significant (1%)*
Liquidity Creation (LQ)	1.3213	0.33	4.004	0.002	*Significant (1%)*
Economic Growth (GDP)	5.8165	1.8561	3.134	0.009	*Significant (1%)*
Interaction Vector (LQ*GDP)	-0.1829	0.0554	-3.3	0.006	*Significant (1%)*
Asset Quality (AQ)	-0.264	0.1331	-1.984	0.071	*Significant (10%)*
Management Efficiency (ME)	-0.9662	0.1121	-8.619	0.000	*Significant (1%)*
D_{2022} (DDEP Pulse Dummy)	-15.0975	4.8569	-3.109	0.009	*Significant (1%)*
Constant (α_0)	82.127	16.3441	5.025	0.000	*Significant (1%)*
Short-Run Parameter					
CointEq (-1) (Error Correction)	-0.984	0.111	-8.864	0.000	*Significant (1%)*
Adjusted R-squared	0.973 (Explains 97.3% of the variance in ROE)				
Durbin-Watson Statistic	1.772 (Indicates absence of primary autocorrelation)				

4.4 Synthesis, Theoretical Alignment, and Discussions

Integrating the interaction term (LQ*GDP) provides a clearer view of the operational dynamics of Ghana's aggregate banking sector. It yields statistically significant long-run parameters for all primary independent variables.

4.4.1 The Capital Buffer Performance Drag

The long-run results from Table 5 above reveal a negative and statistically significant relationship between capital adequacy (CA) and bank profitability (β = -0.9961, p = 0.010). This outcome directly supports the Risk-Return Trade-Off Theory (Markowitz, 1952). While building capital buffers ensures institutional safety and stability, equity funding is the most expensive form of bank capital. Holding excess capital inflates the equity denominator relative to earnings, acting as a structural drag that reduces ROE. This finding aligns with previous empirical studies by Rahman et al. (2026), who argued that tighter regulatory capital requirements compress bank interest margins. Moreover, Ahokpossi (2013) and Anbar and Alper (2011) also showed that over-capitalisation penalises commercial margins. In sub-Saharan African banking markets, Muturi (2017) and Nsanyan-Sandow et al. (2021) show that capital adequacy is negatively associated with commercial bank performance when measured against equity returns. Furthermore, Nsanyan-Sandow et al. (2021) and Tutu (2020) argue that capital requirements have a double-edged effect in Ghana. While initially protective, excessive capital restrictions become counterproductive, diminishing economies of scale and lowering long-run performance thresholds.

4.4.2 The Interactive Synergy of Liquidity and GDP Growth

The standalone Liquidity Creation (LQ) (β = 1.3213, p = 0.002) and Gross Domestic Product (GDP) growth (β = 5.8165, p = 0.009) are both positive and statistically significant. This

supports Berger and Bouwman's (2009) Liquidity Creation Theory, which suggests that a bank's main role is to create value by converting liquid liabilities into illiquid local credit assets. Liquidity generation capacity boosts profitability during normal operations (Berger & Bouwman, 2009; Berger & Sedunov, 2017; Charmler et al., 2018). However, the crucial finding is in the interaction term (LQ*GDP), which is negative and significant ($\beta = -0.1829$, $p = 0.006$). This indicates a diminishing return at higher levels of liquidity during periods of rapid GDP growth, consistent with the Financial Intermediation Theory. During economic booms, holding excessive liquidity becomes inefficient (Benston & Smith, 1976; Diamond, 1984). Yakubu and Bunyaminu (2024) also revealed the importance of GDP in influencing bank profitability in Sub-Saharan Africa. Adeniji et al. (2026) found that firms with higher cash holdings are better able to withstand economic disruptions but forgo profitable investments by holding excess cash. Moreover, Oganda et al. (2018) show that higher cash reserves had a strong negative effect on return on owners' equity

4.4.3 Asset Quality Degradation, Structural Cost Adjustments and Macro Shocks

The control variables show significant negative pressures that match established institutional banking limitations. Asset Quality (AQ) is a significant long-run drag on equity performance ($\beta = -0.2640$, $p = 0.071$) at the 10% level. This inverse relationship is tied to the credit risk literature, as an increase in non-performing loans forces banks to make large loan-loss provisions (Tijjani et al., 2025). This provisioning requirement directly reduces net profits, while non-accrual loans simultaneously diminish interest income streams, eroding shareholder value. Orando et al. (2025) and Wanjiru et al. (2024) demonstrate that increased credit risk, regulatory forbearance measures, and limited lending conditions constrained equity returns in Sub-Saharan Africa. Moreover, Kutsienyo (2011) show that asset quality deteriorates bank profitability in Ghana.

Management Efficiency (ME), measured by the cost-to-income ratio, has a negative coefficient close to one ($\beta = -0.9662$, $p < 0.001$). This confirms that operational overhead passes directly through, reducing shareholder equity value, consistent with Yang & Liu (2012), who show that management efficiency diminishes profitability in Taiwan state-owned banks. Chowdhury & Akhtar (2017) also show that expense management significantly harms bank profits. In Sub-Saharan Africa. Francis (2013) shows that management efficiency negatively affects asset returns. This is supported by Kutsienyo (2011), who found a strong negative correlation between operating expenses and bank performance in Ghana. It underscores efficiency as a prerequisite for survival in the Ghanaian market.

Finally, the D2022 pulse dummy shows a severe negative impact ($\beta = -15.0975$, $p = 0.00$) from the 2022 Domestic Debt Exchange Programme (DDEP). This indicates that sovereign debt restructurings can disrupt the relationship between asset management and profitability in developing economies, exposing banks to sudden impairment traps and severe balance sheet shocks (Atuahen et al., 2024; Grigorian & Vessereau, 2024; Nyamadi, 2025). This is also consistent with the work of Abbas et al. (2023), Guzman and Stiglitz (2016), Mustapha and Prizzon (2015), and Togo et al. (2025), who have shown how destructive sovereign debt restructuring is to banks' performance in developing economies.

4.5 Post-Estimation Diagnostics and Model Stability

To verify the reliability of the estimated parameters, the model residuals were subjected to several post-estimation diagnostic checks.

Table 6. Post-Estimation Diagnostics and Model Stability

Diagnostics Tests	Test statistic Value	p-Value	Empirical Operational Decision
Breusch-Godfrey LM Serial Correlation	0.54	0.460	Fail to reject (H_0): The model is free from residual serial correlation. ($p = 0.46 > 0.05$)
Jarque-Bera Error Normality	0.81	0.660	Fail to reject (H_0): Residuals follow a clean normal distribution ($p = 0.66 > 0.05$)
ARCH Heteroskedasticity	0.32	0.570	Fail to reject (H_0): Error terms exhibit homoscedastic variance ($p = 0.57 > 0.05$)
CUSUM and CUSUM of Squares Checks	within the 5% critical boundaries		Fail to reject (H_0): Model parameters are structurally stable.

Table 6 above indicates that the interactive ARDL model satisfies all essential Gauss-Markov assumptions (Wooldridge et al., 2020). First, the Breusch-Godfrey LM test yielded a p-value of 0.460, indicating no evidence of residual serial correlation at standard significance levels (Breusch, 1978; Godfrey, 1978). Second, the Jarque-Bera test produced a p-value of 0.660, confirming that the residuals are normally distributed (Jarque & Bera, 1987). Third, the ARCH test for heteroskedasticity returned a p-value of 0.570, indicating homoscedastic variance and unbiased, efficient standard errors (Engle, 1982). Lastly, the CUSUM and CUSUM of Squares tests remained within the 5% bounds, indicating that the model parameters are stable over time (Brown et al., 1975). Overall, these diagnostics confirm that the model meets all classical linear regression assumptions, ensuring that the coefficients are robust and suitable for inference (Arunachalam, 2024; Du et al., 2026; Ojiako, 2020).

5. Conclusion and Recommendations

5.1 Conclusion

This research examined how structural capital buffers, liquidity creation, and macroeconomic growth influence shareholder equity returns (ROE) in Ghana's banking industry. Employing an interactive ARDL bounds-testing approach across a 20-year span (2006-2025), the study tackled small-sample estimation challenges by incorporating a specific macroeconomic interaction term (LQ*GDP). It also identified the systemic effects of the 2022 Domestic Debt Exchange Programme (DDEP) using a structural pulse dummy variable. The empirical results yield three main conclusions about financial intermediation in Ghana. Maintaining strong capital adequacy buffers is critical for institutional safety but significantly hampers long-term equity returns ($\beta = -0.9961$, $p = 0.010$). This is because aggressive capital accumulation inflates the equity base relative to earnings, imposing a structural drag on equity returns. Liquidity Creation is a strong driver of shareholder returns ($\beta = 1.3213$, $p = 0.002$). However, this relationship to profitability is non-linear and context-dependent. The negative interaction term (LQ*GDP, $\beta = -0.1829$, $p = 0.006$) indicates a point beyond which additional liquidity yields diminishing returns. While economic growth initially boosts bank profitability through

liquidity, holding excess liquid assets during rapid GDP growth becomes inefficient. Additionally, rising non-performing loans (β = -0.2640, p = 0.071) and Operational inefficiencies (β = -0.9662, $p < 0.001$) are significant long-run drags on equity performance. These underscore the importance of efficient asset management and strict cost control to the bank's survival in a volatile developing market. Lastly, the D2022 pulse dummy reveals a sharp negative effect (β = -15.0975, p = 0.009) attributable to the 2022 DDEP. It shows how sovereign debt restructuring can disrupt traditional financial intermediation in developing economies by triggering large-scale impairment write-offs that trap bank liquidity.

5.2 Contributions of the Study

This research presents several significant contributions to the economic and banking literature across conceptual, methodological, and empirical dimensions. This paper incorporates an explicit interaction vector to model liquidity creation as influenced by the macroeconomic cycle. This approach provides the first empirical evidence of a diminishing-returns threshold for liquidity creation, conditioned by growth cycles, in a sub-Saharan economy. Using the ARDL Bounds Testing method, the study effectively handles mixed stationarity horizons and small sample sizes. It also reveals an exceptionally rapid adjustment process, with 98.4% of systemic imbalances or regulatory shocks self-correcting within one year. Additionally, the paper updates Ghana's banking evolution by introducing a structural pulse dummy (D2022) that isolates the DDEP impairment shock, thereby enabling an unbiased analysis of banking performance through 2025 and an examination of recovery trends among universal banks post-sovereign debt restructuring.

5.3 Policy and Practical Recommendations

Because high Capital Adequacy significantly impedes Return on Equity in the long run, the central bank needs to move away from fixed capital floors. It should adopt a dynamic, counter-cyclical capital buffer system. This will enable banks to draw down their capital reserves during severe macroeconomic downturns, such as the 2022 shock, and replenish them during periods of growth. Such a strategy helps preserve financial stability without permanently reducing shareholder returns. The negative coefficient for the Liquidity interaction term indicates that holding large, passive liquid reserves during periods of fast GDP growth is operationally inefficient. Therefore, the Central Bank should avoid strict, uniform liquidity mandates during economic booms. Instead, it should implement a tiered monitoring system that relaxes liquid asset requirements when private sector credit demand is high, encouraging banks to convert reserves into productive loans. The 15.1% drop in industry ROE during 2022, as indicated by the D_{2022} pulse dummy, shows how extreme sovereign debt distress can severely weaken bank balance sheets. Policymakers must maintain strict fiscal discipline, enforce statutory debt limits, and execute transparent expenditure reforms.

5.4 Limitations and Areas for Future Study

While this research offers strong empirical evidence on Ghana's banking sector, it is limited

to the Central Bank's aggregate annual dataset, suggesting several avenues for future research. Future studies should shift from an aggregate-sector perspective to a bank-specific panel-data approach. Separating data into tiers of large (tier-1) and small (tier-2) commercial banks, or distinguishing between foreign-owned and local banks, would reveal how structural capital burdens and liquidity thresholds differ according to asset size and ownership. Researchers could employ Panel Threshold Regression (PTR) or Smooth Transition Autoregressive (STAR) models to identify the exact points at which liquidity creation transitions from a positive to a negative influence across different GDP growth scenarios. As Ghana's banking landscape rapidly advances toward electronic transactions and mobile financial services, future research should explicitly incorporate FinTech adoption indices into efficiency analyses to monitor their evolving impact on long-term banking performance.

Author Contribution

This manuscript was prepared exclusively by the author.

Competing interests

The author has no competing interest or personal relationship that could have appeared to influence the work reported in this paper.

Informed consent

It is not applicable since the dataset is secondary and publicly available.

Ethics approval

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Data sharing statement

No additional data are available.

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