

The Effects of Liquidity Risk and Credit Risk on Bank Stability in Nepalese Commercial Banks

Lelina Pokhrel*

Abstract

This study examines the effects of liquidity risk and credit risk on the stability of Nepalese commercial banks. Return on assets and Altman Z-score are the selected dependent variables. The selected independent variables are non-performing loan, capital adequacy ratio, bank size, loan-to-deposit ratio, debt-to-equity ratio, interest rate spread and loan loss provision. The study is based on secondary data of 12 commercial banks with 120 observations for the study period from 2014/15 to 2023/24. The data were collected from Bank Supervision Report published by 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 liquidity risk and credit risk on the stability of Nepalese commercial banks.

The study showed that non-performing loan has a negative impact on Z-score and return on assets. It implies that increase in nonperforming loan leads to decrease in Z-score and return on assets. In addition, capital adequacy ratio has a positive impact on Z-score and return on assets. It implies that increase in capital adequacy ratio leads to increase in Z-score and return on assets. However, bank size has a negative impact on Z-score and return on assets. It shows that increase in bank size leads to decrease in Z-score and return on assets. Likewise, loan to deposit ratio has a negative impact on Z-score and return on assets. It implies that increase in loan to deposit ratio leads to decrease in Z-score and return on assets. Similarly, debt to equity ratio has a negative impact on Z-score and return on assets. It implies that increase in debt-to-equity ratio leads to decrease in Z-score and return on assets. In addition, interest rate spread has a positive impact on Z-score and return on assets. It implies that increase in interest rate spread leads to increase in Z-score and return on assets. However, loan loss provision has a negative impact on Z-score and return on assets. It shows that increase in loan loss provision leads to decrease in Z-score and return on assets.

Keywords: non-performing loan, capital adequacy ratio, bank size, loan-to-deposit ratio, debt-to-equity ratio, interest rate spread, loan loss provision, return on assets, Altman Z-score

1. Introduction

Bank stability in the context of commercial banks is a multifaceted concept that plays a crucial role in the financial system by ensuring the effective functioning of the economy and supporting various sectors, including businesses, households, and investors. It is defined as a bank's ability to consistently meet its obligations, maintain profitability, and withstand external and internal environmental factors, thereby ensuring its effective functioning in a competitive environment. The stability of commercial banks is essential for the overall stability of the financial system, as banks are key players in financing the economy, transmitting monetary policy, and facilitating monetary settlements (Paduszynska and Lesiak, 2022). Commercial banks are the cornerstone of modern financial systems, serving as the primary institutions where individuals and businesses deposit funds, access credit, and manage transactions. Their stability is a linchpin for economic health, given their role in facilitating money flow, providing loans, and maintaining public trust in the financial infrastructure. Liquidity risk in commercial banks is influenced by a variety of factors, both bank-specific and macroeconomic. Bank-specific factors include bank size, leverage, and capitalization, which have been shown to impact liquidity risk differently across regions. Macroeconomic factors such as GDP and inflation also play significant roles (Antony, 2023).

Liquidity and credit risks significantly influence a bank's solvency, profitability, and long-term stability (Kamran *et al.*, 2023). Effective credit management, including proactive

* Ms. Pokhrel is a Freelance Researcher, Kathmandu, Nepal.

credit restructuring and stringent monitoring systems, is crucial for reducing NPL risks and stabilizing banks (Wijoyo and Apriyani, 2024). Supiyadi (2021) examined the factors influencing the financial performance and stability of Islamic banks in Indonesia between 2010 and 2017. The study revealed that capital adequacy, bank size, assets quality, management efficiency and GDP had a significant negative impact, while liquidity position, financial stability measured by Z-score and inflation has a significant positive impact on the profitability of Islamic banks in Indonesia. Nkusu (2011) studied that the increase in non-performing loans (NPLs) can cause negative spiral, affecting microeconomic dynamics and further reducing banking system. Olawale (2024) analyzed the relationship between capital adequacy and financial stability in Nigerian banks within a volatile economic environment. This study showed that capital adequacy ratio and firm size positively influence bank stability, while non-performing loan negatively impacted bank stability. Obamuyi (2013) examined the impact of bank capital, bank size, expense management, interest income, and economic condition on banks profitability in Nigeria as measured by return on assets (ROA). The result showed that capital, interest income, expenses management and favorable economics have positive impact on profitability, but bank size has negative significant relationship. Tahir *et al.* (2014) found a negative relationship between loan loss provision (LLP) and bank profitability in Pakistan. The result showed that higher provisions decrease financial stability. Because banks are deeply interconnected, lending to one another and holding mutual financial obligations, their stability directly influences the resilience of the broader financial system, affecting everything from stock markets to everyday commerce.

Katuka *et al.* (2023) highlighted that nonperforming loan (NPLs) negatively affected bank stability and economic performance, reducing lending capacity and contributing to lower economic growth. Similarly, Chukwu *et al.* (2024) found negative relationship between nonperforming loan and bank stability. The results showed that credit and liquidity risk negatively impacted bank stability, while higher capital adequacy ratios positively contributed to bank stability by providing a buffer against risks. Jalloh (2024) demonstrated a positive relationship between capital adequacy and bank profitability, with higher capital buffers improving profitability and financial stability in Sierra Leonean banks. Olawale (2024) found that higher capital adequacy ratios significantly contributed to the stability of Nigerian banks. Danisman and Tarazi (2024) identified that larger banks with strong capital and liquidity were more resilient to economic policy uncertainty. Smaller banks were more vulnerable to instability in uncertain conditions. Ali and Puah (2018) found that larger banks exhibited greater stability, but higher funding risk negatively impacted stability by increasing vulnerability to liquidity pressures. Hodula and Poloucek (2017) found that high LDRs can lead to liquidity problems, but macroprudential policies, such as managing LDR, are vital to maintaining financial stability and preventing instability. Adenuga *et al.* (2021) identified that higher LDR reduces liquidity in banks, with excessive LDR leading to liquidity risk. Effective LDR management is crucial for maintaining liquidity and stability. Arif *et al.* (2024) found that there is positive impact of loan to deposit ratio (LDR) on return on assets. Utama *et al.* (2023) showed that debt equity ratio and times interest earned ratio significantly affected profitability (ROA) and, in turn, share prices. A higher debt equity ratio enhanced profitability, while the times interest earned ratio was essential for maintaining financial stability.

Sukma *et al.* (2022) found that higher debt ratio negatively impacted profitability, indicating that high leverage harms financial performance. The long-term debt-to-equity ratio positively influenced profitability, while firm size showed a positive relationship with profitability, implying larger firms are more efficient in generating returns. Lusy *et al.* (2018) assessed the effect of the current ratio and debt to equity ratio on return on assets and return on equity in firms from 2014-2017. Through multiple regressions with SPSS 24, the study found

that both CR and DER had a significant effect on ROA and ROE. However, the current ratio, indicative of better liquidity, is positively related to both ROA and ROE, concluding that the firms with strong liquidity are more capable of generating returns efficiently. Kang *et al.* (2024) found that interest rate liberalization increases deposit competitiveness, which in turn raises banking system stability. Lopez-Penabad *et al.* (2022) examined the effects of negative interest rate policies on bank profitability and risk-taking behaviors in 2596 banks from 29 European countries for the period of 2011 to 2012. The results showed that negative interest rates compressed net interest margins and reduced bank profitability. The study also found that, in response to such pressures on profits, banks increased their risk-taking activities, possibly destabilizing the banking sector. Owusu-Antwi *et al.* (2017) found that there is significant positive relationship between interest rate spread and profitability. Ahmad *et al.* (2021) found that loan loss provision (LLP) significantly impact bank profitability due to provisioning expenses, emphasizing the need to balance financial stability with profitability. Mala (2024) identified that higher LLP are more stable but less competitive, indicating the need to balance provisioning with competitiveness in the banking sector. Ul Mustafa *et al.* (2021) found that loan loss provisions negatively affect return on assets. Nugroho *et al.* (2021) found that loan loss provision and non-performing loans (NPLs) negatively impact capital adequacy ratio, while third-party funds positively affect CAR, enhancing capital reserves.

In the Nepalese context, Gwachha (2023) revealed a significant impact of liquidity and credit risks on bank stability in Nepal, emphasizing the need for effective risk management practices to ensure a stable banking sector. Liquidity risk negatively affects stock returns, indicating financial instability, while credit risk, although not directly impacting stock returns, remains a critical concern for maintaining bank stability (Dhakal *et al.*, 2024). Niroula and Gnawali (2024) found that bank size and non-performing loans negatively affect liquidity, highlighting the need for banks to address these internal factors to maintain stability. Corporate governance factors, such as board size and the presence of independent directors, affect liquidity risk by influencing cash reserve and credit to deposit ratios (Khadka *et al.*, 2024). Bhattarai (2020) examined the impact of credit risk on the profitability of Nepalese commercial banks. The findings revealed that there was a significant negative relationship between high levels of NPLs and bank profitability, implying that the higher the default rate due to poor credit risk management. The regulatory framework, including capital adequacy ratios and corporate governance practices, further influences risk management. While capital adequacy ratios have an insignificant impact on credit risk, they are crucial for maintaining financial stability (Aryal and Singh, 2024).

The above discussion shows that empirical evidences vary greatly across the studies on the effect of liquidity and credit risk on bank stability. Though there are above mentioned empirical evidences in the context of other countries and in Nepal, no such findings using more recent data exist in the context of Nepal. Therefore, in order to support one view or the other, this study has been conducted.

The major objective of the study is to examine the effect of liquidity and credit risk on bank stability in Nepalese commercial banks. Specifically, it examines the relationship of non-performing loan, capital adequacy ratio, bank size, loan-to-deposit ratio, debt-to-equity ratio, interest rate spread, loan loss provision with return on assets and Altman Z-score of Nepalese commercial banks.

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

2. Methodological aspects

The study is based on the secondary data which were collected from 12 Nepalese commercial banks for the study period from 2014/15 to 2023/24, leading to a total of 120 observations. The main sources of data collected from the Bank Supervision Report published by Nepal Rastra Bank (NRB) and annual reports of the selected commercial banks. This study is based on descriptive as well as causal comparative research designs. Table 1 shows the list of commercial banks selected for the study along with the study period and number of observations.

Table 1

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

S.N.	Name of the banks	Study period	Observation
1	Siddhartha Bank Limited	2014/15-2023/24	10
2	Agricultural Development Bank Limited	2014/15-2023/24	10
3	Prime Commercial Bank Limited	2014/15-2023/24	10
4	Citizens Bank International Limited	2014/15-2023/24	10
5	Nepal Bank Limited	2014/15-2023/24	10
6	Himalayan Bank Limited	2014/15-2023/24	10
7	Machhapuchhre Bank Limited	2014/15-2023/24	10
8	Standard Chartered Bank Nepal Limited	2014/15-2023/24	10
9	Sanima Bank Limited	2014/15-2023/24	10
10	Everest Bank Limited	2014/15-2023/24	10
11	NMB Bank Limited	2014/15-2023/24	10
12	Nepal SBI Bank Limited	2014/15-2023/24	10
Total number of observations			120

Thus, the study is based on 120 observations.

The model

The model used in this study assumes the effect of liquidity and credit risk on bank stability in Nepalese commercial banks. The dependent variables selected for the study are return on assets and Z-score. Similarly, the selected independent variables are non-performing loan, capital adequacy ratio, bank size, loan-to-deposit ratio, debt-to-equity ratio, interest rate spread and loan loss provision. Therefore, the models take the following forms:

$$ROA_{it} = \beta_0 + \beta_1 NPL_{it} + \beta_2 CAR_{it} + \beta_3 BSIZE_{it} + \beta_4 LDR_{it} + \beta_5 DER_{it} + \beta_6 IRS_{it} + \beta_7 LLP_{it} + e$$

$$ZS_{it} = \beta_0 + \beta_1 NPL_{it} + \beta_2 CAR_{it} + \beta_3 BSIZE_{it} + \beta_4 LDR_{it} + \beta_5 DER_{it} + \beta_6 IRS_{it} + \beta_7 LLP_{it} + e$$

Whereas,

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

ZS= Z-score is measured as the model proposed by Altman in 1993 as $Z\text{-score} = 6.56 X_1 + 3.26 X_2 + 6.72 X_3 + 1.05 X_4$

Whereas,

X_1 = Working capital/total assets

X_2 = Retained earnings/total assets

X_3 = EBIT/total assets

X_4 = Market capitalization/total liabilities

NPL = Non-performing loans as measured by the ratio of non-performing loans to total loans, in percentage.

CAR = Capital adequacy ratio as measured by the ratio of a bank's capital to its risk-weighted assets, in percentage.

BSIZE= Bank size as measured by total assets, Rs. in billions

LDR = Loan to deposit ratio as measured by the ratio of total loans to total deposits, in percentage.

DER = Debt to equity ratio as measured by the ratio of a bank's total debt to its total equity, in percentage.

IRS = Interest rate spread as measured by the difference between the interest rate charged on loans and the interest rate paid on deposits, in percentage.

LLP = Loan loss provisions as measured by the ratio of total loan loss provisions to total loans, Rs. In billions

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

Non-performing loan

Trujillo-Ponce (2013), on Spanish banks, found that nonperforming loans (NPLs) negatively affect return on assets (ROA) and return on equity (ROE). Banker et al. (2010) found that nonperforming loans has a negative impact on bank productivity. Andries (2011) examined the data between 2004 and 2009 of different European banking sector, which highlighted the negative impact of nonperforming loans (NPLs) on banks efficiency. According to Foglia (2022), nonperforming loans (NPLs) has a negative impact on banking industry stability. The NPLs reduces banks capital and profitability, resulting in lower capitalization, profitability and instability. Likewise, Richard *et al.* (2008) indicated that if banks failure to reduce the nonperforming loans (NPLs), it leads to banks failure. Kolapo (2012) found that nonperforming loans (NPLs) rate has statistically significant negative relationship with banks profitability. Based on it, this study develops the following hypothesis

H₁: There is a negative relationship between nonperforming loan and bank stability.

Capital adequacy ratio

Kamran *et al.* (2019) examined 28 commercial banks in Pakistan over the period of 2007 to 2016 to investigate the factors affecting financial stability. The finding showed that, when the capital adequacy ratio (CAR) increases at a moderate level financial stability increases. Daoud and Kammoun (2020) found that capital adequacy ratio has a positive impact on financial stability of the banks. Kabir Hassan *et al.* (2016) analyzed monthly data of banks in Turkey, highlighting capital adequacy ratio has positive impact on financial stability of the banks. Similarly, Swandewi and Purnawati (2021) found that capital adequacy ratio has positive and significant relationship with return on assets (ROA). Likewise, Ikhsan *et al.* (2022) found that capital adequacy ratio has a positive relationship with return on assets. Sang (2021) revealed that capital adequacy ratio (CAR) has positive correlation with financial stability. Based on it, this study develops the following hypothesis:

H₂: There is a positive relationship between capital adequacy ratio and bank stability.

Bank size

Adusei (2015) analyzed the impact of bank size and funding risk on banks stability. The result showed that there is positive relationship between bank size and stability of bank. Ali and Puah (2018) found that bank size has a negative impact on bank stability using Z-score as a measure. Similarly, Almazari (2013) examined banks listed in Stock Exchange market of Saudi for 2007 to 2011 and revealed that bank size, capital adequacy and cost income ratio have positive relationship with the profitability. Obamuyi (2013) analyzed the effect of bank

capital, bank size, interest income, expense management and economic condition on banks' profitability. The finding showed that bank size has positive impact on profitability. Berger *et al.* (2009) indicated that bank size has a positive and significant relationship with banks Z-score. Saliha and Abdessatar (2011) indicated a positive relationship between firm profitability and size. Based on it, this study develops the following hypothesis:

H₃: There is positive relationship between bank size and bank stability.

Loan to deposit ratio

Setiawan *et al.* (2021) found that loan to deposit ratio has a positive and significant impact on profitability. Similarly, Koskei (2020) indicated that loan to deposit ratio has a positive and insignificant relationship with banks financial stability. Limajatini *et al.* (2019) found that loan to deposit ratio (LDR) has significant impact on profitability. Likewise, Susantih and Ompusunggu (2022) indicated that loan to deposit ratio has a significant positive impact on banks profitability. Moreover, Anggari and Dana (2020) analyzed the banks of Indonesia for the period of 2016 to 2018 to find the effect of capital adequacy ratio, third party fund, bank size and loan to deposit ratio on profitability of banks. The study stated that capital adequacy ratio, loan to deposit ratio, third party fund and bank size have positive significant effect on profitability. Based on it, this study develops the following hypothesis:

H₄: There is positive relationship between loan to deposit ratio and bank stability.

Debt to equity ratio

Salim and Yadav (2012) analyzed Malaysian firms and found that debt to equity (DER) ratio has insignificant positive impact on profitability. San and Heng (2011) revealed that when there is high debt to equity ratio then firms suffer from financial distress, which reduces profitability. However, Lestari (2021) found that debt to equity ratio has a positive effect on return on assets (ROA) but negative and significant effect on return on equity. Zelalem (2020) examined five commercial banks from Ethiopia over the period of 2008 to 2017 and highlighted that debt-to-equity ratio (DER) and interest coverage ratio (ICR) has significant positive effect on banks performance as measured by return on assets and return on equity. Likewise, Abubakar (2015) found that there is significant relationship between debt to equity and financial performance. Moreover, Gweyi and Karanja (2014) found that positive correlation between debt to equity (DER) and return on assets (ROA). Based on it, this study develops the following hypothesis:

H₅: There is positive relationship between debt-to-equity ratio and bank stability.

Interest rate spread

Aremu *et al.* (2013) found that interest rate spread is significantly related with bank profitability in the long run but insignificant in the short run. Musah *et al.* (2018) analyzed 24 banks in Ghana and found that there is positive and significant effect of interest rate spread on bank profitability in Ghana. Similarly, Antwi *et al.* (2017) identified that return on assets (ROA) and interest rate spread (IRS) has statistically significant positive relationship. Ndiritu *et al.* (2024) found that there is significant positive relationship between interest rate spread and performance of the banks. Ullah and Khan (2021) found that interest rate spread has positive significant relationship with the profitability of bank. Based on it, this study develops the following hypothesis:

H₆: There is positive relationship between interest rate spread and bank stability.

Loan loss provision

Ul Mustafa (2012) found that there is a negative relationship between loan loss provision (LLP) and profitability of bank. Alhadab and Alsahawneh (2016) identified that there is loan loss provision has a negative impact on profitability of banks. Islam (2018) found that loan loss provision has a negative relationship with profitability of bank. Tahir *et al.* (2014) analyzed the impact of loan loss provision and profitability in Pakistan. The result showed that there is negative relationship between loan loss provision (LLP) and return on assets (ROA). Higher the loan loss provision lowers the profitability and financial stability. Based on it, this study develops the following hypothesis:

H₇: There is negative relationship between loan loss provision and bank stability.

3. Results and discussion

Descriptive statistics

Table 2 presents the descriptive statistics of selected dependent and independent variables during the period 2014/15 to 2023/24.

Table 2

Descriptive statistics

This table shows the descriptive statistics of dependent and independent variables of 12 Nepalese commercial banks for the study period from 2014/15 to 2023/24. The dependent variables are ROA (Return on assets as measured by the ratio of net profit to total asset, in percentage) and ZS (Altman Z-score). The independent variables are NPL (Non-performing loans as measured by the ratio of non-performing loans to total loans, in percentage), CAR (Capital adequacy ratio as measured by the ratio of total capital to total risk weighted exposure, in percentage), BSIZE (Bank size as measured by total assets, Rs. in billion), LDR (Loan-to-deposit ratio as measured by the ratio of total loans to total deposits, in percentage), DER (Debt to equity ratio as measured by comparing total debt shareholder equity, in percentage), IRS (Interest rate spread as measured by the difference between lending rate and deposit rate, in percentage), and LLP (Loan loss provision as measured by the expense set aside as an allowance for bad loans, in percentage).

Variables	Minimum	Maximum	Mean	Std. Deviation
ZS	0.66	2.87	1.32	0.36
ROA	0.47	3.56	1.54	0.55
NPL	0.01	4.93	1.43	1.32
CAR	7.49	22.99	14.03	2.41
BSIZE	19.16	357.5	150.74	76.61
LDR	0.09	1.02	0.82	0.12
DER	4.1932	22	8.25	2.38
IRS	0.03	7.15	4.14	0.82
LLP	0.13	9.2	2.51	2.08

Source: SPSS Output

Correlation analysis

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

Table 3

Pearson's correlation coefficients matrix

This table shows the correlation coefficients of dependent and independent variables of 12 Nepalese commercial banks for the study period from 2014/15 to 2023/24. The dependent variables are ROA (Return on assets as

measured by the ratio of net profit to total asset, in percentage) and ZS (Altman Z-score). The independent variables are NPL (Non-performing loans as measured by the ratio of non-performing loans to total loans, in percentage), CAR (Capital adequacy ratio as measured by the ratio of total capital to total risk weighted exposure, in percentage.), BSIZE (Bank size as measured by total assets, Rs. in billion), LDR (Loan-to-deposit ratio as measured by the ratio of total loans to total deposits, in percentage), DER (Debt to equity ratio as measured by comparing total debt shareholder equity, in percentage), IRS (Interest rate spread as measured by the difference between lending rate and deposit rate, in percentage), and LLP (Loan loss provision as measured by the expense set aside as an allowance for bad loans, in percentage).

Variables	ZS	ROA	NPL	CAR	BSIZE	LDR	DER	IRS	LLP
ZS	1								
ROA	0.645**	1							
NPL	-0.198*	-0.155	1						
CAR	0.640**	0.410**	0.043	1					
BSIZE	-0.484**	-0.547**	0.454**	-0.086	1				
LDR	-0.265**	-0.066	0.097	-0.057	0.140	1			
DER	-0.554**	-0.378**	-0.109	-0.666**	0.007	-0.209*	1		
IRS	0.218*	0.360**	0.269**	0.246**	-0.076	-0.006	-0.037	1	
LLP	-0.410**	-0.472**	0.750**	-0.043	0.811**	0.166	-0.034	0.032	1

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

Table 3 shows that there is negative relationship between Z-score and non performing loan (NPL), indicating that increase in nonperforming loan leads to decrease in Z-score. In addition, there is positive relationship between capital adequacy ratio and Z-score. It implies that increase in capital adequacy ratio leads to increase in Z-score. However, there is negative relationship between bank size and Z-score. It shows that increase in bank size leads to decrease in Z-score. Likewise, there is negative relationship between loan to deposit and Z-score. It implies that increase in loan to deposit ratio leads to decrease in Z-score. Similarly, debt to equity ratio has a negative relationship with Z-score. It implies that increase in debt-to-equity ratio leads to decrease in Z-score. In addition, there is positive relationship between interest rate spread and Z-score. It implies that increase in interest rate spread leads to increase in Z-score. However, there is a negative relationship between loan loss provision and Z-score. It shows that increase in loan loss provision leads to decrease in Z-score.

Similarly, there is negative relationship between return on asset and non-performing loan (NPL), indicating that increase in nonperforming loan leads to decrease in return on asset. In addition, there is positive relationship between capital adequacy ratio and return on asset. It implies that increase in capital adequacy ratio leads to increase in return on asset. However, there is negative relationship between bank size and return on asset. It shows that increase in bank size leads to decrease in return on asset. Likewise, there is negative relationship between loan to deposit and return on asset. It implies that increase in loan to deposit ratio leads to decrease in return on asset. Similarly, debt to equity ratio has a negative relationship with return on asset. It implies that increase in debt-to-equity ratio leads to decrease in return on asset. In addition, there is positive relationship between interest rate spread and return on asset. It implies that increase in interest rate spread leads to increase in return on asset. However, there is a negative relationship between loan loss provision and return on asset. It shows that increase in loan loss provision leads to decrease in return on asset.

Regression analysis

Having analyzed the Pearson's correlation coefficients, the regression analysis has been carried out and the results are presented in Table 4 and Table 5. More specifically, Table 4 shows the regression results of non-performing loan, capital adequacy ratio, bank size, loan-

to-deposit ratio, debt-to-equity ratio, interest rate spread and loan loss provision on return on assets of Nepalese commercial banks.

Table 4

Estimated regression results of non-performing loan, capital adequacy ratio, bank size, loan-to-deposit ratio, debt-to-equity ratio, interest rate spread and loan loss provision on return on assets

The results are based on panel data of 12 commercial banks with 120 observations for the period from 2014/15 to 2023/24 by using the liner regression model and the model is $ROA_{it} = \beta_0 + \beta_1 NPL_{it} + \beta_2 CAR_{it} + \beta_3 BSIZE_{it} + \beta_4 LDR_{it} + \beta_5 DER_{it} + \beta_6 IRS_{it} + \beta_7 LLP_{it} + e$ where, the dependent variable is ROA (Return on assets as measured by the ratio of net profit to total asset, in percentage). The independent variables are NPL (Non-performing loans as measured by the ratio of non-performing loans to total loans, in percentage), CAR (Capital adequacy ratio as measured by the ratio of total capital to total risk weighted exposure, in percentage.), BSIZE (Bank size as measured by total assets, Rs. in billion), LDR (Loan-to-deposit ratio as measured by the ratio of total loans to total deposits, in percentage), DER (Debt to equity ratio as measured by comparing total debt shareholder equity, in percentage), IRS (Interest rate spread as measured by the difference between lending rate and deposit rate, in percentage), and LLP (Loan loss provision as measured by the expense set aside as an allowance for bad loans, in percentage).

Model	Intercepts	Regression coefficients of							Adj. R_bar ²	SEE	F-value
		NPL	CAR	BSIZE	LDR	DER	IRS	LLP			
1	1.63 (22.08)**	-0.065 (1.707)							0.016	0.549	2.913
2	0.22 (0.802)		0.094 (4.890)**						0.161	0.507	23.797
3	2.133 (22.69)**			-0.004 (7.040)**					0.293	0.465	50.304
4	1.8 (4.94)**				-0.317 (0.720)				0.004	0.554	0.523
5	2.26 (13.29)**					-0.088 (4.430)**			0.135	0.514	19.642
6	0.532 (2.171)*						0.243 (4.190)**		0.122	0.518	17.53
7	1.85 (26.36)**							-0.126 (5.810)**	0.216	0.489	33.738
8	0.299 (1.09)	-0.072 (2.09)*	0.096 (5.03)**						0.184	0.499	14.424
9	0.937 (3.79)**	-0.033 (1.015)	0.082 (5.105)**	-0.004 (7.01)**					0.422	0.421	29.939
10	0.842 (2.26)*	-0.033 (0.996)	0.083 (5.097)**	-0.004 (6.98)**	-0.115 (0.341)				0.417	0.422	22.31
11	2.086 (3.393)**	-0.027 (0.821)	0.045 (2.034)*	-0.004 (7.1)**	-0.17 (0.487)	-0.057 (2.51)**			0.443	0.413	19.939
12	1.892 (3.296)**	-0.022 (0.686)	0.015 (0.718)	-0.003 (6.52)**	-0.279 (0.857)	-0.078 (3.608)**	0.208 (4.303)**		0.517	0.384	22.254
13	1.74 (3.042)**	-0.046 (0.857)	0.018 (0.857)	-0.002 (2.56)*	-0.204 (0.629)	-0.075 (3.465)**	0.193 (3.997)**	-0.085 (1.996)*	0.53	0.379	20.148

Notes:

- Figures in parenthesis are t-values.
- The asterisk signs (**) and (*) indicate that the results are significant at one percent and five percent level respectively.
- Return on assets is the dependent variable.

Table 4 shows that the beta coefficients for nonperforming loans are negative with return on assets. It indicates that nonperforming loan has negative impact on return on assets. This finding is similar to the findings of Kolapo (2012). 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 consistent with the findings of Daoud and Kammoun (2020). Moreover, the beta coefficients for bank size are negative with return on assets. It indicates that bank size has negative impact on return on assets. This finding

contradicts with the findings of Saliha and Abdessatar (2011). In addition, the beta coefficients of loan to deposit ratio are negative with return on assets. It indicates that loan to deposit ratio has negative impact on return on assets. This finding is similar to the findings of Koskei (2020). Likewise, the beta coefficients of debt-to-equity ratio are negative with return on assets. It indicates that debt to equity ratio has negative impact on return on assets. This finding is consistent with the findings of Zelalem (2020). Moreover, the beta coefficients of interest rate spread are positive with return on assets. It indicates that interest rate spread has a positive impact on return on assets. This finding is similar to the findings of Ndiritu *et al.* (2024). Furthermore, the beta coefficients of loan loss provision are negative with return on assets. It indicates that loan loss provision has negative impact on return on assets. This finding is consistent with the findings of Tahir *et al.* (2014).

Table 5 shows the estimated regression results of non-performing loan, capital adequacy ratio, bank size, loan-to-deposit ratio, debt-to-equity ratio, interest rate spread and loan loss provision on Z-score of Nepalese commercial banks

Table 5

Estimated regression results of non-performing loan, capital adequacy ratio, bank size, loan-to-deposit ratio, debt-to-equity ratio, interest rate spread and loan loss provision on Z-score

The results are based on panel data of 12 commercial banks with 120 observations for the period off 2014/15 to 2023/24 by using the liner regression model and the model is $ZS_{it} = \beta_0 + \beta_1 NPL_{it} + \beta_2 CAR_{it} + \beta_3 BSIZE_{it} + \beta_4 LDR_{it} + \beta_5 DER_{it} + \beta_6 IRS_{it} + \beta_7 LLP_{it} + e$ where, the dependent variable is ZS (Z-score is calculated as model purposed by Altman in 1993). The independent variables are NPL (Non-performing loans as measured by the ratio of non-performing loans to total loans, in percentage), CAR (Capital adequacy ratio as measured by the ratio of total capital to total risk weighted exposure, in percentage.), BSIZE (Bank size as measured by total assets, Rs. in billion), LDR (Loan-to-deposit ratio as measured by the ratio of total loans to total deposits, in percentage), DER (Debt to equity ratio as measured by comparing total debt shareholder equity, in percentage), IRS (Interest rate spread as measured by the difference between lending rate and deposit rate, in percentage), and LLP (Loan loss provision as measured by the expense set aside as an allowance for bad loans, in percentage).

Models	Intercepts	Regression coefficients of							Adj. R _{bar} ²	SEE	F-value
		NPL	CAR	BSIZE	LDR	DER	IRS	LLP			
1	1.392 (29.25)**	-0.054 (2.194)*							0.031	0.354	4.812
2	-0.022 (-0.15)		0.095 (9.051)**						0.405	0.277	81.92
3	1.657 (25.965)**			-0.002 (6.003)**					0.227	0.316	36.036
4	1.99 (8.712)**				-0.82 (2.98)**				0.062	0.348	8.899
5	2.006 (20.186)**					-0.084 (7.23)**			0.301	0.302	52.324
6	0.818 (5.52)**						0.096 (2.431)*		0.04	0.352	5.909
7	1.493 (31.63)**							-0.071 (4.89)**	0.161	0.329	23.877
8	0.045 (0.308)	-0.061 (3.33)**	0.097 (9.564)**						0.452	0.266	49.986
9	0.356 (2.622)**	-0.01 (0.536)	0.09 (10.18)**	-0.002 (6.227)**					0.585	0.231	57.005
10	0.797 (4.031)**	-0.007 (0.426)	0.089 (10.363)**	-0.002 (6.09)**	-0.534 (2.98)**				0.612	0.224	47.897
11	2.09 (6.987)**	-0.014 (0.89)	0.049 (4.644)**	-0.002 (6.724)**	-0.831 (4.891)**	-0.059 (5.37)**			0.687	0.201	53.353
12	2.036 (6.918)**	-0.028 (1.673)	0.041 (3.755)**	-0.002 (6.185)**	-0.861 (5.15)**	-0.065 (5.86)**	0.058 (2.345)*		0.699	0.197	47.131
13	2.032 (6.813)**	-0.026 (1.069)	0.041 (3.736)**	-0.002 (3.77)**	-0.86 (5.09)**	-0.065 (5.81)**	0.058 (2.293)*	-0.002 (0.09)	0.697	0.198	40.045

Notes:

- i. Figures in parenthesis are t-values.
- ii. The asterisk signs (**) and (*) indicate that the results are significant at one percent and five percent level respectively.
- iii. Z-score is the dependent variable.

Table 5 shows that the beta coefficients for nonperforming loans are negative with Z-score. It indicates that nonperforming loan has negative impact on Z-score. This finding is similar to the findings of Andries (2011). Similarly, the beta coefficients for capital adequacy ratio are positive with Z-score. It indicates that capital adequacy ratio has a positive impact on Z-score. This finding is consistent with the findings of Ikhsan *et al.* (2022). Moreover, the beta coefficients for bank size are negative with Z-score. It indicates that bank size has negative impact on Z-score. This finding is inconsistent with the findings of Berger *et al.* (2009). In addition, the beta coefficients of loan to deposit ratio are negative with Z-score. It indicates that loan to deposit ratio has negative impact on Z-score. This finding is similar to the findings of Limajatini *et al.* (2019). Likewise, the beta coefficients of debt-to-equity ratio are negative with Z-score. It indicates that debt to equity ratio has negative impact on Z-score. This finding is consistent with the findings of Abubakar (2015). Moreover, the beta coefficients of interest rate spread are positive with Z-score. It indicates that interest rate spread has a positive impact on Z-score. This finding is similar to the findings of Antwi *et al.* (2017). Furthermore, the beta coefficients of loan loss provision are negative with Z-score. It indicates that loan loss provision has negative impact on Z-score. This finding is consistent with the findings of Alhadab and Alsahawneh (2016).

4. Summary and conclusion

The stability of Nepalese commercial banks is significantly influenced by liquidity risk and credit risk. Effective management practices are crucial for mitigating these risks. Banks need to adopt robust risk management frameworks to ensure adequate liquidity and minimize credit losses. Balancing these aspects efficiently can help in maintaining or enhancing stability and profitability, while poor management of these risks can adversely affect financial performance.

The study attempts to investigate the effects of liquidity risk and credit risk on bank stability in Nepalese commercial banks. This study is based on the secondary data gathered from 12 Nepalese commercial banks for the study period from 2014/15 to 2023/24.

The major conclusion of the study is that non-performing loan, bank size, loan to deposit ratio, debt to equity ratio and loan loss provision negatively influences return on assets. However, the capital adequacy ratio and interest rate spread positively influences return on assets. Furthermore, the non-performing loan, bank size, loan to deposit ratio, debt to equity ratio and loan loss provision negatively influences Z-score. Conversely, the capital adequacy ratio and interest rate spread positively influences Z-score. Likewise, the study concludes that bank size followed by loan loss provision is the most significant factor that influence the return on assets of Nepalese commercial banks. Similarly, capital adequacy ratio followed by debt-to-equity ratio is the most significant factor that influence the Z-score of Nepalese commercial banks.

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