

The Impact of Liquidity, Bank Size and Capital Ratio on Return on Assets (ROA) of Banks in Afghanistan: A Panel Data Regression Analysis for the Period 2015–2024

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The study aimed at assessing the financial performance of the commercial banks in Afghanistan. It aims to examine the impact of Liquidity, Bank Size and Capital Ratio on Return on Assets (ROA) of commercial banks. The study takes the annual financial report of Afghan commercial banks for the period 2015–2024 and investigates the relationship between variables by using the mean of panel data regression analysis. For this study, ROA is considered as dependent variable, and the independent variables are Liquidity, Bank Size, and Capital Ratio. The data have been collected from the annual financial reports of banks, statistical reports of Da Afghanistan Bank and other official sources. The data were analyzed in Microsoft Excel and EViews software. The most important statistical tests used in order to achieve reliable econometric estimation are descriptive statistics, correlation and covariance analysis, cross sectional dependence tests and panel unit root tests. The findings showed that some variables are non-stationary, thus all variables were put in first difference to prevent spurious regression, and to ensure stationarity. Furthermore, it was found that there was heteroscedasticity and Panel Corrected Standard Errors (PCSE) obtained robust and reliable estimates. The model explains 4.47% of the variation in ROA ($R^2 = 0.0447$), while bank size has a positive and statistically significant effect on ROA ($\beta = 0.0163$, $p = 0.026$), while capital ratio ($\beta = 0.0102$, $p = 0.173$) and liquidity ($\beta = -0.0147$, $p = 0.557$) have no statistically significant effects. Explanatory power is not very high in the model, which is typical in banking research because of the effect of unobserved macroeconomic and institutional variables. The overall results indicate that the size of banks is a significant factor in the profitability of the Afghan banking sector and that the liquidity and capital strength have only minor influence. This study will be helpful for the policy makers, banking managers and researchers on the factors influencing banking performance in developing economies.

KEYWORDS: Bank Size, Capital Ratio, Liquidity, Panel Data, Regression Analysis, ROA

1. INTRODUCTION

Banks are an essential part of the financial system and are vital to economic growth, investment mobilization, and financial intermediation. According to empirical research, a healthy banking industry makes a substantial contribution to financial stability and economic growth through effective resource allocation (Levine, 2005; Berger & Humphrey, 1997). Across banking systems, bank profitability typically determined by Return on Equity (ROE) and Return on Assets (ROA) is frequently employed as a gauge of managerial effectiveness and financial success (Athanasoglou et al., 2008).

Since 2002, the banking industry in Afghanistan has experienced significant growth as a result of financial sector reforms spearheaded by the Central Bank of Afghanistan (Da Afghanistan Bank). Afghanistan's banking industry grew from a virtually nonexistent formal system to a dual banking system that included both conventional and Islamic banks, according to official findings from World Bank and IMF inspections. By 2023, there were more than ten commercial banks with licenses in the banking industry, and the use of digital and Islamic financial services was growing. Despite these advancements, the industry is still comparatively small, with limited financial inclusion in comparison to regional norms and total banking assets still below 50% of GDP (World Bank, 2023; IMF, 2022).

Research from developing and fragile economies demonstrates that external macroeconomic conditions like inflation, exchange rate volatility, and political instability, as well as internal factors like liquidity, capital adequacy, and bank size, have a substantial impact on bank profitability (Pasiouras & Kosmidou, 2007; Sufian & Habibullah, 2009). These issues are more serious in Afghanistan because of the country's ongoing political unpredictability, high credit risk, dollarization of the economy, lack of liquidity, and inadequate institutional frameworks, all of which have a direct impact on the performance of the banking system (IMF Country Report, 2022).

However, there is no empirical data that particularly focuses on Afghan commercial banks using contemporary panel data methodologies between 2015 and 2024, despite the expanding body of international literature on bank profitability drivers. There is a glaring knowledge gap regarding the post-reform and recent performance dynamics of Afghan banks because the majority of studies that are currently accessible either concentrate on cross-country comparisons or pre-2015 data.

In order to close this gap, this study uses panel data regression analysis to examine the financial performance of Afghan commercial banks from 2015 to 2024. The study looks at how bank profitability as determined by

Return on Assets (ROA) is affected by liquidity, bank size, and capital ratio. Correlation analysis is also used to look at the direction and strength of correlations between the variables.

This study is important because it offers current empirical data from Afghanistan's banking industry, which has not received enough attention in scholarly publications. It is anticipated that the results will help financial analysts, bank management, and legislators improve regulatory frameworks and increase the stability of the banking industry. Additionally, this study adds to the body of knowledge regarding banking performance in developing and weak economies.

1.1 Problem Statement

The banking sector is regarded as one of the most important sectors of a country's economic system because the banks are the main institutions which mobilise savings, fund investment, stabilise the financial system and facilitate economic activities. Poor financial performance in banks doesn't only have an impact on the banks themselves but it can also pose a risk to the overall economic system. Hence, the study on the profitability and financial performance of banks has been an important subject in financial and economic research.

Afghanistan's banking industry has continued to be extremely susceptible to structural and macroeconomic difficulties. The World Bank (2025) claims that the industry's overall banking operations have been undermined by ongoing liquidity issues, decreased deposit mobilization, and restricted access to external financial systems. Exchange rate swings and dwindling investor confidence have also further curtailed banking operations and diminished banks' ability to extend loans and produce long-term profitability. These factors create problems for many Afghan banks in terms of their ability to use assets and capital efficiently and in a way that would yield good returns. Various studies have been conducted in other countries to explore the relationship between ROA and other indicators of bank performance, such as Liquidity, Bank Size and Capital Ratio, but there is limited statistical and econometric research in Afghanistan banking sector. However, studies that examine factors that affect bank profitability by Panel Data Regression Analysis are still rather limited in particular. Thus, the empirical evidence on the financial performance of Afghan banks is still lacking. Also, there is uncertainty about which of the financial indicators is the most important for profitability of banks in Afghanistan. For instance, it is not well understood if there is a relationship between the increase in liquidity and the increase of ROA, or how much of a role Bank Size and Capital Ratio play in the improvement of banks' financial performance. Moreover, the strength and the statistical significance of the relationships between these variables have not been adequately studied.

Because most prior research on bank profitability has concentrated on broad banking sectors or earlier time periods and has not sufficiently analyzed recent data from Afghanistan's commercial banks, this study fills a glaring vacuum in the body of literature. Specifically, there is little empirical data that uses updated panel data spanning the years 2015–2024 to concurrently assess liquidity, bank size, and capital ratio as important factors influencing Return on Assets (ROA). Because it offers up-to-date, nation-specific empirical evidence on the primary determinants determining bank profitability under current economic and financial conditions, this study is therefore essential in the context of the Afghan banking system. It is anticipated that the results will advance knowledge of bank performance and facilitate better managerial and policy decisions.

1.2 Research Objectives

1.2.1 General Objective

This study's main goal is to use panel data regression analysis to investigate the effects of liquidity, bank size, and capital ratio on Afghan banks' return on assets (ROA) between 2015 and 2024.

1.2.2 Specific Objectives

- to investigate how liquidity affected Afghan banks' return on assets (ROA) from 2015 and 2024.
- to ascertain how bank size affected Afghanistan's banks' return on assets (ROA) between 2015 and 2024.
- to evaluate the impact of capital ratio on Afghan banks' return on assets (ROA) from 2015 to 2024.
- to assess the overall correlation between Afghan banks' financial performance as determined by ROA, bank size, capital ratio, and liquidity.

1.3 Research Questions

- What impact does liquidity have on Afghan banks' return on assets (ROA) between 2015 and 2024?
- What is the effect of bank size on the return on assets (ROA) of banks in Afghanistan for the period 2015–2024?
- What is the effect of capital ratio on the return on assets (ROA) of banks in Afghanistan for the period 2015–2024?
- To what extent do liquidity, bank size, and capital ratio collectively explain variations in the ROA of banks in Afghanistan during the period 2015–2024?

1.4 Research Hypothesis

H₀1: The return on assets (ROA) of Afghan banks between 2015 and 2024 is not statistically significantly impacted by liquidity.

H₁1: The return on assets (ROA) of Afghan banks from 2015 to 2024 is statistically significantly impacted by liquidity.

H₀2: The return on assets (ROA) of Afghan banks between 2015 and 2024 is not statistically significantly impacted by bank size.

H₁2: The return on assets (ROA) of Afghan banks from 2015 to 2024 is statistically significantly influenced by bank size.

H₀3: Between 2015 and 2024, the capital ratio had no statistically significant impact on Afghan banks' return on assets (ROA).

H₁3: The return on assets (ROA) of Afghan banks between 2015 and 2024 is statistically significantly impacted by the capital ratio.

1.5 Significance of the Study

This study is important because it uses contemporary data from 2015 to 2024 to present updated empirical evidence on the factors influencing bank profitability in Afghanistan. This study uses panel data regression to better understand the relationship between liquidity, bank size, capital ratio, and ROA in the present Afghan banking environment, in contrast to earlier research that was primarily based on older data or broader banking settings. The results of this study will help bank management make better financial decisions, especially when it comes to capital structure, asset usage, and liquidity management. Better internal performance reviews and more efficient financial planning in commercial banks may result from this. Additionally, by expanding the scant empirical literature on Afghan banking performance using contemporary panel data approaches, the study provides scholars with pertinent insights. Additionally, it offers a helpful resource for upcoming scholarly research on financial performance analysis in unstable and developing banking systems.

2. LITERATURE REVIEW

The significance of internal financial elements like liquidity, capital adequacy, and bank size is emphasized by recent research on banking profitability. Liquidity significantly improves Return on Assets (ROA), according to Rehman and Jannat's (2023) analysis of Afghan commercial banks. Their findings highlight liquidity

management as a critical factor influencing performance in Afghanistan's banking industry by showing that banks with better liquidity balances are better equipped to produce steady earnings.

Using panel data analysis, Khalilullah et al. (2023) investigated the factors influencing Afghan commercial banks' financial performance. According to their research, bank size, liquidity, and capital ratio all have a big impact on ROA. Although the analysis is restricted to past years and does not take into account current banking difficulties, the study found that larger and well-capitalized banks do better financially.

The effect of efficiency and liquidity on bank profitability in Afghanistan was examined by Amarkhil et al., (2025). The study discovered a robust and favorable correlation between liquidity management and profitability using a number of performance metrics, including ROA. The authors also emphasized how the unpredictable macroeconomic environment in which Afghan banks operate makes internal financial management even more crucial.

Liquidity has a major impact on financial performance, according to Sapand et al., (2022) analysis of the relationship between liquidity parameters and bank profitability. Their research demonstrated that while effective liquidity structures increase ROA and ROE, ineffective liquidity management has a detrimental impact on profitability.

Jamal et al. (2023) examined how credit risk and liquidity affected the financial performance of Afghan banks. According to the study, credit risk has a negative impact on profitability, whereas liquidity has a positive one. The results highlight how crucial risk management is to preserving bank stability and raising ROA.

Haqmal and Faiz, (2025) investigated how liquidity affected Afghan commercial banks' profitability and discovered a strong correlation between ROA and liquidity metrics. According to the study's findings, banks that have more effective liquidity control systems are more profitable.

When comparing Afghanistan's state and private banks, Enami and Arian (2026) discovered that both sectors' profitability is strongly impacted by liquidity. In contrast to public banks, private banks were somewhat more effective at turning liquidity into profits.

In their study of bank size and profitability, Bolívar et al., (2024) discovered that because of economies of scale, larger banks typically attain better profitability. However, operational inefficiencies may cause the effect to diminish beyond a certain scale.

Liquidity, capital structure, and bank size are important factors affecting ROA, according to Hossain and Ahamed, (2021) analysis of banking industry profitability determinants. The general theoretical framework employed in the majority of banking performance research is supported by their findings.

Athanasoglou et al., (2008) offered solid proof that bank-specific elements like size and capital ratio have a major impact on profitability. Their research serves as a popular theoretical foundation for contemporary banking performance studies.

The significance of internal bank-specific factors in influencing profitability is further supported by recent empirical data. According to Jamal et al., (2022), credit risk has a negative influence on Return on Assets (ROA), but liquidity has a favorable and considerable impact on Afghan commercial banks' financial performance. According to their research, sustaining profitability in a precarious banking environment such as Afghanistan requires effective liquidity and risk management.

Haqmal and Faiz, (2025) also looked at the connection between profitability and liquidity in Afghan banks and came to the conclusion that increasing ROA requires liquidity. The study emphasized the significance of liquidity management in banking operations by showing that banks with stronger control over liquid assets are more financially stable and able to provide steady profits.

When comparing the performance of Afghanistan's public and private banks, Enami and Arian, (2026) discovered that both sectors' profitability is strongly impacted by liquidity. However, compared to public banks, private banks typically use their assets more effectively, resulting in comparatively better returns on assets.

Bolívar et al., (2024) looked at how bank size affects profitability and discovered that larger banks gain from economies of scale, which raises ROA. A non-linear link between size and profitability is shown by the study's observation that very large banks may experience diminishing profits as a result of operational inefficiencies.

In their analysis of the profitability of the banking industry in emerging nations, Hossain and Ahamed, (2021) found that bank size, capital adequacy, and liquidity were important factors influencing ROA. Their results provide credence to the idea that variations in bank performance among institutions are mostly explained by internal financial structure.

3. METHODOLOGY

3.1 Research Design

The impact of liquidity, bank size, and capital ratio on the return on assets (ROA) of Afghan banks between 2015 and 2024 is investigated in this study using a quantitative, descriptive, and analytical research design. The

study is based on secondary financial data that was gathered from pertinent Da Afghanistan Bank documents and the financial reports of a eight Afghan banks. The study can use statistical methods to quantify and examine the relationships between the study variables thanks to the quantitative approach. Additionally, the effects of capital ratio, bank size, and liquidity on the financial performance of banks as determined by return on assets (ROA) are examined using panel data regression analysis.

3.2 Data Source and Sample

A Panel Data Research Design was employed in this study because the data were collected from several banks over a period of ten years (2015–2024). This design is considered appropriate for analyzing variations across both time and banks and enhances the accuracy and reliability of the findings.

The data used in this study were obtained from the annual financial reports of banks, statistical publications of Da Afghanistan Bank, and other official documents. All data were organized using Microsoft Excel and subsequently analyzed using the EViews software.

The study includes eight commercial banks operating in Afghanistan. Three of these banks (New Kabul Bank, Pashtany Bank, and Bank-e-Millie Afghan) are state-owned banks, while the remaining five banks (Azizi Bank, Afghan United Bank, Ghazanfar Bank, Afghanistan Islamic Bank, and AIB Bank) are privately owned banks. The banks were selected based on the availability of financial reports. In other words, only those banks that had published financial reports throughout the selected study period were included in the sample. Banks operating in Afghanistan that did not publish their financial reports during the selected years or whose reports were unavailable were excluded from the study.

3.3 Variables

In this study, return on Assets (ROA) was used as the dependent variable, while Liquidity (LIQ), Bank Size (SIZE), and Capital Ratio (CAP) were used as independent variables. To examine the relationships among the variables, Descriptive Statistics, Correlation Analysis, and Multiple Regression Analysis were employed. Without (ROA) Another three variables used in the regression analysis are transformed into first differences to ensure stationarity and avoid spurious regression problems. Δ represents the first-differenced form of the variables used to achieve stationarity.

3.4 Research Model

The general regression model is presented as follows:

$$ROA_{it} = \beta_0 + \beta_1 \Delta Liquidity_{it} + \beta_2 \Delta Size_{it} + \beta_3 \Delta Capital_{it} + u_i + \epsilon_{it}$$

ROA_{it} : Return on Assets of bank i at time t (dependent variable)

i : Cross-sectional dimension (different banks, Kabul Bank, Azizi Bank, etc.)

t : Time dimension (years 2015–2024)

β_0 : Constant term (intercept)

$\beta_1, \beta_2, \beta_3$: Coefficients measuring the impact of each independent variable

$\Delta SIZE, \Delta LIQ, \Delta CAP$: Independent variables (Bank Size, Liquidity, and Capital Adequacy)

u_i : Random effect, capturing unobserved individual bank-specific characteristics

ε_{it} : Error term, representing random disturbances and other unexplained factors

This model was used to determine which independent variables have the greatest impact on the profitability of banks, as measured by Return on Assets (ROA).

4. RESULTS AND DISCUSSION

4.1 Descriptive Analysis

The table 1 presents the descriptive statistics of four variables (CAP, LIQ, SIZE, and ROA) based on 72 observations covering the period 2015–2024. These statistics include measures of central tendency, dispersion, and distributional properties, which are essential for understanding the nature of the dataset before econometric analysis.

The mean values indicate the average level of each variable over the study period. The results show that all variables have relatively small positive mean values: ΔCAP (0.006812), ΔLIQ (0.001518), $\Delta SIZE$ (0.010651), and ROA (0.005879). This suggests that, on average, the variables exhibit low but positive fluctuations over time.

However, a noticeable difference exists between the mean and median values for some variables, particularly CAP and SIZE. For example, CAP has a positive mean but a negative median (-0.001934), while SIZE shows a large gap between its mean (0.010651) and median (0.051362). This indicates that the distributions are not perfectly symmetric and are influenced by extreme observations or skewness.

The maximum and minimum values show the range of variation in the dataset. CAP ranges from -0.742461 to 0.831702, indicating high volatility. Similarly, LIQ ranges from -0.462518 to 0.247616, while size shows even greater variation from -1.384705 to 0.588323. These wide ranges suggest significant fluctuations in capital, liquidity, and firm size over time. In contrast, ROA varies within a relatively narrow range (-0.076726 to 0.087943), indicating more stability in profitability compared to other variables.

Standard deviation measures the degree of variation around the mean. SIZE has the highest standard deviation (0.272971), indicating it is the most volatile variable in the dataset. CAP (0.163916) and LIQ (0.109417) also

show moderate variability. ROA has the lowest standard deviation (0.020166), confirming that profitability is relatively stable compared to other financial indicators.

Skewness indicates whether the data distribution is symmetric or asymmetric. The results show that ΔCAP (0.572930) is moderately positively skewed, meaning that the distribution has a longer right tail with some higher positive values. In contrast, ΔLIQ (-1.556677) is strongly negatively skewed, suggesting that most observations are concentrated on the higher side while the distribution has a long left tail. Similarly, $\Delta SIZE$ (-2.501049) is highly negatively skewed, indicating a strong left-skewed distribution with the presence of extreme negative values. On the other hand, ROA (-0.147738) is approximately symmetric with only a slight negative skewness, showing that its distribution is relatively balanced compared to the other variables. Overall, the results indicate that most variables are not symmetrically distributed, confirming the presence of noticeable skewness in the dataset.

Table 1: Descriptive Analysis

	CAP	LIQ	SIZE	ROA
Mean	0.006812	0.001518	0.010651	0.005879
Median	-0.001934	0.003206	0.051362	0.005139
Maximum	0.831702	0.247616	0.588323	0.087943
Minimum	-0.742461	-0.462518	-1.384705	-0.076726
Std. Dev.	0.163916	0.109417	0.272971	0.020166
Skewness	0.572930	-1.556677	-2.501049	-0.147738
Kurtosis	17.78454	9.108898	13.60587	9.519504
Jarque-Bera	659.6869	141.0348	412.5163	127.7737
Probability	0.000000	0.000000	0.000000	0.000000
Sum	0.490464	0.109287	0.766846	0.423299
Sum Sq. Dev.	1.907667	0.850010	5.290450	0.028873

The Kurtosis results indicate that all variables exhibit values significantly higher than 3 (CAP = 17.78454, LIQ = 9.108898, SIZE = 13.60587, ROA = 9.519504). This suggests that the distributions are leptokurtic, meaning they are highly peaked with heavy tails and a higher probability of extreme values (outliers). Such characteristics are common in financial data.

All variables have probability values of 0.0000, which are below the 5% significance level, according to the Jarque-Bera test results. As a result, all variables' null hypothesis of a normal distribution is rejected, proving

that the data is not normally distributed. This non-normality indicates that the dataset may contain skewness and possible outliers. Non-normality does not, however, always invalidate the estimation results in panel data regression analysis because regression coefficients maintain their objectivity and consistency under large sample qualities. However, it might have an impact on the accuracy of estimates and the reliability of some statistical tests, especially those that depend on normalcy assumptions. Thus, large-sample corrections or robust estimating techniques are thought to be suitable for guaranteeing trustworthy inference.

4.2 Correlation analysis

The covariance and correlation analysis provides important insights into the relationship, direction, and strength of association among the variables CAP, LIQ, SIZE, and ROA. This analysis helps to understand how variables move together and whether there is any potential issue of multicollinearity in the model.

Covariance measures the degree to which two variables move together. A positive value indicates that variables move in the same direction, while a negative value indicates an inverse relationship. However, covariance values are scale-dependent, meaning they are affected by the units of measurement, and therefore are not suitable for comparing the strength of relationships directly.

The results show that the covariance between CAP and LIQ (-0.000326) is slightly negative, indicating a very weak inverse relationship between capital and liquidity changes. Similarly, the covariance between Δ CAP and SIZE (-0.002426) is also negative but extremely small, suggesting a negligible relationship. On the other hand, the covariance between LIQ and SIZE (0.013861) is positive, indicating that liquidity and firm size tend to move in the same direction, although the relationship is still weak.

Regarding ROA, the covariance values with all other variables (CAP, LIQ, and SIZE) are extremely close to zero (0.000240, 5.85E-05, and 0.000984 respectively), which implies that profitability does not exhibit a meaningful co-movement with the other variables in the model.

Correlation provides a standardized measure of the linear relationship between variables, ranging from -1 to +1. It indicates both the direction and strength of the relationship, making it more suitable for interpretation compared to covariance.

The correlation results show that most relationships among the variables are weak. The correlation between CAP and LIQ (-0.018430) is almost zero, indicating no meaningful relationship. Similarly, CAP has very weak negative and positive correlations with SIZE (-0.054979) and ROA (0.073761), respectively, suggesting no significant economic relationship.

The most notable finding is the correlation between LIQ and SIZE (0.470627), which indicates a moderate positive relationship. This suggests that larger firms tend to have higher liquidity levels, which is economically

reasonable since larger firms usually have better access to financial resources and stronger cash positions. Additionally, the correlation between SIZE and ROA (0.181294) is weakly positive, indicating a slight association between firm size and profitability, although it is not strong enough to be considered highly significant.

Table 2: Correlation analysis

Correlation	CAP	LIQ	SIZE	ROA
CAP	0.026495			
	1.000000			
LIQ	-0.000326	0.011806		
	-0.018430	1.000000		
SIZE	-0.002426	0.013861	0.073478	
	-0.054979	0.470627	1.000000	
ROA	0.000240	5.85E-05	0.000984	0.000401
	0.073761	0.026872	0.181294	1.000000

Overall, the results indicate that both covariance and correlation values are generally weak among most variables. Only liquidity and firm size show a moderate positive relationship, while all other relationships are weak or negligible. This suggests that the risk of multicollinearity in the model is low, and the explanatory variables can be considered relatively independent. Therefore, the model is appropriate for regression analysis, and the results can be interpreted with a reasonable level or reliability.

4.3 Cross-Sectional Dependence Test

The results of the Cross-Sectional Dependence (CSD) tests indicate the presence of partial cross-sectional dependence among the banks included in the panel dataset. Specifically, the test results for Return on Assets (ROA) and Bank Size (SIZE) reveal statistically significant cross-sectional dependence, suggesting that changes in these variables are influenced by common factors and may affect one another across banks. This finding implies that the performance and size dynamics of individual banks are not entirely independent within the sample.

In contrast, the results for Liquidity (LIQ) and Capital Adequacy Ratio (CAP) do not provide sufficient evidence of significant cross-sectional dependence, indicating that these variables remain relatively independent across the cross-sectional units. Therefore, shocks affecting one bank's liquidity position or capital adequacy are less likely to be transmitted directly to other banks in the sample.

Overall, the findings suggest that the panel dataset is characterized by a degree of cross-sectional interdependence rather than complete independence among all units. Consequently, the use of econometric techniques that account for cross-sectional dependence is recommended. Such approaches include second-generation panel unit root tests and estimation methods with robust standard errors, such as the Driscoll–Kraay estimator, to ensure reliable and unbiased statistical inference.

Table 3 : Residual Cross-Section Dependence Test

Test	Statistic	d.f.	Prob.
Breusch-Pagan LM	41.77282	28	0.0455
Pesaran scaled LM	1.840471		0.0657
Pesaran CD	2.045868		0.0408

4.4 Unit Root Test Results

To examine the stationarity properties of the variables, Panel Unit Root Tests were conducted using the Levin, Lin & Chu (LLC), Im, Pesaran and Shin (IPS), Augmented Dickey-Fuller (ADF), and Phillips-Perron (PP) methods. The results indicate that ROA is stationary at level, $I(0)$, according to all four tests (LLC, IPS, ADF, and PP) at the 1% and 5% significance levels. This suggests that the variable is stable in its original form and suitable for panel regression analysis without further transformation.

For the Capital Adequacy Ratio (CAP), mixed results were obtained. While the LLC and PP tests support stationarity at level, the IPS and ADF tests indicate non-stationarity. Therefore, CAP can be considered a weakly stationary variable or a variable with mixed integration properties.

Regarding Bank Size (SIZE), only the LLC test indicates stationarity, whereas the IPS, ADF, and PP tests suggest non-stationarity. Consequently, SIZE is generally considered an integrated variable of order one, $I(1)$, and is expected to become stationary after first differencing.

Similarly, the Liquidity Ratio (LIQ) exhibits non-stationary behavior according to most panel unit root tests, with the exception of the PP test, which suggests stationarity. Overall, LIQ is also classified as an $I(1)$ variable.

4.5 Unit Root Test (First Difference)

The panel unit root test results indicate that liquidity (LIQ), bank size (SIZE), and capital adequacy ratio (CAP) are stationary after first differencing. This suggests that these variables are integrated of order one, $I(1)$, and become stationary only after transformation. Therefore, their first-differenced forms are appropriate for

econometric analysis, ensuring that the regression results are not affected by spurious relationships and are statistically reliable.

4.6 Pedroni Panel Cointegration Test

The Pedroni panel cointegration test was conducted to examine the existence of a long-run equilibrium relationship among ROA, SIZE, LIQ, and CAP. The null hypothesis of the test states that there is no cointegration among the variables. The results revealed that all panel and group statistics were statistically insignificant, with probability values exceeding the 5% significance level. Specifically, the Panel ADF statistic reported a probability value of 0.8588, while the Group ADF statistic reported a probability value of 0.3187. Similarly, the probability values of the Panel PP, Group PP, Panel rho, and Group rho statistics were all greater than 0.05.

Therefore, the null hypothesis of no cointegration could not be rejected. This finding indicates that there is no evidence of a long-run equilibrium relationship among ROA, SIZE, LIQ, and CAP during the study period. In other words, changes in bank size, liquidity, and capital adequacy do not exhibit a stable long-term relationship with profitability. Consequently, since the variables were found to be non-stationary at level and no cointegration relationship was detected, the study employed first-differenced variables in the regression analysis to avoid spurious regression results and ensure data stationarity.

4.7 Heteroskedasticity Test

The results of the Panel Cross-section and Period Heteroskedasticity Likelihood Ratio (LR) tests indicate the presence of heteroskedasticity in the estimated model. Specifically, the Cross-section LR test reports a statistic of 61.66386 with a probability value of 0.0000, while the Period LR test reports a statistic of 66.71394 with a probability value of 0.0000. Since both probability values are below the 5 percent significance level, the null hypothesis of homoskedastic residuals is rejected in both cases.

This finding implies that the variance of the error terms is not constant across cross-sectional units and over time. In other words, there is significant heterogeneity among banks as well as variations over the study period. Therefore, the presence of heteroskedasticity suggests that appropriate estimation techniques. Therefore, Panel Corrected Standard Errors (PCSE) were employed to obtain robust and reliable estimates.

4.8 Hausman Test

The Hausman specification test was conducted to determine the most appropriate panel data estimation technique between the Fixed Effects Model and the Random Effects Model. The results revealed that the Chi-

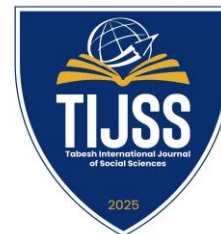
square statistic for the cross-section and period random effects was 0.948547 with a probability value of 0.8137. Since the p-value is greater than the 5% significance level (0.05), the null hypothesis cannot be rejected. Therefore, the Random Effects Model is considered more appropriate than the Fixed Effects Model for estimating the relationship between the study variables. This result indicates that the individual effects are not correlated with the explanatory variables, supporting the use of the Random Effects approach in the analysis

4.9 Regression Analysis

The random effects panel regression model was estimated using Panel Corrected Standard Errors (PCSE) to account for heteroskedasticity and improve the reliability of statistical inference. The findings reveal that bank size (SIZE) exerts a positive and statistically significant effect on return on assets (ROA) at the 5% significance level, indicating that larger banks tend to achieve higher profitability. In contrast, the effects of capital ratio (CAP) and liquidity ratio (LIQ) are not statistically significant during the study period. Although the explanatory power of the model is relatively modest ($R^2 = 0.0447$), this is not uncommon in banking and financial performance studies, where profitability is influenced by numerous internal and external factors beyond those included in the model. Furthermore, the use of PCSE estimation ensures robust and reliable coefficient estimates in the presence of heteroskedasticity. Overall, the results suggest that firm size is an important determinant of bank profitability, while the influence of capital adequacy and liquidity appears to be limited within the sampled banks and period under investigation.

Table 4: Panel EGLS (Cross-section random effects)

Variable	Coefficient	Std. Error	t-Statistic	Prob
C	0.005658	0.002838	1.993667	0.0502
Δ CAP	0.010205	0.007418	1.375764	0.1734
Δ LIQ	-0.014706	0.024938	-0.589694	0.5574
Δ SIZE	0.016323	0.007177	2.274508	0.0261
Effects Specification				
			S.D.	Rho
Cross-section random			0.004656	0.0504
Idiosyncratic random			0.020211	0.9496
Weighted Statistics				
R-squared	0.044739	Mean dependent var		0.004836



Adjusted R-squared	0.002595	S.D. dependent var	0.019852
S.E. of regression	0.019826	Sum squared resid	0.026729
F-statistic	1.061571	Durbin-Watson stat	1.687999
Prob(F-statistic)	0.371269		
Unweighted Statistics			
R-squared	0.044362	Mean dependent var	0.005879
Sum squared resid	0.027593	Durbin-Watson stat	1.635146

The model's limited explanatory power is indicated by the R-squared (0.0447) and modified R-squared (0.0026), which means that only a small percentage of ROA fluctuation can be explained by liquidity, bank size, and capital ratio. This implies that other overlooked elements including macroeconomic conditions, credit risk, managerial caliber, and the regulatory environment are major drivers of bank profitability in Afghanistan. Because the model only accounts for a small number of profitability-related factors over the research period, the results should be evaluated cautiously.

4.10 DISCUSSION

The study's conclusions offer significant proof of the connection between bank-specific financial characteristics and Afghan commercial banks' financial results from 2015 to 2024. The impact of bank size, capital ratio, and liquidity on Return on Assets (ROA) is the main topic of discussion. The empirical findings are interpreted within the framework of the Afghan banking industry.

The findings show that ROA is positively and statistically significantly impacted by bank size. The probability value is 0.0261, the t-statistic is 2.274508, and the coefficient of $\Delta SIZE$ is 0.016323. This result shows that, when all other factors are held constant, a larger bank is linked to higher profitability. Larger banks might profit from economies of scale, increased operational capacity, broader customer networks, and better chances to diversify their financial operations. Additionally, larger banks may be able to spread fixed operational costs over a larger number of assets and transactions, increasing their overall profitability and efficiency. This result implies that variations in profitability across Afghan commercial banks can be largely explained by the size of banking operations.

In the case of Afghanistan, the strong and positive correlation between bank size and ROA is also economically significant. Larger asset bases may enable banks to offer more financial services, mobilize deposits, extend credit, and make money from a variety of banking operations. The positive correlation does not, however, show

that unrestricted growth inevitably boosts profitability. To guaranty that an increase in bank size results in improved profitability, sustainable expansion, efficient resource allocation, cost control, and good asset management are still crucial.

The findings indicate a positive but statistically negligible correlation between ROA and capital ratio. The probability value is 0.1734, the t-statistic is 1.375764, and the coefficient of ΔCAP is 0.010205. The statistical evidence is insufficient to demonstrate a meaningful relationship at the 5% level, despite the positive coefficient suggesting that increases in capital ratio may be linked to increased profitability. Therefore, over the sample and study period, changes in ROA do not seem to be significantly influenced by changes in the capital ratio.

Maintaining a larger capital position may both provide better financial stability and lessen the need or capability to employ funds in potentially higher-return assets, which could account for the capital ratio's little impact. Furthermore, since profitability can also be influenced by asset quality, lending possibilities, operational effectiveness, risk management, and general economic conditions, variations in capital structures among Afghan banks may not necessarily translate into variations in profitability. Therefore, sufficient capitalization may be necessary for the stability of banks without necessarily having a statistically significant short-term impact on ROA.

The results also show that ROA and liquidity have a negative but statistically insignificant connection. The probability value is 0.5574, the t-statistic is -0.589694, and the coefficient of ΔLIQ is -0.014706. Although the relatively high p-value suggests that this association is not statistically significant, the negative coefficient suggests that increases in liquidity may be linked to reduced profitability. As a result, there is insufficient empirical data in the study to draw the conclusion that variations in liquidity have a substantial impact on ROA across the study period.

The opportunity cost of holding highly liquid assets could account for the liquidity coefficient's negative direction. While sufficient liquidity is required to satisfy withdrawal requests and preserve financial stability, too much liquidity could lead to money staying in non-earning or very low-return assets rather than being used for lending and other revenue-generating endeavors. However, this explanation should be regarded as a potential interpretation rather than a conclusive causal finding because the estimated effect is statistically insignificant.

The disparities in the explanatory factors' significance emphasize how crucial it is to take Afghanistan's unique institutional and economic context into account. Beyond the three variables this study looked at, a number of other factors, such as credit risk, non-performing loans, operating efficiency, interest rates, inflation, economic growth, regulatory conditions, and the general degree of financial intermediation, may have an impact on the profitability of Afghan commercial banks. The calculated model's comparatively low explanatory power, as

evidenced by its R-squared value of 0.044739, further implies that a significant percentage of ROA changes are linked to variables not included in the current model.

Overall, the analysis shows that of the three explanatory variables, bank size is the only one that shows a statistically significant association with ROA in the estimated model. Liquidity exhibits a negative but negligible relationship, whereas the capital ratio exhibits a positive but negligible association. These results lay the groundwork for the conclusions and implications discussed in the next part and offer a platform for comprehending the factors influencing profitability in the Afghan banking industry.

5. CONCLUSIONS

This study looked at how Afghanistan's commercial banks performed financially from 2015 and 2024 in relation to capital ratio, liquidity, and bank size. The study examined whether variations in capital ratio, liquidity, and bank size have a substantial impact on banks' Return on Assets (ROA) using panel data regression analysis. The empirical research shows how much these bank-specific financial factors account for differences in Afghan commercial banks' profitability.

The results show that ROA is positively and statistically significantly impacted by bank size. The probability value is 0.0261, the t-statistic is 2.274508, and the projected coefficient of bank size (Δ SIZE) is 0.016323. The null hypothesis about the impact of bank size is rejected because the p-value is below the 5% significance level. This finding implies that gains in ROA are linked to bank size increases. Larger banks may profit from economies of scale, increased operational capacity, a wider customer base, and more effective use of their resources, as suggested by the positive link. Thus, in the Afghan banking industry, bank size seems to be a significant bank-specific driver of profitability.

On the other hand, the findings indicate that during the study period, the capital ratio had no statistically significant impact on ROA. The probability value is 0.1734, the t-statistic is 1.375764, and the coefficient of CAP is 0.010205. The link is not statistically significant at the traditional 5% threshold even tho the coefficient is positive because the p-value is higher than 0.05. As a result, it is impossible to reject the null hypothesis that the capital ratio has no statistically significant impact on ROA. This result implies that variations in the capital ratio alone are insufficient to account for shifts in Afghan commercial banks' profitability during the course of the study.

Similarly, ROA is not statistically significantly impacted by liquidity. The probability value is 0.5574, the t-statistic is -0.589694, and the predicted coefficient of LIQ is -0.014706. Despite the fact that the estimated association is negative, the effect is statistically negligible at the 5% significance level, according to the high p-

value. As a result, it is impossible to reject the null hypothesis on how liquidity affects ROA. This finding suggests that fluctuations in the profitability of the banks included in the study were not significantly influenced by changes in liquidity.

With an R-squared value of 0.044739 and an Adjusted R-squared value of 0.002595, the model's overall explanatory power is quite poor. This shows that variations in the capital ratio, liquidity, and bank size considered in the model account for about 4.47% of the variation in ROA. The remaining variation could be linked to additional macroeconomic and bank-specific variables that the model does not account for. Additionally, the explanatory factors are not jointly statistically significant at the 5% level, according to the overall F-statistic of 1.061571 and probability value of 0.371269.

Overall, the empirical data shows that of the three explanatory factors, bank size is the only one that has a statistically significant positive connection with ROA. Despite the fact that liquidity has a negative coefficient and capital ratio has a positive coefficient, neither variable shows a statistically significant impact on ROA at the 5% level. These results imply that capital adequacy and liquidity circumstances alone cannot account for Afghan commercial banks' profitability throughout the study period. Rather, differences in financial performance may be more significantly influenced by bank size and possibly other internal and external factors.

The results have significant ramifications for politicians and bank managers. In addition to making sure that expansion is supported by efficient resource management and operational efficiency, bank managers should focus especially on the efficient and sustainable growth of bank assets. Even though their direct effects on ROA were not statistically significant in this study, maintaining sufficient capital and liquidity is still crucial for risk management and financial stability. The findings emphasize the significance of taking into account broader institutional, economic, and bank-specific issues when developing policies meant to increase the stability and profitability of the Afghan banking industry for policymakers and banking regulators.

In conclusion, by offering panel-data evidence for the years 2015–2024, this study adds to the empirical literature on the financial performance of Afghan commercial banks. The findings show that while capital ratio and liquidity do not exhibit statistically significant effects, bank size has a significant positive association with ROA. By adding more variables like non-performing loans, interest rates, inflation, operational effectiveness, loan growth, and other macroeconomic and bank-specific indicators, future research may increase the model's explanatory power.

5.1 Limitations of the Study

The study has several limitations. This study is limited in a few ways.

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- The study had some limitations that could limit the extrapolation and conclusions of the results. First, the period 2015 to 2024 did not have consistent financial reports for all the commercial banks in Afghanistan. Thus, the sample represents only banks with a full and easy-to-access set of financial data.
 - Second, the analysis is based on secondary data gathered from Central Bank of Afghanistan statistical reports and published financial statement of commercial banks. Due to its affordability and accessibility, secondary data is frequently utilized in financial research; yet, it may have some drawbacks. Specifically, the researcher has no control over the original recording, classification, or reporting of the data, which could lead to measurement mistakes or inconsistencies. Additionally, the accuracy and comparability of the results may be impacted by any lack of transparency, delayed reporting, or variations in accounting procedures among institutions.
 - Third, just a few financial variables are studied, including Liquidity, Bank Size, and Capital Ratio. Inflation, interest rates, political instability, and exchange rate fluctuations, however, are other economic and political factors that can impact bank profitability and were not considered in this project.
 - Furthermore, the findings of the study may not be fully comparable with those of banking sectors in other countries due to the special economic and political conditions. In spite of these limitations, all the data were analysed in an accurate and scientific manner to get the valid and reliable results of research.

5.2 Suggestions and Recommendations

Several specific suggestions for raising the profitability of Afghanistan's commercial banks can be made in light of the study's empirical findings.

- First, Commercial banks should concentrate on growing their asset base in a sustainable and effective way because bank size was proven to have a considerable beneficial impact on Return on Assets (ROA). To guarantee that growth results in increased profitability, this expansion should be complemented by effective risk management procedures.
- Second, the findings also demonstrated that during the study period, profitability was not significantly impacted by liquidity or the capital ratio. This implies that ROA may not be directly improved by merely keeping bigger levels of capital or liquidity. Therefore, rather than only boosting liquidity or capital buffers, bank managers should concentrate more on enhancing the effective use of resources.
- Third, the results show that banking performance in Afghanistan is more size-driven than liquidity- or capital-driven for policymakers and regulatory bodies. Therefore, rather than concentrating only on capital adequacy criteria, regulations should promote improved asset management techniques, operational efficiency, and consolidation where needed.

5.3 Suggestion's for Further Research

Given the low explanatory power of the current model, future researchers are advised to investigate additional potential profitability determinants, such as credit risk, operational efficiency, and macroeconomic variables, as these may better explain bank performance in the Afghan environment.

5.4 Data availability information

If you have any concerns regarding the data supporting the findings of this research, you may contact the author via the following email address. (muneerhamdibrahimi@gmail.com)

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