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Effect of financial risk factors on bank profitability in Nepal

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Abstract

The study examines the impact of financial risk factors on the profitability of Nepalese commercial banks. Return on assets and net interest margin are selected as the dependent variables. The selected independent variables are non-performing loan, capital adequacy ratio, loan to deposit ratio, cash reserve ratio, operating cost ratio, and exchange rate. The study is based on secondary data of 14 commercial banks with 112 observations for the period from 2014/15 to 2021/22. The data are collected from Banking and Financial Statistics published by Nepal Rastra Bank, publications and websites of Nepal Rastra Bank (NRB), and annual reports of the selected commercial banks. The correlation coefficients and regression models are estimated to test the significance and importance of financial risk factors on the profitability of Nepalese commercial banks. The study shows that non-performing loan has a negative impact on return on assets and net interest margin. It shows that an increase in non-performing loan leads to a decrease in return on assets and net interest margin. On the other hand, capital adequacy ratio has a positive impact on return on assets and net interest margin. Similarly, loan to deposit ratio has a negative impact on return on assets and net interest margin. It implies that an increase in loan to deposit ratio leads to a decrease in return on assets and net interest margin. However, cash reserve ratio has a positive impact on return on assets and net interest margin. In addition, operating cost ratio has a negative impact on return on assets and net interest margin.

Keyword: Return on assets, Net interest margin, Non-performing loan, Capital adequacy ratio, Loan to deposit ratio, Cash reserve ratio, Operating cost ratio, Exchange rate.
JEL classification: E58, G21, G32

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INTRODUCTION

The symbiotic link between lending institutions and borrowers shapes the foundation of economies in the complex world of finance. Since loan default has a substantial impact on the profitability and overall financial stability of commercial banks, it remains a major concern worldwide. Failure by borrowers to meet loan repayment obligations results in loan default, which affects commercial banks' profitability both directly and indirectly. The banking sector plays a pivotal role in the economic development of any country by providing financial intermediation and fostering economic growth. Commercial banks, as key players in this sector, facilitate the flow of funds from savers to borrowers, thereby stimulating investment and consumption. Loan failure erodes a bank's capital, increases provisioning expenses, and raises the risk of liquidity and solvency problems (Rajan & Dhar, 2020). Reducing the likelihood of loan default requires effective credit risk management. Banks benefit from effective credit assessment, risk monitoring, and early intervention measures to reduce or mitigate the impact of loan defaults on profitability (Altman & Saunders, 2015). Loan default requires higher loan loss provisions, which affect a bank's profitability and income statement. Inadequate provisioning affects not only current earnings but also capital adequacy and long-term profitability (Gande & Lewis, 2020).

Risk is defined as anything that creates hindrances to the achievement of certain objectives. Market risk refers to the risk of losses arising from movements in market prices, whereas financial risk refers to uncertainty in future financial outcomes that influence institutional profitability and targets. Financial risk represents a major risk category that severely affects the performance of financial institutions. It is often defined as the unexpected variability or volatility of returns and includes credit risk, liquidity risk, and market risk (Holton, 2004). Adeusi et al. (2014) identify six types of bank-related risks. They are credit, market, operational, liquidity, reputational, and legal risks, which affect cash flows and profitability and subsequently reduce shareholders' wealth. According to Haneef et al. (2012), bank liquidity also affects bank performance. Liquidity risk mainly originates from a weak deposit base. It also arises from the inability of banks to meet obligations from cash flow funding sources or high-quality liquid assets without disrupting normal operations, as measured by the loan-to-deposit ratio (Badawi, 2017). Kolapo and Dapo (2015) define credit risk as the possibility that a borrower or counterparty fails to meet obligations under agreed terms. Operational risk refers to losses arising from inadequate or failed internal processes, people, systems, or external

events, which generate volatility in reserves, expenses, and business value. Operational efficiency aims to ensure that banks operate optimally while serving customers. Improved efficiency allows banks to minimise costs and maximise revenues (Adam et al., 2018). Operational risk materialises directly, such as through errors in electronic fund transfers, or indirectly through credit or market losses. Given its close linkage with other risks, institutions must clearly understand operational risk before designing appropriate measurement and management frameworks (Epetimehin & Obafemi, 2015). According to Cuaca et al. (2020), the operating costs to operating income ratio (BOPO) measures a bank's operational capability.

Loan is one of the major components of the earning assets of commercial banks. However, an increase in non-performing loans reduces bank performance and efficiency (Farhan et al., 2024). Kadioglu and Ocal (2017) examine the impact of non-performing loans on bank profitability in Turkey and find a negative relationship with return on assets and return on equity. Similarly, Islam and Rana (2017) show a negative correlation between non-performing loans and bank profitability in Bangladesh. Mehta and Bhavani (2017) analyse profitability determinants of banks in the UAE and indicate that the credit-to-deposit ratio has an inverse relationship with return on assets and return on equity. Chowdhury and Zaman (2018) and Purbaningsih and Fatimah (2014) also find an inverse relationship between loan to deposit ratio and return on assets. Iloska (2014) concludes that operational expenditures and loan loss provisions have an inverse relationship with bank profitability. In contrast, Sondakh et al. (2021) show a significant positive influence on profitability. Fahrul and Rusliati (2016) analyse the effects of credit, market, operational, and liquidity risks on Indonesian banks and find that market, operational, and liquidity risks positively affect profitability. Furthermore, Olivia et al. (2022) show a partial impact of market risk on bank profitability.

Thinh et al. (2022) find that liquidity has a positive relationship with profitability, measured by return on assets and net interest margin, while loan to deposit ratio negatively affects net interest margin. Joseph and Adelegan (2023) reveal that cash reserve ratio positively affects net interest margin but negatively affects return on assets. Similarly, Khalid et al. (2019) conclude that liquidity has no significant impact on return on assets. Witjaksono and Natakusumah (2020) show that capital adequacy and operating expense to operating income ratio significantly affect profitability. Ahmed (2015) finds that foreign exchange exposure negatively affects the performance of listed commercial banks in Kenya. Vong and Chan (2009) find that loan loss provisions

negatively affect return on assets in the Macao banking industry. Bamidele et al. (2015) show that increases in monetary policy rate, exchange rate depreciation, and inflation negatively affect banking system stability in Nigeria, while increases in cash reserve requirements and banking reforms improve stability.

In the context of Nepal, Bhandari (2023) examines the effect of credit performance and interest spread on bank profitability and find a positive correlation between non-performing loans and profitability. Shrestha (2022) finds that credit to deposit ratio, capital adequacy ratio, and cash reserve ratio have insignificant effects on return on assets of joint venture banks. Pradhan and Parajuli (2017) find negative relationships between capital adequacy, cost-income ratio, liquidity ratio, and return on assets. Bhattarai (2018) shows that exchange rate significantly and negatively affects profitability. Malla and Paudel (2023) find that credit deposit ratio and cash reserve ratio have greater impacts on lending than short-term loan ratios. Chalise (2019) reveals that cost-income ratio significantly and negatively affects bank performance, while capital adequacy shows a negative but insignificant effect. Shrestha (2022) further shows that loan to deposit ratio positively affects profitability, while non-performing loans and loan loss provisions negatively affect profitability.

A review of theoretical and empirical studies indicates inconsistent findings across the literature. Most studies employ time series or cross-sectional data and apply conventional fixed or random effects models. The results reveal both positive and negative relationships between dependent and independent variables, influenced by varying institutional and macroeconomic contexts. Many banking studies focus on developed or large emerging economies, creating a gap in understanding the dynamics of financial risk factors in Nepal's unique economic, regulatory, and cultural setting. Data availability also poses challenges, particularly access to granular bank-level data. Addressing these gaps contributes to the literature on Nepalese banking and provides valuable insights for policymakers, regulators, and practitioners.

This study addresses these gaps through a holistic examination of non-performing loans, capital adequacy ratio, loan to deposit ratio, cash reserve ratio, operating cost ratio, and exchange rate, which show strong historical associations with return on assets and net interest margin in emerging economies. The analysis identifies the key drivers of profitability across Nepalese commercial banks and provides evidence to support balanced policy and regulatory decisions.

The objective of the study is to examine the impact of financial risk factors on the profitability of Nepalese commercial banks. Profitability, measured by return on assets and net interest margin, reflects a bank's financial health, stability, and efficiency. The selected independent variables represent key dimensions of credit risk, capital structure, liquidity management, cost efficiency, and external economic conditions, enabling a comprehensive analysis of banking profitability.

The remainder of the study is organised as follows. Section two describes the sample, data, and methodology. Section three presents the empirical results, and the final section draws the conclusion.

RESEARCH METHODOLOGY

The study is based on the secondary data which were gathered from 14 commercial banks for the study period from 2014/15 to 2021/22, leading to a total of 112 observations.

Table 1: Data

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

S.N.	Name of the banks	Study period	Observations
Public Banks			
1	Nepal Bank Limited	2014/15 - 2021/22	8
2	Agricultural Development Bank Limited	2014/15 - 2021/22	8
3	Rastriya Banijya Bank Limited	2014/15 - 2021/22	8
Joint Venture Banks			
4	NMB Bank Limited	2014/15 - 2021/22	8
5	Everest Bank Limited	2014/15 - 2021/22	8
6	Standard Chartered Bank Nepal Limited	2014/15 - 2021/22	8
Private Banks			
7	NIC Asia Bank Limited	2014/15 - 2021/22	8
8	Himalayan Bank Limited	2014/15 - 2021/22	8
9	Prime Commercial Bank Limited	2014/15 – 2021/22	8
10	Siddhartha Bank Limited	2014/15 – 2021/22	8
11	Nepal SBI Bank Limited	2014/15 - 2021/22	8
12	Sanima Bank Limited	2014/15 - 2021/22	8
13	Citizens Bank International Limited	2014/15 - 2021/22	8
14	Machhapuchchhre Bank Limited	2014/15 - 2021/22	8
Total number of observations			112

The study employed convenience sampling method. The recently merged banks were not considered in the study. The main sources of data include

Banking and Financial Statistics published by Nepal Rastra Bank, reports published by Ministry of Finance and the annual report of respective banks. This study is based on descriptive as well as correlational research designs. Table 1 shows the list of commercial banks selected for the study along with the study period and number of observations. Thus, the study is based on 112 observations.

Econometric Model

The econometric models employed in this study analyses the financial risk factors on profitability of Nepalese commercial banks using the panel data. The following linear regression model is used in this study to examine the impacts of financial risk factors on profitability of Nepalese commercial banks. Thus, the following model equation is designed to test the hypothesis. From the conceptual framework the function of dependent variables (i.e. the profitability) takes the following form:

$$ROA = f(NPL, CAR, LDR, CRR, BOPO, EXR)$$

$$NIM = f(NPL, CAR, LDR, CRR, BOPO, EXR)$$

More specifically, the given model has been segmented into the following models:

$$ROA_{it} = \beta_0 + \beta_1 NPL_{it} + \beta_2 CAR_{it} + \beta_3 LDR_{it} + \beta_4 CRR_{it} + \beta_5 BOPO_{it} + \beta_6 EXR_{it} + \varepsilon_{it} \quad (1)$$

$$NIM_{it} = \beta_0 + \beta_1 NPL_{it} + \beta_2 CAR_{it} + \beta_3 LDR_{it} + \beta_4 CRR_{it} + \beta_5 BOPO_{it} + \beta_6 EXR_{it} + \varepsilon_{it} \quad (2)$$

Where,

i represents the individual bank (cross-sectional unit).

t represents the time period.

ROA = Return on assets as measured by the ratio of net income to total assets, in percentage.

NIM = Net interest margin as measured by the ratio of net interest income to total assets, in percentage.

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

CAR = Capital adequacy ratio as measured by the ratio of total capital to total risk weighted exposure, in percentage.

LDR = Loan to deposit ratio as measured by total loan to total deposit, in percentage.

CRR = Cash reserve ratio as measured by the ratio of cash balance with NRB to total deposits, in percentage.

$BOPO$ = Operating cost ratio as measured by operating expenses to operating

income.
EXR = Exchange rate is measured by the rate of last day of each reporting fiscal year, in NRS/USD.
β_0 = intercept term.
β_1, β_2, β_3, ..., β_6 = Coefficients measuring the impact of each independent variable.
ε_{it} = Error term capturing the unobserved variables

Explanation of Variables

The following section describes the independent variables used in this study along with the hypothesis formulation:

Non-performing loan

Marshal and Onyekachi (2014) find a positive relationship between the ratio of non-performing loans to loans and advances (LogNPL) and bank performance measured by return on assets (LogROA). In contrast, Inggawati et al. (2018) reveal that non-performing loans have a significant negative impact on profitability. Similarly, Collaku and Aliu (2021) show a significant negative relationship between non-performing loans and profitability as measured by return on assets. Dewi and Badjra (2020) also reveal that non-performing loans are negatively related to profitability. Further, Hersugondo et al. (2021) conclude that non-performing assets, as a whole, have a negative effect on bank performance. In addition, Anggriani and Muniarty (2020) state that banks should lower the level of non-performing loans to increase return on assets, suggesting a negative relationship between non-performing loans and profitability. Moreover, Uddin (2022) reveals that non-performing loans have a negative but insignificant impact on profitability. Based on these findings, this study develops the following hypothesis:

H_1: There is a negative relationship between non-performing loan and bank profitability.

Capital adequacy ratio

Nguyen (2020) shows that capital adequacy has a positive impact on return on assets of small-sized banks in Vietnam. Jadhav et al. (2021) find that the capital adequacy ratio has a positive impact on profitability. Similarly, Iftikhar (2016) finds that the capital adequacy ratio has a positive and significant impact on financial performance. Ebenezer et al. (2017) also state that capital

adequacy ratio has a positive and significant effect on bank profitability. In addition, Arseto et al. (2022) reveal that capital adequacy ratio positively affects profitability. Singh and Milan (2023) find that capital adequacy is positively related to bank performance but inversely related to interest margin income. Further, Saniç and Yüncü (2021) conclude that capital adequacy ratio and net interest margin have a positive relationship. Based on these findings, this study develops the following hypothesis:

H_2: There is a positive relationship between capital adequacy ratio and bank profitability.

Loan to deposit ratio

Astuti et al. (2023) find that the loan to deposit ratio has a significant positive effect on return on assets. However, Mohanty and Krishnankutty (2018) show that return on assets has a negative and significant relationship with the loan to deposit ratio. In contrast, Steven and Toni (2020) find that the loan to deposit ratio has a positive relationship with profitability. In addition, Nugraha et al. (2021) state that the loan to deposit ratio has a significant positive effect on return on assets. Similarly, Gurung and Gurung (2022) reveal that the loan to deposit ratio, also known as the credit deposit ratio, has a significant positive impact on both return on assets and net interest margin of commercial banks. Kalimashi et al. (2022) find that the loan to deposit ratio has a positive impact on return on assets but a negative impact on net interest margin. Based on these findings, this study develops the following hypothesis:

H_3: There is a positive relationship between loan to deposit ratio and bank profitability.

Cash reserve ratio

Akinleye and Oluwadare (2022) reveal that the cash reserve ratio exerts a negative and significant effect on return on assets. Similarly, Mia et al. (2023) find that the cash reserve ratio has a negative relationship with return on assets. However, Joseph and Adelegan (2023) show that the cash reserve ratio has a positive relationship with net interest margin. In addition, Olagunju and Isiaka (2021) conclude that cash reserve requirements have an inverse and significant relationship with bank profitability. Based on these findings, this study develops the following hypothesis:

H_4: There is a negative relationship between cash reserve ratio and bank profitability.

BOPO ratio

Wahyuni (2023) shows that the BOPO ratio has a significant effect on return on assets at BPRS Amanah Rabbaniah Banjaran. In addition, Murtiningsih and Tohirin (2023) conclude that operating income and operating costs have a significant influence on return on assets in both the short and long run. Kusumastuti and Alam (2019) find a negative and significant relationship between the cost-to-income ratio (BOPO) and return on assets. Similarly, Sitompul and Nasution (2019) conclude that operational costs relative to operational income have a significant negative effect on return on assets. In addition, Hasmiana and Pintor (2022) show that the BOPO ratio has a negative relationship with profitability. Moreover, Farooq et al. (2021) find that BOPO has a negative association with both return on assets and net interest margin. Based on these findings, this study develops the following hypothesis:

H_5: There is a negative relationship between operating cost ratio and bank profitability.

Exchange rate

Onyancha and Muturi (2023) conclude that the exchange rate affects the financial performance of commercial banks. Similarly, Njagi and Nzai (2022) find that exchange rate volatility has a negative and significant effect on bank performance. Elhussein and Osman (2019) document that foreign exchange rate fluctuations have a weak negative effect on the financial performance of Sudanese banks. Moreover, Ibekwe (2021) concludes that exchange rate fluctuations have a negative but insignificant effect on return on assets. Based on these findings, this study develops the following hypothesis:

H_6: There is a negative relationship between exchange rate and bank profitability.

RESULTS AND DISCUSSION

Descriptive Statistics

Table 2 presents the descriptive statistics of selected dependent and independent variables during the period 2014/15 to 2021/22.

Table 2: Descriptive statistics

Table 2 shows the descriptive statistics of dependent and independent variables of 14 Nepalese commercial banks for the study period of 2014/15 to 2021/22. The dependent variables are ROA and NIM. The independent variables are NPL, CAR, LDR, CRR, BOPO and EXR.

Variables	Minimum	Maximum	Mean	Std. Deviation
ROA	0.55	3.22	1.63	0.50
NIM	1.871	5.67	3.16	0.721
NPL	0.01	5.35	1.381	1.331
CAR	7.49	22.99	13.951	2.511
LDR	48.92	107.01	83.921	9.581
CRR	2.01	24.27	8.33	4.71
BOPO	20.35	78.251	41.14	8.82
EXR	100.16	121.731	111.08	7.17

The descriptive analysis table shows that Return on Assets (ROA) ranges from 0.550 to 3.220, with an average of 1.630 and a standard deviation of 0.500, indicating moderate variability. Net Interest Margin (NIM) has a mean of 3.160 and fluctuates between 1.871 and 5.670, with a standard deviation of 0.721. Non-Performing Loans (NPL) exhibit high variability, ranging from 0.010 to 5.350, with an average of 1.381 and a standard deviation of 1.331. Capital Adequacy Ratio (CAR) varies between 7.490 and 22.990, with a mean of 13.951 and a relatively low dispersion of 2.511. Loan to Deposit Ratio (LDR) has a mean of 83.921, ranging from 48.920 to 107.010, with a standard deviation of 9.581, indicating moderate variation. Cash Reserve Ratio (CRR) shows high variability, with a mean of 8.330 and a standard deviation of 4.710, ranging from 2.010 to 24.270. Operating Cost Ratio (OCR) varies significantly from 20.350 to 78.251, with an average of 41.140 and a standard deviation of 8.820. Furthermore, the Exchange Rate (ER) has a mean of 111.080, fluctuating between 100.160 and 121.731, with a standard deviation of 7.170, showing moderate dispersion. The results highlight variations in financial performance indicators, risk management measures, and cost structures among Nepalese commercial banks.

Correlation Analysis

Having indicated the descriptive statistics, Pearson's correlation coefficients are computed and the results are presented in Table 3.

Table 3 shows that non-performing loan has a negative relationship with return on assets. It indicates that increase in non-performing loan leads to

Table 3: Pearson's correlation coefficients matrix

Table 3 shows the bivariate Pearson's correlation coefficient matrix of dependent and independent variables of 14 Nepalese commercial banks for the study period from 2014/15 to 2021/22. The dependent variables are ROA and NIM. The independent variables are NPL, CAR, LDR, CRR, BOPO, and EXR.

Variable	ROA	NIM	NPL	CAR	LDR	CRR	BOPO	EXR
ROA	1							
NIM	0.648**	1						
NPL	-0.287**	-0.569**	1					
CAR	0.256**	0.242*	-0.037	1				
LDR	-0.190*	-0.029	-0.137	0.09	1			
CRR	0.314**	0.041	-0.065	0.021	-0.566**	1		
BOPO	-0.272**	-0.129	0.379**	-0.096	0.078	-0.134	1	
EXR	-0.448**	-0.281**	-0.118	0.202*	0.381**	-0.466**	0.194*	1

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

decrease in return on assets. Similarly, capital adequacy ratio has a positive relationship with return on assets. It indicates that increase in capital adequacy ratio leads to increase in return on assets. In contrast, loan to deposit ratio has a negative relationship with return on assets. It indicates that increase in loan to deposit ratio leads to decrease in return on assets. Furthermore, there is a positive relationship between cash reserve ratio and return on assets. It indicates that increase in cash reserve ratio leads to increase in return on assets. Further, there is a negative relationship between operating cost ratio and return on assets. It indicates that increase in operating cost ratio leads to decrease in return on assets. Moreover, exchange rate has a negative relationship with return on assets. It indicates that higher the exchange rate, lower would be the return on assets.

Similarly, non-performing loan has a negative relationship with net interest margin. It indicates that increase in non-performing loan leads to decrease in net interest margin. Similarly, capital adequacy ratio has a positive relationship with net interest margin. It indicates that increase in capital adequacy ratio leads to increase in net interest margin. In contrast, loan to deposit ratio has a negative relationship with net interest margin. It indicates that increase in loan to deposit ratio leads to decrease in net interest margin. Furthermore, there is a positive relationship between cash reserve ratio and net interest margin. It indicates that increase in cash reserve ratio leads to increase in net interest margin. Further, there is a negative relationship between operating cost ratio and net interest margin. It indicates that increase in operating cost

ratio leads to decrease in net interest margin. Similarly, exchange rate has a negative relationship with net interest margin. It indicates that higher the exchange rate, lower would be the net interest margin.

Heteroskedasticity Test: Arch

Table 4 shows the Engle ARCH Test of heteroskedasticity to check whether the variance of the errors (residuals) is constant across all levels of the independent variables.

Table 4: Engle ARCH Test of heteroskedasticity

F-statistic	1.400887	Prob. F (1,109)		0.2391
Obs*R-squared	1.408489	Prob. ChiSquare (1)		0.2353
Test Equation: Dependent variable: $RESID^2$ Method: Least Squares				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.11194	0.025245	4.434221	0.0000
$RESID^2$(-1)	0.111694	0.094369	1.183591	0.2391
R-squared	0.012689	Mean dependent var.		0.12655
Adjusted R-squared	0.003631	S. D. dependent var.		0.232427
S. E. of regression	0.232004	Akaike info criterion		- 0.066269
Sum squared resid.	5.56703	Schwarz criterion		- 0.017448
Log likelihood	5.677905	Hannan-Quinn criterion		- 0.046464
F-statistic	1.400887	Durbin-Watson stat.		1.914881
Prob (F-statistic)	0.23915			

The residuals are analysed Using Engle ARCH Test of heteroskedasticity. Since the $p-$value is 0.2353 which is greater than 0.05 level of significance. Therefore, the residuals are homoscedastic. It implies that their variance is constant across all levels of the independent variables.

Autocorrelation Test

Table 5 shows the Breusch-Godfrey Serial Correlation LM Test which is conducted to check for autocorrelation in a regression model. Autocorrelation occurs when the errors of a regression model are correlated with each other. In other words, it means that there is a systematic pattern in the residuals of the regression model.

Table 5 shows that the p-value is 0.8943 is greater than 0.05, therefore there is no presence of autocorrelation. The result implies that there is no

Table 5: Breusch-Godfrey Serial Correlation LM Test

F-statistic	0.102932	Prob. F (1,103)		0.9023
Obs*R-squared	0.223405	Prob. ChiSquare (2)		0.8943
Dependent variable: RESID				
Method: Least Squares				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.00318	0.766702	-0.004147	0.9967
NPL	-4.25E-05	0.030506	-0.001392	0.9989
CAR	0.000536	0.015051	0.0356	0.9717
LDR	-0.000195	0.004727	-0.041184	0.9672
CRR	-0.000672	0.010201	-0.065893	0.9476
BOPO	6.49E-05	0.004605	0.014083	0.9898
EXR	0.000135	0.006108	0.022136	0.9824
RESID(-1)	-0.006031	0.100819	-0.059815	0.9524
RESID(-2)	-0.045275	0.100467	-0.450644	0.6532
R-squared	0.001995	Mean dependent var.		1.48E-15
Adjusted R-squared	-0.07552	S. D. dependent var.		0.361673
S. E. of regression	0.375081	Akaike info criterion		0.953594
Sum squared resid.	14.49063	Schwarz criterion		1.172045
Log likelihood	-44.40129	Hannan-Quinn criterion		1.042227
F-statistic	0.025733	Durbin-Watson stat.		1.962884
Prob (F-statistic)	0.999995			

significant evidence to suggest the presence of autocorrelation in the residuals of the regression model.

Multicollinearity Test

The Variance Inflation Factor (VIF) is a measure used to assess multicollinearity in regression analysis. Multicollinearity occurs when independent variables in a regression model are highly correlated with each other. When multicollinearity is present, it can lead to inflated standard errors of regression coefficients, making the estimates unreliable. VIF helps to detect the extent of multicollinearity in a regression model. Table 6 shows the Variance Inflation Factor analysis.

Table 6 shows the multicollinearity test using Variance Inflation Factor. The factor is less than 10 which indicates that there is no multicollinearity in the selected variables. With low multicollinearity, the coefficients estimated for each independent variable tend to be more reliable. This means that the estimates are more stable and less sensitive to changes in the dataset. Models with low multicollinearity tend to have better prediction accuracy. Since the coefficients are more stable, the model can provide more accurate

Table 6: Variance Inflation Factor

Variable	Coefficient variance	Uncentered VIF	Centered VIF
C	0.576047	466.5638	-
NPL	0.000914	2.715483	1.303003
CAR	0.000217	35.35602	1.098135
LDR	2.16E-05	124.6254	1.588476
CRR	0.0001	7.401412	1.776787
BOPO	2.07E-05	29.60595	1.289725
EXR	3.65E-05	366.1618	1.506002

predictions for new observations or data points. In essence, the absence of multicollinearity in the table enhances the reliability, interpretability, and predictive performance of regression models, making them more valuable for decision-making and analysis.

Normality Test

Normality of residuals is crucial for valid statistical inference. Confidence intervals and hypothesis tests rely on the assumption of normality to produce accurate results. If the residuals are not normally distributed, these statistical measures may be unreliable. Figure I shows the normality test. As the value

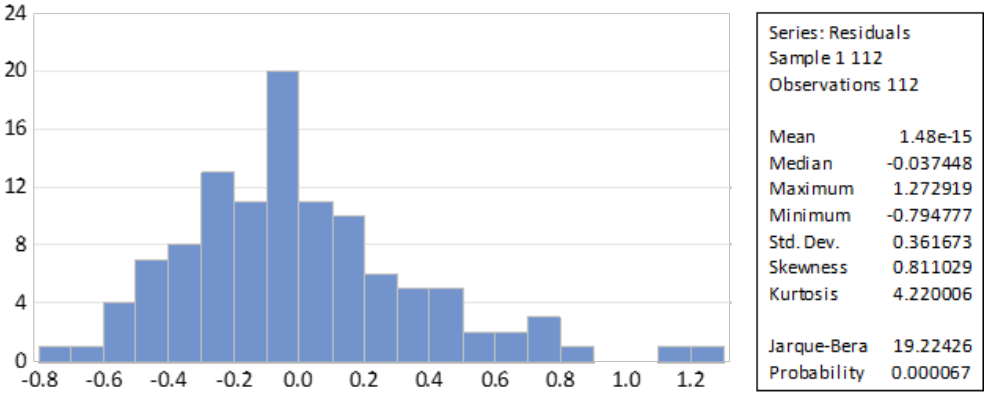

Figure 1: Normality test using Jarque-Bera coefficients

of the Jarque Bera is 19.22 and probability is 0.000067 which higher than 5 percent level of significance, therefore the residuals are normally distributed.

Regression Analysis

Having indicated Pearson's correlation coefficients, the regression analysis has been carried out and the results are presented in Table VII. More specifically, it shows the regression results of non-performing loan, capital adequacy ratio, loan to deposit ratio, cash reserve ratio, operating cost ratio and exchange rate on return on assets of Nepalese commercial banks.

Table 7 shows that the beta coefficients for non- performing loan are negative with return on assets. It indicates that non-performing loan has a negative impact on return on assets. This finding is not consistent with the findings of Wahyuni and Umam (2023). Similarly, the beta coefficients for capital adequacy ratio are positive with return on assets. It indicates that capital adequacy ratio has a positive impact on return on assets. This finding is similar to the findings of Tibebe and Gujral (2022). In contrast, the beta coefficient for loan to deposit ratio are negative with return on assets. It indicates that loan to deposit ratio has a negative impact on return on assets. This finding is similar to the findings of Mondol and Wadud (2022). Moreover, the beta coefficients for cash reserve ratio are positive with return on assets. It indicates that cash reserve ratio has a positive impact on return on assets. This finding is similar to the findings of Uremadu (2012).

Table 7: Regression results of Eq. (1)

The results are based on panel data of 14 commercial banks with 112 observations for the period from 2014/15 to 2021/22 by using the linear regression model and the model is $ROA = \beta_0 + \beta_1 NPL + \beta_2 CAR + \beta_3 LDR + \beta_4 CRR + \beta_5 BOPO + \beta_6 EXR + \varepsilon_{it}$ *where, the dependent variable is ROA. The independent variables are NPL, CAR, LDR, CRR, BOPO and EXR.*

Model	Intercept	Regression coefficients of						Adj. $\bar{R}^2$	SEE	F-value
		NPL	CAR	LDR	CRR	BOPO	EXR			
1	1.482	-0.107						0.074	0.479	9.911
	(22.68)**	(3.148)**								
2	0.922		0.051					0.057	0.483	7.707
	(3.554)**		(2.776)**							
3	2.459			-0.010				0.027	0.491	4.105
	(5.978)**			(2.026)*						
4	1.353				0.033			0.029	0.475	12.044
	(14.770)**				(3.470)**					
5	2.264					-0.015		0.074	0.481	8.810
	(10.382)**					(2.968)**				
6	5.087						-0.031	0.193	0.447	27.589
	(7.715)**						(5.253)**			
7	0.738	-0.111	0.053					0.138	0.462	9.899
	(2.908)**	(3.371)**	(3.025)**							
8	1.484	-0.102	0.056	-0.009				0.162	0.456	8.143
	(3.325)**	(3.117)**	(3.230)**	(2.018)*						
9	0.332	-0.121	0.051	-0.001	0.036			0.234	0.435	9.499
	(-0.606)	(3.868)**	(3.792)**	(-0.252)	(3.354)**					
10	1.081	-0.178	0.044	-0.004	0.035	-0.022		0.361	0.398	13.563
	(2.062)*	(5.648)**	(2.887)**	(-0.752)	(3.501)**	(4.719)**				
11	3.463	-0.151	0.059	-0.005	0.021	-0.018	-0.025	0.443	0.371	15.708
	(4.572)**	(4.947)**	(4.027)**	(-1.137)	(-1.962)	(3.851)**	(4.063)**			

Notes:

i. Figures in parentheses are t-statistics.

ii. The asterisk signs (**) and (*) indicate that the results are significant at one percent and five percent level respectively.

iii. Return on assets is dependent variable.

Similarly, the beta coefficients for BOPO ratio are negative with return on assets. It indicates that BOPO ratio has a negative impact on return on assets. This finding is consistent with the findings of Hasmiana and Pintor (2022). Moreover, the beta coefficients for exchange rate are negative with return on assets. It indicates that exchange rate has a negative impact on return on assets. This finding is similar to the findings of Njagi and Nzai (2022).

Estimated regression results of non-performing loan, capital adequacy ratio, loan to deposit ratio, cash reserve ratio, operating cost ratio and exchange rate on net interest margin of Nepalese commercial banks are presented in Table 8.

Table 8 shows that the beta coefficients for non-performing loan are negative with net interest margin. It indicates that non-performing loan has a negative impact on net interest margin. This finding is not consistent with the findings of Ardelia and Lubis (2023). Similarly, the beta coefficients for capital adequacy ratio are positive with net interest margin. It indicates that capital adequacy ratio has a positive impact on net interest margin. This finding is similar to the findings of Sarakiri (2023). In contrast, the beta coefficient for loan to deposit ratio are negative but insignificant with net interest margin. This finding is similar to the findings of Thinh et al. (2022). Moreover, the beta coefficients for cash reserve ratio are positive but insignificant with net interest margin. This finding is similar to the findings of Joseph and Adelegan (2023). Similarly, the beta coefficients for BOPO ratio are negative with net interest margin. It indicates that BOPO ratio has a negative impact on net interest margin. This finding is not consistent with the findings of Hasmiana and Pintor (2022). Moreover, the beta coefficients for exchange rate are negative with net interest margin. It indicates that exchange rate has a negative impact on net interest margin. This finding is similar to the findings of Njagi and Nzai (2022).

Table 8: Regression results of Eq. (2)

The results are based on panel data of 14 commercial banks with 112 observations for the period from 2014/15 to 2021/22 by using the linear regression model and the model is $NIM = \beta_0 + \beta_1 NPL + \beta_2 CAR + \beta_3 LDR + \beta_4 CRR + \beta_5 BOPO + \beta_6 EXR + \varepsilon_{it}$ *where, the dependent variable is ROA. The independent variables are NPL, CAR, LDR, CRR, BOPO and EXR.*

Model	Intercept	Regression coefficients of						Adj. $\bar{R}^2$	SEE	F-value
		NPL	CAR	LDR	CRR	BOPO	EXR			
1	2.73	-0.309						0.318	0.597	52.797
	(33.503)**	(7.266)**								
2	2.182		0.076					0.053	0.704	6.854
	(5.774)**		(2.618)**							
3	3.342			-0.002				0.008	0.726	0.094
	(5.497)**			-0.307						
4	3.104				0.006			0.007	0.726	0.183
	(22.172)**				-0.428					
5	2.723					-0.011		0.008	0.72	1.847
	(8.347)**					-1.359				
6	6.305						-0.028	0.071	0.697	9.429
	(6.137)**						(3.071)**			
7	1.663	-0.314	0.071					0.382	0.568	35.371
	(5.33)**	(7.759)**	(3.528)**							
8	1.499	-0.316	0.075	-0.002				0.377	0.57	23.434
	(2.684)**	(7.705)**	(3.471)**	-0.354						
9	0.844	-0.327	0.073	-0.008	0.021			0.384	0.567	18.297
	-1.184	(7.883)**	(3.351)**	-1.145	-1.464					
10	1.064	-0.344	0.07	-0.009	0.02	-0.007		0.384	0.567	14.818
	-1.421	(7.647)**	(3.237)**	-1.238	-1.427	-0.97				
11	4.314	-0.304	0.092	-0.011	-0.001	-0.001	-0.034	0.457	0.533	16.566
	(3.965)**	(7.025)**	(4.334)**	-1.636	-0.047	-0.146	(3.910)**			

Notes:

i. Figures in parentheses are t-statistics.

ii. The asterisk signs (**) and (*) indicate that the results are significant at one percent and five percent level respectively.

iii. Net interest margin is dependent variable.

SUMMARY AND CONCLUSION

This study attempts to examine the impact of financial risk factors on the profitability of Nepalese commercial bank. The study is based on secondary data of 14 commercial banks for the study period from 2014/15 to 2021/22, leading to a total of 112 observations.

The major conclusion of this study is that capital adequacy ratio and cash reserve ratio have positive impact on return on assets and net interest margin. It indicates that banks with higher CAR and CRR tend to have higher return on assets and net interest margin, indicating better financial performance and profitability. However, non-performing loan, loan to deposit ratio, operating expenses to operating income and exchange rate have negative impact on return on assets and net interest margin. It indicates that high levels of NPLs indicate that a significant portion of loans are not being repaid, which can strain a bank's resources and decrease profitability. Moreover, the study also concludes that banks are lending out a large portion of its deposits, which can increase risk and reduce profitability, especially if the loans are not generating sufficient returns.

Limitation and Scope for Future Research

The study has used secondary data from published sources to study the variables of the impact of financial risk factors on profitability of Nepalese commercial banks. Further studies can be extended using primary data to see the bank employees, customer, bank management perception towards the impact of financial risk factors on profitability of Nepalese commercial banks. This study has applied linear regression model. Further, the study can be done by using some advanced statistical tools such as non-linear statistical tools and bidirectional causality tools.

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