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Determinants of Bank Profitability: A Panel Data Analysis from Bangladesh

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Abstract - **Bank profitability is central to financial stability in emerging economies such as Bangladesh, where rising non-performing loans, high leverage, and Basel III liquidity requirements create significant challenges. This study investigates the determinants of return on assets (ROA) in 15 top performing listed private commercial banks over the last decade (2015–2024) using a fixed-effects panel regression model. The analysis considers traditional financial ratios of gross NPLs, debt-to-equity ratio, deposit-to-asset ratio, and cost-to-income ratio as well as Basel III liquidity measures. Results show that higher NPLs and leverage significantly reduce ROA, while a stronger deposit base enhances profitability. In contrast, cost-to-income and the Basel III liquidity ratios have no statistically significant effect. These findings highlight that asset quality, capital structure, and funding composition dominate profitability outcomes in Bangladesh, offering important implications for bank managers and regulators seeking to balance stability with sustainable financial performance.**

Keywords - **Bank profitability, ROA, NPLs, Basel III liquidity requirements, Bangladesh Banking Sector.**

I. INTRODUCTION

Banks are central to economic development through financial intermediation: by mobilizing deposits and channeling them into loans and investments, they support credit creation, liquidity provision, and broader macroeconomic activity [1]. In emerging markets such as Bangladesh, banking sector health directly affects growth, stability, and investor confidence [2]. Profitability signals bank soundness by reflecting management effectiveness, asset quality, and the efficiency with which liabilities are transformed into income. Return on assets (ROA) is widely used as a robust indicator because it captures the ability of the entire asset base, debt- and equity-financed, to generate earnings [3], [4].

A broad literature identifies recurring profitability drivers. Asset quality, proxied by non-performing loans (NPLs), typically reduces profitability through weaker interest income and higher provisioning costs [5], [6], [7]. Capital structure presents a trade-off: while leverage can raise returns, excessive debt elevates financing costs and fragility, diminishing ROA [8], [9], [10]. Deposits are generally a low-cost, stable funding source that supports lending [11], [12]. Operational efficiency, measured by the cost-to-income ratio (CIR), also influences returns, though its effect varies [13], [14].

More recently, Basel III liquidity measures—Liquidity Coverage Ratio (LCR) and Net Stable Funding Ratio (NSFR)—have added a new dimension. Evidence is mixed: some studies report profitability costs [15], [16], others neutral or positive effects [17], [18], and still others nonlinear relationships [19]. In Bangladesh, findings remain limited and sometimes contradictory [17], [2].

Against this background, the present study investigates how traditional bank-specific determinants and Basel III liquidity measures jointly influence profitability in Bangladeshi private commercial banks. Specifically, it examines the impact of NPLs, leverage (DER), deposit funding (DTA), operational efficiency (CIR), and liquidity requirements (LCR, NSFR) on ROA.

II.LITERATURE REVIEW

A. Dependent Variable: Return on Asset (ROA)

Return on Assets (ROA) is widely recognized as a key indicator of profitability across industries, including banking, as it reflects how effectively firms utilize their assets to generate income. A higher ROA typically signals stronger managerial efficiency in optimizing asset use to produce revenue [4]. Petersen and Schoeman [3] similarly emphasize that ROA serves as a measure of operational efficiency, capturing how well banks maximize output while minimizing costs, and providing investors with insights into management performance over time.

In the context of banking, scholars have argued that ROA is often a more comprehensive profitability measure than Return on Equity (ROE), as it incorporates the role of financial leverage. Jamal *et al.* [20] in their study of Malaysian banks, found ROA superior to ROE for this reason, while Desa [21] highlighted that ROA reflects management's ability to convert both debt- and equity-financed assets into income. Beyond financial structure, Sujud and Hashem [22] showed that banking innovations—such as internet banking, point of sale terminals, and electronic fund transfers—also enhance profitability as measured by ROA, with statistically significant results in the Lebanese context.

Taken together, these studies confirm that ROA is not only a measure of profitability but also a broader indicator of efficiency, financial structure, and innovation. Its consistent application across diverse settings—from U.S. financial institutions [4] and Malaysian commercial banks [20] to Lebanese banks [22]—underscores its robustness as a dependent variable for assessing bank performance.

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B. Deposits to Asset Ratio (DTA)

Bank deposits serve not only as a safe avenue for savings but also as the foundation for credit creation, enabling banks to transform deposits into loans that generate profit and support economic activity. By influencing money supply, deposits affect liquidity and purchasing power within the economy [1].

Empirical research consistently highlights the positive link between deposits and bank profitability across different contexts. In Sri Lanka, Kawshala and Panditharathna [11] find that higher customer deposits significantly enhance profitability, as greater deposit inflows expand lending capacity and future earnings ($p = 0.027$). Similarly, Gul *et al.* [12] examining Pakistani banks, emphasized that deposits are the primary funding source; more deposits improve liquidity and open investment opportunities, though the effect depends on factors such as interest rates, loan quality, and operational efficiency.

Evidence from Jordan also confirms this relationship. Haddawee and Flayyih [23] report that deposits significantly drive profitability in the Commercial Bank of Jordan, with savings deposits having the strongest effect, followed by time deposits, while current deposits exert minimal influence. In Europe, Menicucci and Paolucci [24] demonstrate that a higher deposit-to-asset ratio raises profitability, particularly in the aftermath of the 2008 financial crisis when banks effectively converted additional savings deposits into profitable investments.

Taken together, these studies suggest that while the strength of the deposit–profitability link may vary depending on the type of deposits and market conditions, deposits remain a critical driver of bank performance by providing stable, low-cost funding that supports lending and investment activities.

C. Debt to Equity Ratio (DER)

The Debt-to-Equity Ratio (DER) is a key leverage measure reflecting the balance between debt financing and shareholders' equity, thereby indicating both financial risk and potential return. While debt can enhance profitability through leverage, excessive reliance increases interest burdens and bankruptcy risk [25].

Empirical findings on the effect of DER on bank profitability are mixed across contexts. In Ethiopia, Birru [8] found a negative and statistically significant relationship between DER and Return on Assets (ROA), with a coefficient of –0.003 ($p = 0.018$), suggesting that higher debt burdens reduce profitability by raising financial costs. By contrast, Zelalem [10] also examining Ethiopian banks, reported a positive and significant relationship, with a coefficient of 0.00134 ($p < 0.01$), indicating that under certain conditions debt financing can improve returns by more effectively leveraging equity.

Evidence from other markets places greater emphasis on capitalization. Ngo *et al.* [26] using data from Vietnamese banks, found that the equity-to-total-assets ratio (CAP) had a significant positive effect on profitability, with a coefficient of 0.051 ($p < 0.05$), rising to 0.135 ($p < 0.001$) in the post-crisis period, underscoring the stabilizing role of equity. Similarly, Trujillo-Ponce [9] showed that Spanish banks with higher capitalization enjoyed stronger ROA, reflecting lower funding costs and enhanced stability.

Taken together, these studies suggest that while the profitability effects of DER vary by context—sometimes positive, sometimes negative—the consistent finding across markets is that stronger equity positions generally enhance profitability, whereas excessive reliance on debt can erode performance.

D. Gross Non-Performing Loans (Gross NPLs)

Non-performing loans (NPLs) are widely recognized as a critical indicator of banking distress, as high default rates erode asset quality, weaken earnings, and undermine financial stability. Historical crises illustrate their destructive potential: in Benin (1988–1990), all three commercial banks collapsed when NPL portfolios reached 80%, while in Nepal, NPL levels above 50% nearly bankrupted Nepal Bank Limited and Rastriya Banijya Bank Limited, generating a negative net worth of Rs 10 billion [27]. These episodes underscore that elevated NPLs can act as precursors to systemic disruption and institutional failure.

Empirical evidence consistently demonstrates the adverse impact of NPLs on bank profitability across diverse settings. In Indonesia, Silaban [5] reported a strong and statistically significant negative relationship, with a coefficient of –0.270 ($p = 0.000$), showing that higher bad loans directly depress ROA. Similar findings emerge in Vietnam, where Hong [6] found that NPLs significantly reduce profitability, with a coefficient of –0.2824 ($p < 0.01$) using GMM analysis. In Turkey, Kadioglu *et al.* [7] confirmed this pattern, documenting a negative coefficient of –0.126 ($p = 0.000$) for the NPL-to-assets ratio in a fixed-effects regression, again highlighting the profitability costs of deteriorating loan quality.

Taken together, these studies provide robust evidence that rising NPLs consistently and significantly erode bank profitability, regardless of market context. The findings highlight credit risk management as a central determinant of financial performance and underscore the vulnerability of banks to loan portfolio quality.

E. Cost to Income Ratio (CIR)

The Cost-to-Income Ratio (CIR) is commonly used as a measure of operational efficiency, reflecting how well banks manage expenses relative to income. A lower CIR generally signals greater efficiency and stronger profitability, while a higher ratio suggests cost pressures that may erode returns.

Empirical evidence shows contrasting patterns across countries. In Bangladesh, Jeris [13] found CIR to have no meaningful effect on profitability, reporting a positive but statistically insignificant coefficient ($\beta = 1.26E\text{-}06$, $p = 0.984$). This suggests that within the Bangladeshi context, efficiency as captured by CIR did not significantly influence ROA during 2014–2018.

By contrast, studies in other countries consistently demonstrate a negative and significant relationship between CIR and profitability. In Nigeria, Ayinuola and Gumel [28] showed that higher operating costs relative to income strongly diminished ROA, with coefficients ranging from –2.410% to –0.952% (all $p < 0.01$) across pooled OLS, fixed

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effects, and random effects models. Similar evidence emerges from Nepal, where Marasini [29] found CIR to have a significant negative effect on ROA ($\beta = -1.870$; $p = 0.031$), highlighting the profitability costs of inefficiency. In Jordan, Al-Sharkas and Al-Sharkas [14] likewise reported a consistent and highly significant negative association, with coefficients ranging from –0.024 to –0.025 ($p < 0.01$).

Taken together, these findings suggest that while CIR does not significantly explain profitability in the Bangladeshi banking sector, international evidence strongly supports its role as a determinant of performance. The divergence may reflect structural differences in market competition, cost structures, or regulatory environments, underscoring the need to interpret CIR's role within specific national contexts.

F. Net Stable Funding Ratio (NSFR)

NSFR is intended to strengthen banks' long-term funding profiles, but its profitability effects are empirically mixed, reflecting a stability–profit trade-off that varies by market structure and period.

In Indonesia, Rokiyanto and Siahaan [16] find a negative, statistically significant association between NSFR and ROA for 12 listed banks (2018–2023): baseline $\beta = -0.0259$; $p < 0.01$, and with controls $\beta = -0.0115$; $p = 0.0012$; sub-sample analyses by bank category confirm the same negative pattern. Global evidence points similarly downward: using 2,909 banks across 127 countries (2007–2018), Setiyono and Naufa [15] report NSFR has a negative, significant impact on ROA ($\beta = -28.15$; $p < 0.01$), consistent with profitability costs from higher stable-funding requirements.

By contrast, Sidhu *et al.* [30] studying 31 Indian banks (2010–2021) with two-step system GMM, find no significant NSFR effect on ROA (base model $\beta = 1.085$; $p > 0.10$; ownership-interaction models also insignificant), implying no detectable linkage in that setting. In Vietnam, Dang [18] shows a positive, significant relationship for 28 commercial banks (2007–2018): lagged NSFR enters the ROA equation with $\beta = 0.003$; $p < 0.01$, suggesting that stronger stable funding can coincide with higher asset returns when balance-sheet structures and pricing adjust favorably.

Taken together: NSFR's effect on profitability is context-dependent—often negative where stable funding raises costs faster than revenues (Indonesia; global panel), null in some markets (India), and positive where funding structure and loan pricing offset the cost (Vietnam). These contrasts motivate testing both instantaneous and lagged NSFR, and exploring heterogeneity by bank size/model and interactions (e.g., with deposit ratios or NPLs) in country-specific studies.

G. Liquidity Coverage Ratio (LCR)

The Liquidity Coverage Ratio (LCR) — HQLAs divided by 30-day net cash outflows — is a Basel III tool intended to insulate banks from short-term liquidity stress [31]. Empirical studies, however, report mixed effects of LCR on profitability, suggesting a context-dependent trade-off between liquidity resilience and return.

Evidence from Bangladesh is contradictory. Yeasin [17] finds a positive, highly significant effect: a one-unit increase in LCR is associated with a 0.004 unit increase in ROA ($p = 0.000$), implying that holding more HQLAs can enhance short-term profitability in that sample. By contrast, Nath *et al.* [2] investigated 14 Bangladeshi banks, from 2015–2023 and reported a negative, highly significant effect: $\beta = -0.067$ ($p = 0.0001$), indicating a reduction in profitability to higher LCR in their specification.

Other country studies similarly show heterogeneity. Arin *et al.* [32] used a regression-discontinuity design on 14 Nigerian banks (2009–2020) and found banks above the LCR threshold experienced a 0.69% increase in ROA ($p < 0.1$), suggesting beneficial effects once a minimum liquidity standard is met. Vu [19] uncovers an inverted U-shaped relationship in Vietnam (Q1 2015–Q4 2022): a positive linear term (0.00412, $p = 0.032$) and a negative quadratic term (−0.00035, $p = 0.034$), implying LCR raises ROA up to an optimal point (≈ 5.89 for ROA) beyond which further liquidity reduces returns due to opportunity costs involved.

Findings on LCR's impact on profitability are mixed, with evidence showing positive, negative, and non-linear effects. These differences may stem from variations in sample periods, bank size, regulatory context, or measurement approaches. Overall, the results suggest the existence of an optimal liquidity buffer — sufficient to enhance stability and efficiency, but not so large that excess reserves reduce returns through opportunity costs.

III. DATA AND METHODOLOGY

A. Research Design

This study uses a quantitative panel data approach with a fixed-effects (FE) regression model to examine what drives Return on Assets (ROA) in private commercial banks. The sample was chosen through purposive sampling, including all listed private banks in Bangladesh with complete annual reports from 2024 to 2015. The fixed effects (FE) model is also suitable as it controls for unobserved, time-invariant heterogeneity in bank characteristics, thereby reducing omitted variable bias. By focusing on within-bank changes over time, it yields more reliable estimates of the determinants of ROA. Several authors, namely, Kadioglu *et al.* [7], Birru [8]and Zelalem [10] have used a FE model to analyze Panel Data in similar contexts.

B. Data Collection & Sample

Annual financial data were collected for 15 publicly traded commercial banks listed on the Dhaka Stock Exchange (DSE) over the period 2015 to 2024. The sample includes only those banks with complete information for all required financial variables across the ten-year horizon. All banks are private, non–state-owned, and publicly listed, which ensures consistency in both ownership structure and regulatory treatment.

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In Bangladesh, the banking sector consists of 33 conventional private commercial banks and 10 Islamic (Shariah-based) private commercial banks [33]. This study focuses solely on the conventional segment. From the 33 conventional banks, inclusion required that annual reports and financial disclosures be available for the full study period. Since not all conventional banks were listed on the DSE as early as 2015, only those that satisfied both criteria were retained. This purposive sampling method ensured that the dataset was both complete and reliable, resulting in a final sample of 15 banks.

The banks included in the study are: *AB Bank PLC, Bank Asia PLC, BRAC Bank PLC, The City Bank PLC, Dhaka Bank PLC, Dutch-Bangla Bank PLC, Eastern Bank PLC, IFIC Bank PLC, Jamuna Bank Limited, Mercantile Bank PLC, Mutual Trust Bank PLC, ONE Bank PLC, Prime Bank PLC, Trust Bank PLC, and United Commercial Bank PLC.*

C. Econometric Model

To examine the impact of bank-specific and liquidity-related determinants on bank profitability, this study estimates the following linear panel regression model:

$$ROA(i,t) = \beta0 + \beta1\ GrossNPL(i,t) + \beta2\ DER(i,t) + \beta3\ NSFR(i,t) + \beta4\ CIR(i,t) + \beta5\ DTA(i,t) + \beta6\ LCR(i,t) + \alpha(i) + \varepsilon(i,t)$$

Where:

- ROA(i,t) is the Return on Assets for bank *i* in year *t*.
- β0 is the intercept.
- β1 –β6, are coefficients for each independent variable:
    1. Gross NPL: Gross Non-Performing Loans ratio
    2. DER: Debt-Equity ratio
    3. NSFR: Net Stable Funding Ratio
    4. CIR: Cost-Income ratio
    5. DTA: Deposit-Assets ratio
    6. LCR: Liquidity Coverage Ratio
- α(i) represents the bank-specific fixed effect, capturing all unobservable, time-invariant factors unique to each bank.
- ε(i,t) is the error term encompassing all other unexplained variation.

Table A.1 in the appendix provides the detailed formulas and definitions of all variables used in the regression model, along with relevant references for each.

Table 1: Descriptive Statistics of Variables

IV. EMPIRICAL FINDINGS

A. Descriptive Analysis

Table 1 summarizes the descriptive statistics of the variables. ROA has a low mean of 0.0081 with a narrow spread (SD = 0.0060), indicating that profitability across banks is fairly stable. Gross NPLs range from 0.0208 to 0.6714, showing considerable differences in asset quality. The Debt-to-Equity Ratio (DER) also varies widely, with a mean of 15.10 and a maximum of 84.75, reflecting substantial heterogeneity in bank leverage.

The Net Stable Funding Ratio (NSFR) is more concentrated, averaging 1.11 with limited variation, suggesting most banks align closely with Basel III requirements imposed.

The Cost-to-Income Ratio (CIR) displays the broadest range, from –53.64 to 100.05, pointing to significant differences in operational efficiency and possible outliers. By contrast, the Deposit-to-Assets Ratio (DTA) is relatively consistent and high (mean = 74.91), highlighting the strong role of deposits in bank funding. Finally, the Liquidity Coverage Ratio (LCR) averages 1.47 but ranges from 0.47 to 3.59, indicating variation in short-term liquidity management practices.

Overall, while bank profitability remains stable, large disparities in leverage, efficiency, and credit quality suggest that these factors are likely to drive differences in performance across the sample.

	ROA	*Gross NPL*	*DER*	*NSFR*	*CIR*	*DTA*	*LCR*
Mean	0.0081	0.0664	15.1005	1.1068	50.6651	74.9107	1.4674
Minimum	-0.0454	0.0208	7.26	0.9575	-53.64	61.5937	0.4744
Maximum	0.0202	0.6714	84.75	1.2794	100.05	85.1219	3.5897
Standard Deviation	0.0060	0.0770	8.2279	0.0683	12.1379	5.5197	0.4682
Range	0.0656	0.6506	77.49	0.3219	153.69	23.5281	3.1153

Table 2: Regression Model Summary and Multicollinearity Test

Variable	VIF	PanelOLS Estimation Summary			
Intercept	440.299091	R-squared	0.6606	Dep. Variable	ROA
Gross NPL	1.288771	R-squared (Between)	0.3163	Estimator	PanelOLS
DER	1.509257	R-squared (Within)	0.6606	Cov. Estimator	Unadjusted
NSFR	1.053169	R-squared (Overall)	0.5103	Entities	15

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CIR	1.218552	Log-likelihood	678.96	Time periods	10
DTA	1.065058	F-statistic	41.847	F-statistic (Poolability)	7.7912
LCR	1.066414	P-value (F-statistic)	0	P-value (Poolability)	0

B. Estimation Procedure

The econometric analysis was carried out using Python 3 on Google Colab, which provides a flexible and reproducible environment for statistical computing. Panel regressions were estimated with the *linearmodels* package, which is applied for fixed effects, random effects, and pooled OLS models. This approach allowed for efficient handling of panel data and ensured robust estimation of the FE model.

C. Poolability Test

The F-test for poolability produced a statistic of 7.79 with a p-value of 0.000, leading to rejection of the null hypothesis that all banks share a common intercept. This confirms that the data is not poolable and supports the choice of a Fixed Effects model over Pooled OLS.

D. Multicollinearity Test

The Variance Inflation Factor (VIF) results show that all explanatory variables fall well below the threshold of 5, indicating that multicollinearity is not a concern in this model. Specifically, Gross NPL, Debt-Equity Ratio, NSFR, Cost-to-Income, Deposit-to-Assets, and LCR all have VIF values close to 1, suggesting that these variables are largely independent of one another.

Although the intercept records a high VIF value, this is expected and not problematic, as the intercept does not represent a substantive variable. Overall, the results confirm that multicollinearity does not pose a threat to the reliability of the regression estimates.

E. Regression Analysis

The regression results show that the model explains a substantial portion of the variation in bank profitability. The within R-squared of 0.66 indicates that 66% of the variation in ROA over time within each bank is explained by the independent variables, highlighting the strength of the Fixed Effects model.

The between R-squared is lower at 0.32, reflecting weaker explanatory power for differences across banks, while the overall R-squared of 0.51 suggests that the model accounts for about half of the total variation in the data.

The high F-statistic of 41.85 with a p-value of 0.000 confirms that the model as a whole is statistically significant, meaning the explanatory variables jointly have a strong effect on profitability. The log-likelihood value of 678.96 indicates how well the model fits the data, with higher values representing better overall fit.

Table 3: Coefficients and P values

Parameter	Estimate	Std. Err.	T-stat	P-value	Lower CI	Upper CI
const	0.0018	0.0086	0.213	0.8316	-0.0152	0.0189
Gross NPL	-0.0295	0.0047	-6.3125	0.000	-0.0388	-0.0203
DER	-0.0003	6.18E-05	-4.845	0.000	-0.0004	-0.0002
NSFR	-0.0059	0.0052	-1.1325	0.2595	-0.0161	0.0044
CIR	5.04E-05	3.28E-05	1.538	0.1265	-1.44E-05	0.0001
DTA	0.0002	8.27E-05	2.779	0.0063	6.62E-05	0.0004
LCR	-0.0003	0.0006	-0.622	0.535	-0.0015	0.0008

Table 3 presents the estimated coefficients from the Fixed Effects panel regression model, which examines the determinants of bank profitability measured by ROA. Standard errors, t-statistics, p-values, and 95% confidence intervals are reported for each coefficient to provide a complete assessment of the estimation results.

Among the explanatory variables, *Gross NPL* and *Debt-to-Equity Ratio* show significant negative effects on ROA at the 5% level, indicating that higher non-performing loans and greater leverage are associated with lower bank profitability. In contrast, *Deposit-to-Assets* has a significant positive coefficient, at the 5% level, suggesting that a higher proportion of deposits relative to total assets contributes positively to profitability. These results highlight the key financial factors that meaningfully influence ROA within banks over time.

Other variables, including *NSFR, Cost-to-Income Ratio,* and *LCR*, are not statistically significant at conventional levels. Their coefficients are relatively small, and their p-values exceed the 5% threshold, implying that these factors do not have a detectable impact on ROA in the context of this model. While they may still be important from a managerial perspective, their effect on profitability is not robustly supported by the panel data estimates.

V. DISCUSSION

The regression results highlight that Gross NPL is highly significant ($p < 0.05$) and has a negative impact on Return on Assets (ROA), with an estimated coefficient of $\beta = –0.0295$. This finding implies that higher levels of non-performing loans have a detrimental impact on profitability by reducing interest income and increasing provisioning costs, ultimately weakening the financial performance of banks. Several authors in the past, namely Silaban [5], Hong [6], and Kadioglu *et al.* [7], who investigated the impact of NPLs on ROA in commercial banks of Indonesia, Vietnam, and Turkey respectively, similarly found NPLs to have a

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highly significant and negative effect on commercial bank profitability.

Debt-to-Equity Ratio (DER) has a negative and statistically significant effect on Return on Assets (ROA), with an estimated coefficient of $\beta = -0.0003$ ($p < 0.05$). This finding is consistent with Birru [8], who reported a negative and significant effect of DER on ROA in Ethiopian commercial banks, as well as with Trujillo-Ponce [9] and Ngo *et al.* [26], who found that higher equity relative to total assets enhances profitability by improving financial stability and lowering funding costs. Interpreted inversely, these studies imply that a higher DER, reflecting greater reliance on debt financing, weakens ROA. However, the result contrasts with Zelalem [10], who identified a positive and significant relationship between DER and ROA, suggesting that under certain conditions debt financing may improve returns by leveraging equity more effectively.

Deposit-to-Assets ratio has a positive and statistically significant effect on Return on Assets (ROA), with an estimated coefficient of $\beta = 0.0002$ ($p < 0.05$). This suggests that a higher proportion of deposits relative to total assets enhances bank profitability, as deposits provide a stable and low-cost source of funds that can be transformed into income-generating loans and investments. This finding is consistent with Kawshala and Panditharathna [11], Gul *et al.* [12], Haddawee and Flayyih [23], and Menicucci and Paolucci [24], all of whom report that higher levels of deposits significantly contribute to improved profitability across different banking systems.

Cost-to-Income Ratio (CIR) has a positive but statistically insignificant effect on Return on Assets (ROA), with an estimated coefficient of $\beta = 5.04E\text{-}05$ ($p > 0.05$). This suggests that, within the sample of Bangladeshi banks, operational efficiency as measured by CIR does not have a meaningful influence on profitability. This result is consistent with Jeris [13], who also found CIR to be statistically insignificant in the context of Bangladesh, indicating that fluctuations in cost-to-income may not strongly determine bank performance in this market. However, the finding contrasts with studies from other countries, such as Ayinuola and Gumel [28] in Nigeria, Marasini [29] in Nepal, and Al-Sharkas and Al-Sharkas [14] in Jordan, all of which reported a significant negative relationship between CIR and ROA. Their results suggest that higher operating costs relative to income significantly reduce profitability, underscoring the importance of efficiency in bank performance.

The regression results show that both the Liquidity Coverage Ratio (LCR) and the Net Stable Funding Ratio (NSFR) have negative but statistically insignificant effects on Return on Assets (ROA), with estimated coefficients of $\beta = -0.0003$ ($p > 0.05$) and $\beta = -0.0059$ ($p > 0.05$), respectively. These results suggest that in the Bangladeshi banking context, compliance with Basel III liquidity requirements does not exert a meaningful influence on short-term profitability.

The findings diverge from several studies that identified significant effects of these ratios on bank performance. For the LCR, Yeasin [17] reported a positive and highly significant relationship with ROA in Bangladeshi banks, while Arin *et al.* [32] also found a positive effect in Nigerian banks. By contrast, Nath *et al.* [2] documented a significant negative effect in Bangladesh, and Vu [19] revealed an inverted U-shaped relationship in Vietnam, where profitability rises with LCR up to an optimal point before declining due to the opportunity costs of excess liquidity.

For the NSFR, Rokiyanto and Siahaan [16] reported a significant negative impact on ROA among Indonesian banks, while Setiyono and Naufa [15] found a similar global pattern of profitability costs linked to higher stable funding requirements. In contrast, Dang [18] reported a positive and significant relationship in Vietnam, whereas Sidhu *et al.* [30] found no significant effect in Indian banks.

VI. POLICY IMPLICATIONS

The findings of this study provide valuable insights to bank's management, policymakers and regulatory authorities such as Bangladesh Bank for strengthening bank profitability in Bangladesh.

First, the strong and negative relationship between Gross NPL and ROA highlights the urgent need for *stricter credit risk management and loan monitoring practices*. Regulators such as Bangladesh Bank should encourage banks to adopt advanced credit appraisal techniques, strengthen recovery mechanisms, and implement early-warning systems to reduce the accumulation of non-performing loans. Reducing NPLs will not only enhance profitability but also ensure greater stability in the sector.

Second, the negative effect of the Debt-to-Equity Ratio suggests that excessive reliance on debt financing undermines bank profitability. This calls for policies that promote *sound capital adequacy and stronger capitalization of banks*. Regulators should continue enforcing Basel III capital standards and encourage banks to raise more equity capital relative to debt, thereby lowering financial risk and enhancing resilience during periods of stress.

Third, the positive impact of the Deposit-to-Assets ratio indicates that deposit mobilization remains a critical driver of bank profitability. Policymakers should therefore prioritize *strategies that boost deposit growth*, particularly through savings and term deposit products. At the same time, banks should be incentivized to design innovative deposit schemes to attract retail customers and channel these funds into productive investments, thus contributing to both profitability and economic growth.

Fourth, the insignificant effect of the Cost-to-Income Ratio suggests that operational efficiency, while important, does not currently play a decisive role in determining profitability in Bangladesh. However, given the consistent international evidence of a negative CIR–profitability relationship, policymakers should encourage banks to *improve cost management and invest in digital transformation*. This will help reduce overhead costs and prepare banks to remain competitive in a more efficiency-driven global environment.

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Finally, the insignificant effects of LCR and NSFR indicate that Basel III liquidity requirements, while vital for stability, may not directly influence short-term profitability. This suggests that regulators should *strike a balance between liquidity resilience and profitability*, ensuring that liquidity rules are implemented in a manner that safeguards stability without imposing excessive profitability costs.

Periodic review of liquidity standards, alongside capacity building for banks to better deploy liquidity buffers into income-generating opportunities, can help harmonize regulatory compliance with sustainable performance.

VII. CONCLUSION

This study examined the bank-specific and regulatory determinants of profitability in Bangladeshi private commercial banks by analyzing annual panel data from 2015 to 2024. Using a fixed-effects regression framework, the research addressed how non-performing loans, capital structure, deposit funding, operational efficiency, and Basel III liquidity metrics influence return on assets (ROA). The findings reveal that profitability is most strongly shaped by asset quality, leverage, and deposit mobilization: higher levels of non-performing loans and greater reliance on debt financing significantly reduce ROA, while a larger deposit base enhances it. By contrast, the cost-to-income ratio and Basel III liquidity requirements (LCR and NSFR) showed no statistically significant impact on profitability within the study period.

These results carry important implications. For bank management, the findings underscore the necessity of strengthening credit risk management, reducing leverage, and innovating deposit mobilization strategies. For regulators such as Bangladesh Bank, the evidence suggests that strict liquidity requirements can be maintained without materially harming short-term profitability, allowing regulatory focus to shift toward credit quality and capitalization.

By jointly analyzing traditional financial ratios and modern regulatory liquidity measures, this study fills a gap in the empirical literature on Bangladesh and provides actionable insights for balancing profitability with financial stability. Future research could expand the scope by incorporating state-owned and Islamic banks, or by examining how macroeconomic variables and nonlinear relationships interact with profitability. Such extensions would further support policy design and strengthen the resilience of Bangladesh's banking sector.

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APPENDIX

Table A.1: Descriptive accounts of the variables used in the FE regression model

Variable	Formula	Reference
Return on Assets (ROA)	Net Income / Total Assets	[3]
Gross NPL Ratio	Gross Non-Performing Loans / Total Loans	[6]
Debt-Equity Ratio	Total Debt / Shareholders' Equity	[25]
Net Stable Funding Ratio (NSFR)	Available Stable Funding (ASF) / Required Stable Funding (RSF)	[15]
Cost-Income Ratio	Operating Expenses / Operating Income	[14]
Deposit-Assets Ratio	Total Deposits / Total Assets	[11]
Liquidity Coverage Ratio (LCR)	High-Quality Liquid Assets (HQLA) / Total Net Cash Outflows over 30 days	[19]

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