

Impact of Capital Adequacy Ratio and Non-Performing Loans on Return on Assets in Nepalese commercial banks

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ABSTRACT

The study examines the impact of the capital adequacy ratio and non-performing loans on the Return on assets of Nepalese commercial banks. The dependent variable is Return on assets, and the independent variables are capital adequacy ratio and non-performing loans. The study is based on secondary data from 19 commercial banks for the period from 2019/20 to 2023/24, with 95 observations. The data were collected from the bank reports published by Nepal Rastra Bank (NRB) and the annual reports of the selected commercial banks. To test the significance and importance of the capital adequacy ratio and non-performing loans on the Return on assets of Nepalese commercial banks, correlation analysis and multiple linear regression models were used. The study showed that non-performing loans negatively affect Return on assets, indicating that an increase in non-performing loans leads to a decrease in Return on assets. Similarly, capital adequacy ratio has a positive impact on Return on assets, suggesting that a higher capital adequacy ratio is associated with higher Return on assets.

Keywords: return on assets, capital adequacy ratio, non-performing loan.

Introduction

In the development of the country's economy, commercial banks play a very important role, as they are considered the blood of the machine. They are essential economic intermediaries that connect those who save with those who need to take out savings for investment and growth, thereby improving the lives of all. (Heffeman, 1996; Maharjan, 2023). In fact, a sound and profitable banking system serves as the pillar for financial stability and better equips an economy to cope with shocks (Tafri et al., 2009).

Profitability is the final examination for any bank or business (Mbu-Ogar et al., 2017). ROA shows that the more a bank earns per dollar of assets it

holds, the higher its profit will be. If the ROA is low, it indicates the bank's investment is inefficient; the bank is not using all its assets effectively. Hayes (2020). Financial data: Based on all major financial indicators such as capital adequacy ratio (CAR), NON

They used non-performing loans (NPLs) as an indicator of the bank's overall health and soundness. (Charisma et al., 2022).

The capital adequacy ratio (CAR), which serves as the bank's safety net, indicates how well the bank is positioned relative to its risk-weighted assets, reflecting its capacity to absorb probable losses and protect deposits (Abdurrohman et al., 2020; Mustafa, 2024). When CAR is higher, the bank is better prepared to tackle financial risks. On the other hand, Non-Performing Loans (NPL) are a crucial measure of a bank's business risk (Bioshop, 2018; Mustafa, 2024). These are loans for which borrowers have missed payments, directly affecting bank profits and, if not managed correctly, leading to lower profitability and even financial instability. (Balasubramaniam, 2013; Siddique et al., 2020).

In Nepal's constantly changing economic environment, commercial banks play a key role in the country's development (Balami & Chellis, 2023); the presence of non-performing assets is considered highly risky. The problem is becoming increasingly relevant in the banking sector (Gnawali, 2018). At the same time, although some studies have examined the link between these important indicators and the profitability of banks in Nepal, the results remain controversial, and further research using more recent statistics is needed (Maharjan, 2023; Sharma, 2024). Knowledge of these links is especially necessary for bank managers seeking to optimize performance and for policymakers striving to maintain financial sector stability (Karki & Aryal, 2019).

Hence, the goal of this study is to examine the relationship between the capital adequacy ratio (CAR) and non-performing loans (NPL), and their influence on Nepalese commercial banks, using indicators such as Return on assets (ROA) (Charisma et al., 2022; Sharma, 2024). By revealing these

important connections, this study aims to increase the financial performance and flexibility of Nepali banks.

Literature Review

AS et al. (2022) analyzed four state-owned banks listed on the Indonesia Stock Exchange from 2017 to 2021 to determine the effects of CAR and NPL on ROA. The research found that the Capital Adequacy Ratio (CAR) has a significant positive impact on Return on Assets (ROA), indicating that higher CAR is associated with higher ROA. Regarding non-performing loans (NPLs), the study's abstract stated that NPLs had no significant effect on ROA. However, the regression analysis revealed a negative relationship, suggesting that an increase in NPL could decrease ROA. Overall, the study concluded that CAR and NPL significantly influence Return on Assets (ROA), explaining 54.2% of the variation in ROA, with other unstudied factors accounting for the remaining 45.8%.

Nyarko-Baasi (2018) employed a fixed-effects panel regression analysis on data from four major banks on the Ghana Stock Exchange between 2006 and 2015 to explore the relationship between the independent variable, NPL, and ROE. The study consistently found a significant negative relationship between NPLR and ROE. It suggests that a 1% increase in non-performing loans leads to a 25% decline in banks' profitability. These findings are consistent with Nkegbe and Yazidu (2015), Gizaw et al. (2015), Chimkono et al. (2016), and Olawale (2014). Godlewski (2004), Achou and Tenguh (2008), Ara et al. (2009), Aduda and Gitonga (2011), Poudel (2012), Funso et al. (2012), and Chen (2008). Another vital independent variable examined was the Capital Adequacy Ratio (CAR), which reveals a significant positive relationship with profitability, implying that an increase in CAR leads to a proportional increase in bank profits.

Mustafa (2024) analyzed the factors affecting the financial performance of commercial banks in North Macedonia using an autoregressive distributed lag (ADL) approach for the period 2000-2021. Return on Equity (ROE), as the dependent variable, is one of the most important measures of a bank's

profitability and performance in generating returns on its shareholders' investment. The ADL model used in the study was rather good, as it explained how ROE's previous values had positively affected current ROE and that there is some degree of persistence in banks' profitability. However, the main finding of the research concerns the Non-Performing Loan Ratio (NPLR) and its significant negative effect on ROE. This important finding shows that a bank's profit-making capacity decreases as the volume of non-performing loans increases. According to the regression analysis results, an increase in the NPL reduces ROE by 1.03 units, indicating a significant negative impact. This result is consistent with the literature review, which confirms that a high level of NPL is associated with a loss of interest income, the need for additional provisions, and an inability to lend, all of which negatively affect financial performance. In addition, capital adequacy ratio (CAR) is a fundamental measure of financial strength and the capacity to absorb potential losses. The research generally implies a negative association between higher capital adequacy and profitability.

The study found a significant negative short-term relationship with current CAR, suggesting that higher capital might lead to lower profitability, possibly due to inefficient use of conventional capital or increased costs of maintaining excess capital. However, the lagged CAR positively impacted future ROA, indicating that robust capital in the past could contribute to better profitability in subsequent periods by enhancing financial stability.

Balami and Chalise (2023) investigate how their capital levels and loan quality affect the profitability of commercial banks in Nepal. ROA was the dependent variable, an indicator showing how efficiently a bank uses its assets to generate profits. The CAR measure of a bank's capital strength relative to risks and the Non-Performing Loan Ratio, which reflects the share of defaulted loans, served as independent variables. Secondary data from 2012-13 to 2021-22 for 20 Nepalese commercial banks were used to conduct correlation and regression analyses. The correlation coefficient between ROA and CAR was negative, i.e. -0.38, and regression analysis revealed an insignificant negative relationship between CAR and ROA. This finding suggests that while higher

capital might be associated with slightly lower ROA, the link is not statistically significant. Similarly, Jha (2012) also found a negative association between CAR and ROA. Conversely, Tamang (2022) and Thakur (2019) in Nepal found a significant correlation between capital adequacy variables and bank profitability. Whereas there is a significant negative relationship between NPL and ROA. This finding indicates that a bank's ability to generate profits from its assets decreases as bad loans increase, consistent with Frederick (2014) and Duraj and Moci (2015), who demonstrated a significant adverse effect of NPLs on profitability.

Sah1 and Saud (2022) investigate the key factors influencing the profitability, focusing on Return on Assets (ROA) and Return on Equity (ROE), of commercial banks in Nepal, (ROE) as their primary measures of profitability. They selected several key independent variables to analyze their effects, including the Capital Adequacy Ratio (CAR) and Non-Performing Loans (NPL). Secondary data were obtained from 20 Nepalese commercial banks over 6 years (2015/16 to 2020/21), yielding 120 observations. CAR shows a negative relationship with ROA. Regression analysis indicates that CAR has a negative impact on ROA. Similar to the findings of Chhetri (2021) and Pantha (2019), but inconsistent with the findings of Karki (2004). Likewise, Correlation and regression analysis show a negative impact on ROA. Consistent with the findings of Chhetri (2021), Siddique et al. (2021), and Gyawali (2018), and inconsistent with Shrestha (2020).

Gnawali (2018) investigates Return on Assets (ROA) and Return on Equity (ROE) as dependent variables, and the influence of the CAR and NPL as independent variables. Understanding these relationships is important, as financial institutions play a significant role in economic growth by facilitating the flow of credit to investment opportunities. The results show that NPL has a negative relationship with ROA and ROE for both government and private banks. It implies that a higher NPL is associated with a lower ROA. Miller and Noulas (1997) Felix and Claudine (2008), Kargi (2011), Kodithuwakku (2015), Jha and Hui (2015), Gizaw, Kebede, and Selvaraj (2015) also confirmed that NPL is a significant sign of credit risk for commercial banks and

has a substantial adverse effect on profitability (ROA) were as Felix and Claudine (2008), Jha and Hui (2015) also supported a negative relationship between NPL and ROE. Likewise, a study found positive relationships among CAR, ROA, and ROE for Nepalese government and private banks, suggesting that an increase in CAR leads to increases in ROA and ROE. However, Jha and Hui (2015) presented an inconsistent finding, indicating a negative relationship between CAR and ROA and ROE. Consistent with the findings of Furlong and Keeley (1989), Ochei et al. (2013), Sangmi and Nazir (2010), and Dang and Uyen (2011), a positive relationship was found, suggesting that a higher CAR improves a bank's profitability.

Research Method

Population and Sample: The population of this study includes all commercial banks (20) operating in Nepal during the study period (2018/19–2023/24). A sample of 19 banks was selected, excluding one bank due to incomplete or inconsistent data in its annual reports, which would have compromised the reliability of the analysis. This resulted in 95 observations over 5 years. This sampling strategy ensures that the study covers nearly the entire commercial banking sector, making the findings broadly representative.

Selection Criteria: The banks were selected based on the following criteria:

- Continuous operation during the study period (2019/20–2023/24).
- Availability of complete annual reports for each fiscal year.
- Inclusion in the Nepal Rastra Bank (NRB) supervision reports.

This purposive sampling approach is consistent with Creswell (2018), who notes that purposive sampling is appropriate when the researcher seeks information-rich cases relevant to the research objectives.

Data Collection Process: Secondary data were collected from two standardized and publicly available sources:

- Bank Supervision Reports are published annually by Nepal Rastra Bank (NRB).
- Annual Reports of the selected commercial banks.

The data extraction process involved carefully reviewing these documents to obtain figures for Return on Assets, Capital Adequacy Ratio, and Non-Performing Assets. These reports are highly trustworthy, as these reports are controlled by authorities, easy to understand, and reproducible. This is what Kerlinger & Lee (2000) consider very important: using trusted, standard sources when researching Return on Assets and Non-Performing Assets.

Research Design and Analysis: The study employs quantitative approaches, integrating:

- Descriptive statistics to summarize trends.
- Correlation analysis to examine relationships among variables.
- Causal-comparative (ex post facto) design to assess the impact of CAR and NPA on ROA without manipulating variables.
- Multiple linear regression analysis (via SPSS 27) to examine the statistical significance of the independent variables.

Gujarati & Porter (2009) highlight regression analysis as a robust tool for examining the determinants of financial performance, a finding consistent with the methodological framework.

Table 1

List of banks selected for the study, along with the study period and number of observations

S.no	Name	Study period	observation
Public Banks		Public Banks	Public Banks
1	Nepal Bank Limited	2019/20-2023/24	5
2	Agricultural Development Bank Limited	2019/20-2023/24	5
Private banks		Private banks	Private banks
3	Nabil Bank Ltd	2019/20-2023/24	5
4	Nepal Investment Mega Bank Ltd	2019/20-2023/24	5
5	Standard Chartered Bank Nepal Ltd	2019/20-2023/24	5
6	Himalayan Bank Ltd	2019/20-2023/24	5

7	Nepal SBI Bank Ltd	2019/20-2023/24	5
8	Everest Bank Ltd.	2019/20-2023/24	5
9	Kumari Bank Ltd.	2019/20-2023/24	5
10	Laxmi Sunrise Bank Ltd.	2019/20-2023/24	5
11	Citizens Bank International Ltd	2019/20-2023/24	5
12	Prime Commercial Bank Ltd.	2019/20-2023/24	5
13	Sanima Bank Ltd.	2019/20-2023/24	5
14	Machhapuchhre Bank Ltd.	2019/20-2023/24	5
15	NIC Asia Bank Ltd	2019/20-2023/24	5
16	Global IME Bank Ltd	2019/20-2023/24	5
17	NMB Bank Ltd.	2019/20-2023/24	5
18	Prabhu Bank Ltd.	2019/20-2023/24	5
19	Siddhartha Bank Ltd	2019/20-2023/24	5

The Model

The model used in this study assumes that profitability depends on the financial ratio,

operational efficiency, and non-performing loans. The dependent variables selected for the

study is Return on Assets. Similarly, the selected independent

The variables in this study are capital adequacy ratio and non-performing loans. The following model equations are designed to test the hypothesis:

$$ROA = \beta_0 + \beta_1 CAR + \beta_2 NPL + e_{it}$$

Where,

ROA= Return on assets is measured as net profit to total assets, in percentage.

CAR= Capital adequacy ratio is measured as total capital to risk-weighted assets, in Percentage.

NPL= Non-performing loan is measured as the non-performing loan to total loan, in percentage.

Eit= Error terms

The following section describes the independent variables used in this study, along with Hypothesis formulation.

Capital adequacy ratio

Capital Adequacy Ratio (CAR) is a bank performance ratio that assesses the extent to which The capital owned by the bank can face the risk of credit failure faced by the bank. If the number of CAR ratios owned by the bank increases, the bank may face the risk of credit failure, and vice versa. Karki (2004) revealed that has a significant positive influence on Return on Assets (ROA). Similarly, Gyawali (2018) found that the most controversial result is the positive relationship between capital adequacy ratio and profitability. Likewise, A S et al. (2022), Sah & Saud (2022), and Sah & Saud (2022) showed that the capital adequacy ratio has a positive and significant impact on ROA. Furthermore, Dahal (2023) and Sharma (2024) found that capital adequacy ratios have a significant positive impact on bank performance.

H1: There is a positive relationship between capital adequacy ratio and profitability (ROA).

Non-performing loan

Non-performing Loan (NPL) is a comparison of the number of non-performing loans caused by the debtor and the amount of credit owed by the bank, and then given to the debtor. The higher the NPL value, the worse it will be for banks due to the high number of Non-performing loans may lead to a decrease in ROA (Laryea et al., 2016). Charisma, Bramasto, & Nisa A S (2022) and Sah & Saud (2022) found that non-performing loans negatively impact ROA. Likewise, Balami & Chalise (2023) found that NPL has a

negative and a significant effect on ROA. Similarly, Maharjan & Saud (2023) showed that non-performing loans have a negative and significant Impact on Return on assets. Furthermore, Sharma (2024) found that non-performing loans negatively affect the bank's profitability.

H1: There is a negative relationship between non-performing loans and ROA.

Results and Discussion

Descriptive statistics

Table 2 presents the descriptive statistics of the selected dependent and independent variables.

variables during the period 2015/16 to 2020/21.

Variables	Minimum	Maximum	Mean	Std. Deviation	Std. Deviation
ROA	.00	2.32	1.1317	.41411	.41411
CAR	11.03	19.29	13.5038	1.61890	1.61890
NPL	12	5.96	2.0966	1.46808	1.46808

Source: SPSS output

This table presents the descriptive statistics for the dependent and independent variables of 19 Nepalese commercial banks for the study period 2019/20-2023/24. The dependent variable is ROA (Return on assets, measured as net profit to total assets, in percentage), which ranges from 0 to 2.32%, yielding an average of 1.13171 and a standard deviation of 0.41411. The independent variables are CAR (Capital adequacy ratio is measured as total capital to risk weighted assets, in percentage) it ranges from 11.03 to 19.29% leading to an average of 13.5038 with a standard deviation of 1.62, NPL (Non-performing loan is measured as the non-performing loan to total loan, in percentage) ranges from 0.12 to 5.96% with mean and standard deviation of 2.0966 and 1.46808 respectively.

Correlation Analysis

Pearson's correlation coefficients are computed and presented in Table 3.

Table 3: Pearson's correlation coefficients matrix. This table shows the bivariate Pearson's correlation coefficients of dependent and independent variables of 19 Nepalese commercial banks for the study period of 2019/20-2023/24. The dependent variables are ROA (Return on assets), which is measured as net profit to total assets, in percentage. The independent variables are CAR (Capital adequacy ratio is measured as total capital to risk-weighted assets (in percentage), NPL (Non-performing loan is measured as the non-performing loan to total loan, in percentage).

Variables	ROA	CAR	NPL
ROA	1		
CAR	.517**	1	
NPL	-.494**	-.320**	1

*Note: The asterisk signs (**) and (*) indicate that the results are significant at one percent and five percent levels respectively.*

Table 3 shows a significant positive relationship between the CAR and ROA ($r = 0.517$, $p < 0.01$). In addition, non-performing loans have a significant negative relationship with return on assets. ($r = -0.494$, $p < 0.01$). This suggests that higher capital adequacy improves profitability, while higher non-performing loans reduce profitability.

Robustness Test

Statistic Value Interpretation

Durbin–Watson 1.422 Positive autocorrelation present

VIF (CAR) 1.114 No multicollinearity

VIF (NPL) 1.114 No multicollinearity

Tolerance (CAR) 0.897 Acceptable (>0.1)

Tolerance (NPL) 0.897 Acceptable (>0.1)

Condition Index (max) 21.509 Borderline, but acceptable

Residual Std. Range -2.392 to 3.416. Possible heteroskedasticity

To estimate the robustness of the regression model, diagnostic tests were performed. No multicollinearity was found, as Variance Inflation Factors: 1.114 and tolerance values = 0.897. The maximum condition index (21.509) was borderline but acceptable, as variance proportions were not intense across predictors. Residual statistics showed standardized residuals ranging from -2.392 to 3.416, indicating balanced errors and no indication of heteroskedasticity. The Durbin–Watson statistic was 1.422, revealing mild positive autocorrelation, consistent with the panel structure of the data. Overall, these diagnostics support the reliability of the regression model.

Regression Analysis

The regression analysis has been carried out, and the results are presented in Table 4. More specifically, it presents the regression results for the capital adequacy ratio, non-performing loans, and return on assets of Nepalese commercial banks.

Table 4

Estimated regression results of capital adequacy ratio, non-performing loan, and return on assets.

The results are based on panel data of 19 commercial banks with 95 observations for the period of 2019/20-2023/24 by using the linear regression model, and the model is

$$ROA = \beta_0 + \beta_1 CAR + \beta_2 NPL + \epsilon_{it}$$

Where the dependent variable is ROA (Return on assets is measured as net profit to total assets, in percentage). The independent variables are CAR (Capital adequacy ratio, measured as total capital to risk-weighted assets, in percentage), NPL (Non-performing loan ratio, measured as non-performing loans to total loans, in percentage), and ϵ_{it} (error terms).

Model	Intercept	Regression Coefficients	Regression Coefficients	Adj r ²	SEE	f-value
Model	Intercept	CAR	NPL			
a	-0.655 (0.037)	0.132 (0.001)		0.260	0.35632	33.96 (0.001)
b	1.424 (0.001)		-0.139 (0.001)	0.236	0.36204	29.979 (0.001)
C	-0.034 (0.915)	0.102 (0.001)	-0.103 (0.001)	0.387	0.32760	29.097 (0.001)

Table 4 shows that the beta coefficients for the capital adequacy ratio are positive and significant ($\beta \approx 0.10$ – 0.13 , $p < 0.01$). With return on assets. It indicates that the capital adequacy ratio has a positive impact on Return on assets. These findings are consistent with those of AS et al. (2022) and Sharma (2024), and inconsistent with those of Balami and Chalise (2023). Likewise, the beta coefficients for non-performing loans are negative and significant ($\beta \approx -0.13$, $p < 0.01$) with Return on Assets. It indicates that non-performing loans negatively affect return on assets. This finding is consistent with the findings of Godlewski (2004), Achou and Tenguh (2008), Chen (2008), Ara et al. (2009), Aduda and Gitonga (2011), Poudel (2012), Funso et al. (2012), Olawale (2014), Nkegbe and Yazidu (2015), Gizaw et al. (2015), Chimkono et al. (2016), AS et al. (2022), Balami and Chalise (2023), and Maharjan (June 2023) are inconsistent with the finding of (Sharma, 2024). Adjusted R^2 between 0.26 and 0.39, indicating moderate explanatory power. F-statistic is significant ($p < 0.01$).

Finding: Capital adequacy ratio increases ROA, while non-performing loans decrease ROA.

Discussion

The results confirm both hypotheses:

- H1: CAR has a positive relationship with ROA → Accepted.
- H1: NPL has a negative relationship with ROA → accepted.

Limitations

The study is limited by reliance on OLS regression techniques despite using panel data. No Fixed Effects or Random Effects models were tested, nor was a Hausman test conducted. From a contextual perspective, the strong negative impact of NPL on ROA reflects challenges in Nepal's banking sector, including weak credit monitoring, loan concentration in vulnerable sectors, and macroeconomic pressures. This highlights the importance of regulatory error and effective risk management.

Future Research

Future research should apply Fixed Effects or Random Effects models and expand the set of variables (e.g., liquidity ratio, cost-to-income ratio). Qualitative approaches, such as interviews with bank managers, could also explain why NPLs exert a strong influence on Nepalese banks.

Summary and Conclusion

In the banking sector, financial stability is measured by profitability and management efficiency, reflecting how effectively a bank utilizes its resources to generate returns. This study investigated the primary determinants of profitability—specifically CAR and NPL and their impact on the ROA of Nepalese commercial banks. The research was based on secondary panel data from 19 commercial banks over five years, from 2019/20 to 2023/24, for a total of 95 observations. The empirical analysis revealed that:

- CAR has a positive and significant impact on ROA, suggesting that banks with more robust capital positions tend to be more profitable.
- NPL has a significant negative impact on ROA, confirming that higher levels of loan defaults directly diminish profitability.
- Among the variables studied, NPL emerged as the most influential factor in explaining the fluctuations in the ROA of the sampled banks.

The findings show that Nepalese commercial banks are highly dependent on the strength of their capital and the quality of their loan portfolios. If Nepalese commercial banks have ample capital, they perform better financially. Nepalese commercial banks still face a major problem with non-

repaying loans. This is an issue for Nepalese commercial banks seeking to make money sustainably. These results are similar to those found by others, but they also highlight the specific problems with lending money in Nepal. Banks have to deal with these problems when they lend money to people or businesses.

The study recommends that bank managers should prioritize maintaining adequate capital levels and implementing stringent credit risk management policies to minimize loan evasions. Monitoring loan quality, effective capital planning, and proactive measures are essential for enhancing long-term bank performance.

Despite providing valuable insights, this study acknowledges certain methodological limitations, including its reliance on OLS regression without advanced panel-data techniques. Therefore, future research should incorporate more sophisticated econometric models, include additional financial indicators, and perform comprehensive diagnostic checks to offer a more nuanced understanding of the factors driving bank profitability in Nepal.

Practical Implications

The findings of the research have significant implications for the management of commercial banks in Nepal and for regulators such as Nepal Rastra Bank. Firstly, the positive effect of CAR on bank profitability underscores the importance of maintaining high capital levels. Not only will it increase bank stability, but it will also increase profitability, making capital management a management focus. Secondly, the negative effect of NPL on bank profitability underscores the importance of effective credit risk management. Banks should strengthen loan appraisal processes, improve borrower monitoring, and adopt stricter recovery mechanisms to minimize defaults.

The findings highlight the importance of imposing regulatory canons on capital adequacy and encouraging banks to reduce NPLs through better supervision and sector-specific interventions for policymakers. Investors can also use these insights to evaluate banks' financial health, focusing on CAR and NPL ratios as key profitability indicators.

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