Macroeconomic and Institutional Determinants of Non-Performing Loans in Nepalese Commercial Banks

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Abstract

This study examines the macroeconomic and institutional determinants of non-performing loans in Nepalese commercial banks. Non-performing loan and total loan and advances are the selected dependent variables. The selected independent variables are bank size, capital adequacy ratio, interest rate, gross domestic product, inflation rate and money supply. The study is based on secondary data of 16 commercial banks with 128 observations for the study period from 2016/17 to 2023/24. The data were collected from Bank Supervision Report published by Nepal Rastra Bank (NRB), Economic Survey Report, World Bank Data and annual reports of the selected commercial banks. The correlation coefficients and regression models are estimated to test the significance and importance of the macroeconomic and institutional determinants on non-performing loans in Nepalese commercial banks.

The study showed that inflation rate has a positive impact on non-performing loan. It indicates that increase in inflation rate leads to increase in non-performing loan. In contrast, capital adequacy ratio has a negative impact on non-performing loan. It indicates that increase in capital adequacy ratio leads to decrease in non-performing loan. Similarly, money supply has a negative impact on non-performing loan. It indicates that increase in money supply leads to decrease in non-performing loan. Likewise, interest rate has a negative impact on non-performing loan. It indicates that higher the lending interest rate, lower would be the non-performing loan. Further, gross domestic product has a negative impact on non-performing loan. It indicates that increase in gross domestic product leads to decrease in non-performing loan. However, bank size has a positive impact on non-performing loan. It indicates that larger the bank size, higher would be the non-performing loan.

Keywords: gross domestic product, inflation rate, money supply, bank size, interest rate, capital adequacy ratio, non-performing loan, total loan and advances

1. Introduction

A large amount of bad loans in the banking system generally results in bank failure. Non-performing loans are one of the main causes of economic stagnation. A high level of non-performing loans contribute to economic stagnation by disrupting credit flow to productive sectors, weakening investor confidence, and constraining economic growth. Each impaired loans in the financial sector increases the possibility of leadership crisis in the company and also results into unprofitability. The deterioration in the quality of the loans portfolio of the banks has become a major problem in the banking system and also in the financial crises of developed economies. A loan becomes non-performing when the payments of interest and principal have past their due by 90 days or more, or at least 90 days of their interest payments have been capitalized, Refinanced or delayed by the agreement, or when there are other good reasons to doubt that payments will be made in full (Alton and Hazen, 2001). Commercial banks actively channel money from depositors to investors, which is an essential part of how countries allocate their economic resources (Ongore and Kusa, 2013). Banks provide different services such as deposit and loan facilities for both individual and business customers, as well as the ability to access the country's payment systems and provide credit and liquidity in challenging market conditions (Handley-Scharler *et al.*, 2007). An economy

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is more stable and resilient when banking systems have strong financial foundations (Asif *et al.*, 2017). The bank's financial institutions, also known as banks, are among the financial institutions that appear to play the largest role in economic development (Syahyunan *et al.*, 2017). Commercial banks' lending services play a crucial role in their customers' short, medium and long-term financial goals. The banks offer loans and advances to their clients, including people, businesses, and governments, in accordance with formal procedures. The customer invests the advance and loan in various business ventures. In general, it contributes to the growth in the nation's economic development (Olokoyo, 2011).

Farhan *et al.* (2012) concluded that interest rate is one of the primary economic determinants of NPLs to bad loans. An increase in interest rate affects the performing assets in banks as it increases the cost of loans charged on the borrowers and reduces the borrower's capacity to pay (Ombaba, 2013). Similarly, Ekanayake and Azeez (2015) examined the factors influence non-performing loans in licensed commercial banks. The study discovered a significant and favorable relationship between market lending rate, as determined by AWPR, and non-performing loans. Likewise, Skarica (2014) discovered that there is a statistically significant relationship between interest rates and defaulted loans. Further, Shingjergji (2013) assessed the factors affected the non-performing loans in the banking system of Albania. The study discovered that the ratio of non-performing loans and GDP growth are positively correlated. Anjom and Karim (2015) analyzed the relationship between non-performing loans and macroeconomic factors with institutional factors in SAARC nations. The results of the study showed that non-performing loans and GDP are positively correlated. In contrast, there is a negative correlation of public debt and inflation with non-performing loans. Similarly, Chowdhury (2012) stated that lenders know full well that inflation will reduce the value of their money over the course of a loan, so they raise interest rates to make up for the shortfall. Therefore, the higher interest rates may have an impact on how any commercial bank borrows. Likewise, Szarowska (2018) found a negative influence of inflation and exchange rate on non-performing loans. Further, Osunnaiye and Alymkulova (2022) found that money supply and interest rates have negative impact on non-performing loans. Msomi (2022) assessed the factors affecting non-performing loans in commercial banks of selected West African countries. The study stated that success of banks is not only on their capacity to reach the capital adequacy ratio but also on their ability to ensure that loans are subjected to scrutiny before being distributed to beneficiaries. Similarly, Castro (2024) assessed the macroeconomic determinants of the credit risk in the banking system: The case of the Latin American countries. The study revealed that economic growth, unemployment, and inflation are the primary macroeconomic variables affecting NPLs. Likewise, Abid and Naifar (2023) investigated the influence of macroeconomic and bank-specific variables on NPLs in the MENA region. The study conclude that GDP progress and inflation are significant determinants with complex inflation leading to NPLs growth.

Rathnayake and Dissanayake (2022) assessed the determinants of non-performing loans evidence from Sri Lanka. The study found that gross domestic product (GDP) growth rate has a significant but negative relationship with non-performing loans. Similarly, Ahiase *et al.* (2023) explored the relationship between non-performing loans (NPLs) and macroeconomic factors. The study concluded that GDP, gross external debt, unemployment, inflation, interest rates, and government effectiveness have significant impact on non-performing loan. Likewise, Syed and Aidyngul (2022) suggested that the common macroeconomic and specific factors of the bank that affect non-performing loans between developed and developing countries are

growth rate, inflation, interest rate, capital adequacy ratio, deposit-to-deposit ratio and bank lending for the private sector. Bridges *et al.* (2014) examined how capital requirements affected bank lending. The study showed that a rise in capital requirements results in a reduction in loans. Similarly, Arintoko (2021) discovered that over the long term, capital adequacy ratio has a favorable impact on bank lending. Likewise, Ahmed *et al.* (2021) examined the impact of bank specific and macro-economic factors on non-performing loans in the banking sector: An evidence from an emerging economy. The study revealed that non-performing loans are significantly increased by higher interest rates, exchange rates, and political risk. Further, Badar *et al.* (2013) assessed the effects of macroeconomic factors on non-performing loans held by commercial banks in Pakistan. The study concluded that inflation, exchange rates, interest rates, gross domestic product, and money supply have strong negative long-run relationships with non-performing loans. 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.

In the context of Nepal, Panta (2018) identified that the net interest margin and bank size as factors affecting non-performing loans, and the study also suggested that the net interest margin has a positive and significant impact while the bank size has a negative and significant relationship with non-performing loan. Similarly, Pachhaldangaya and Bista (2023) examined the economic factors influencing credit risks in Nepalese commercial banks. The study found that inflation, interest rates, and economic growth significantly influence non-performing loan. Likewise, Niroula *et al.* (2024) examined the impact of NPLs on the financial performance of Nepalese commercial banks. The study found that loan growth, credit policies, and external economic conditions have negative impact on non-performing loan. The study also found that poor credit management and adverse macroeconomic environments are closely associated with higher NPL ratios, leading to diminished profitability.

The above discussion shows that empirical evidences vary greatly across the studies on the macroeconomic and institutional determinants of non-performing loans in commercial banks. 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 this study is to examine the macroeconomic and institutional determinants of non-performing loans in Nepalese commercial banks. Specifically, it examines the relationship of bank size, capital adequacy ratio, interest rate, GDP, inflation rate and money supply with non-performing loan and total loan and advances in 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 16 Nepalese commercial banks for the study period from 2016/17 to 2023/24, leading to a total of 128 observations. The main sources of data collected from the Bank Supervision Report published by Nepal Rastra Bank (NRB), Economic Survey Report, World Bank Data 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 banks	Study Period	Observations
Private banks			
1	Global IME Bank Limited	2016/17-2023/24	8
2	NIC Asia Bank Limited	2016/17-2023/24	8
3	Prime Commercial Bank Limited	2016/17-2023/24	8
4	Siddhartha Bank Limited	2016/17-2023/24	8
5	Kumari Bank Limited	2016/17-2023/24	8
6	Prabhu Bank Limited	2016/17-2023/24	8
7	Sanima Bank Limited	2016/17-2023/24	8
8	Citizens Bank International Limited	2016/17-2023/24	8
9	Machhapuchchhre Bank Limited	2016/17-2023/24	8
10	Nepal SBI Bank Limited	2016/17-2023/24	8
Joint venture banks			
11	Nabil Bank Limited	2016/17-2023/24	8
12	NMB Bank Limited	2016/17-2023/24	8
13	Everest Bank Limited	2016/17-2023/24	8
14	Himalayan Bank Limited	2016/17-2023/24	8
Public banks			
15	Rastriya Banijya Bank Limited	2016/17-2023/24	8
16	Nepal Bank Limited	2016/17-2023/24	8
Total number of observations			**128**

Thus, the study is based on the 128 observations.

The model

The models estimated in this study assumes that non-performing loans depends upon determinants of macroeconomic and institutional factors. The selected dependent variables are non-performing loan and total loan and advances. Similarly, the selected independent variables are gross domestic product, inflation rate, money supply, bank size, interest rate,

and capital adequacy ratio. The models take the following forms:

$$NPL_{it} = \beta_0 + \beta_1 BS_{it} + \beta_2 CAR_{it} + \beta_3 IR_{it} + \beta_4 GDP_{it} + \beta_5 INFR_{it} + \beta_6 MS_{it} + e_{it}$$

$$TLA_{it} = \beta_0 + \beta_1 BS_{it} + \beta_2 CAR_{it} + \beta_3 IR_{it} + \beta_4 GDP_{it} + \beta_5 INFR_{it} + \beta_6 MS_{it} + e_{it}$$

Where,

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

TLA = Total loans and advances as measured by loan and advances disbursed by bank in particular year, Rs. in billions.

GDP = Gross domestic product as measured by the annual percentage increase in the total value of goods and services produced in the economy, in percentage.

INFR = Inflation rate as measured by the annual percentage change in the general price level of goods and services in the economy, in percentage.

MS = Money supply as measured by annual growth of broad money supply, in percentage.

BS = Bank size as measured by the total assets of the banks, Rs. in billions.

IR = Interest rate as measured by the central bank's benchmark interest rate, in percentage.

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

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

Gross domestic product

Moussa and Chedia (2016) investigated the determinants of bank lending in Tunisia. The study found that gross domestic product has a negative relationship with bank lending. However, Al-Kilani and Kaddumi (2015) found that bank lending is positively and significantly influenced by gross domestic product. Likewise, Zandi *et al.* (2019) revealed that there is a positive relationship between GDP and lending behavior. Further, Zheng *et al.* (2019) examined the impact of macroeconomic variables on non-performing loan. The study revealed a negative impact of GDP on non-performing loans dynamics. Based on it, this study develops the following hypothesis:

H_1: There is a positive relationship between gross domestic product and loan and advances.

H_2: There is negative relationship between gross domestic product and non-performing loan.

Inflation rate

Caglayan and Xu (2016) examined the impact of inflation volatility on the distribution of bank loans. The study showed that inflation has a negative impact on expansion of credit. Similarly, Omondi (2014) found that there is a negative relationship between inflation and commercial banks' lending. In contrast, Hosen and Muhari (2019) analyzed the non-performing financing of Islamic rural bank industry in Indonesia. The study revealed that rate of inflation has a positive and significant impact on the level of non-performing

loan. However, Ahmed *et al.* (2022) concluded that inflation has a negative impact on non-performing loans. In addition, Szarowska (2018) found that inflation has a negative influence on non-performing loan. Based on it, this study develops the following hypothesis:

H_3: There is a negative relationship between inflation and loan and advances.

H_4: There is negative relationship between inflation and non-performing loan.

Money supply

Akinbobola (2012) stated that money supply is positively correlated to bank's loans. Similarly, Onaolapo and Habeeb (2017) revealed that money supply has a positive impact on loans and advances of commercial banks. However, Ayodele (2014) found that liquidity ratio and money supply have negative impact on loan and advances. Likewise, Salem *et al.* (2020) demonstrated a positive relationship between money supply and the ratio of non-performing loans. In addition, Osunnaiye and Alymkulova (2022) stated that money supply has a positive impact on non-performing loan. Based on it, this study develops the following hypothesis:

H_5: There is a positive relationship between money supply and loan and advances.

H_6: There is positive relationship between money supply and non-performing loan.

Interest rate

Ajayi and Atanda (2012) revealed that interest rate has a negative impact on bank loan. However, Rajha (2017) concluded that there is a positive and statistically significant relationship between interest rate and non-performing loans. Likewise, Farhan *et al.* (2012) concluded that interest rate is one of the primary economic determinants of NPLs to bad loans. Further, Adzis *et al.* (2018) investigated the bank specific and macroeconomic determinants of commercial bank lending in Malaysia using a sample of 27 banks covering the period from 2005 to 2014. The study revealed that there is no significant relationship between the lending rate and non-performing loan. In addition, Ouhibi *et al.* (2017) found that high interest is expectedly exposed to higher rate of defaults on non-performing loans. Based on it, this study develops the following hypothesis:

H_7: There is a negative relationship between interest rate and loan and advances.

H_8: There is positive relationship between interest rate and non-performing loan.

Bank size

Shikumo and Mirie (2020) concluded that bank size has a significant positive relationship with lending. Similarly, Ladime *et al.* (2013) showed that bank size has a significant and positive relationship with bank lending behaviour. Likewise, Ahmed *et al.* (2021) revealed that bank size has a negative relationship with non-performing loan. Further, Zhang *et al.* (2016) investigated the moral risks, non-performing loans, and regulation of the Chinese commercial banking system. The study found that bank size has a positive and significant relationship with non-performing loans. In addition, Alexandri and Santoso (2015) found that banks size and GDP have positive but insignificant impact on the non-performing loans. Based on it, this study develops the following hypothesis:

H_9: There is a positive relationship between bank size and loan and advances.

H_{10}: There is negative relationship between bank size and non-performing loan.

Capital adequacy ratio

Bridges *et al.* (2014) analyzed how capital requirements affected bank lending. The study showed that increase in capital requirement leads to cut down the loan. Similarly, Noss and Toffano (2016) found that increase in capital requirement leads to decrease in bank lending capacity. Likewise, Indrajaya (2019) implicated that bank capital has a negative impact on non-performing loans. Further, Umar and Sun (2018) suggested that bank capital has no impact on non-performing loans. In addition, Arintoko (2021) stated that bank capital requirement negatively affects bank lending capacity in long run. Based on it, this study develops the following hypothesis:

H_{11}: There is a negative relationship between capital adequacy ratio and loan and advances.

H_{12}: There is negative relationship between capital adequacy ratio and non-performing loan.

3. Results and discussion

Descriptive statistics

Table 2 presents the descriptive statistics of selected dependent and independent variables during the period 2016/17 to 2023/24.

Table 2

Descriptive statistics

This table shows the descriptive statistics of dependent and independent variables of 16 Nepalese commercial banks for the study period of 2016/17 to 2023/24. The dependent variables are NPL (Non-performing loan as measured by the ratio of non-performing loan to total loan, in percentage) and TLA (Total loans and advances as measured by loan and advances disbursed by bank in particular year, Rs. in billions). The independent variables are GDP (Gross domestic product as measured by the annual percentage increase in the total value of goods and services produced in the economy, in percentage), MS (Money supply as measured by annual growth of broad money supply, in percentage), INFR (Inflation rate as measured by the annual percentage change in the general price level of goods and services in the economy, in percentage), IR (Interest rate as measured by the central bank's benchmark interest rate, in percentage), BS (Bank size as measured by the total assets of the banks, Rs. in billions) and CAR (Capital adequacy ratio as measured by the ratio of total capital to total risk weighted exposure, in percentage).

Variables	Minimum	Maximum	Mean	Std. Deviation
NPL	0.010	5.960	1.833	1.504
TLA	44.700	385.720	140.647	71.397
BS	61.420	604.520	209.934	110.188
CAR	10.390	17.010	13.253	1.331
IR	3.070	7.760	4.172	0.641
GDP	-2.370	8.980	4.598	3.375
INFR	3.600	7.740	5.311	1.285
MS	6.810	22.690	15.298	4.682

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 16 Nepalese commercial banks for the study period of 2016/17 to 2023/24. The dependent variables are NPL (Non-performing loan as measured by the ratio of non-performing loan to total loan, in percentage) and TLA (Total loans and advances as measured by loan and advances disbursed by bank in particular year, Rs. in billions). The independent variables are GDP (Gross domestic product as measured by the annual percentage increase in the total value of goods and services produced in the economy, in percentage), MS (Money supply as measured by annual growth of broad money supply, in percentage), INFR (Inflation rate as measured by the annual percentage change in the general price level of goods and services in the economy, in percentage), IR (Interest rate as measured by the central bank's benchmark interest rate, in percentage), BS (Bank size as measured by the total assets of the banks, Rs. in billions) and CAR (Capital adequacy ratio as measured by the ratio of total capital to total risk weighted exposure, in percentage).

Variables	NPL	TLA	BS	CAR	IR	GDP	INFR	MS
NPL	1							
TLA	0.379**	1						
BS	0.486**	0.975**	1					
CAR	-0.365**	-0.322**	-0.329**	1				
IR	-0.373**	-0.116	0.180*	-0.116	1			
GDP	-0.178*	-0.414**	-0.426**	-0.042	-0.008	1		
INFR	0.317**	0.444**	0.476**	-0.104	0.099	-0.558**	1	
MS	-0.233**	-0.348**	-0.361**	0.163	-0.090	-0.049	-0.719**	1

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

Table 3 shows that inflation rate has a positive relationship with non-performing loan. It indicates that increase in inflation rate leads to increase in non-performing loan. In contrast, capital adequacy ratio has a negative relationship with non-performing loan. It indicates that increase in capital adequacy ratio leads to decrease in non-performing loan. Similarly, money supply has a negative relationship with non-performing loan. It indicates that increase in money supply leads to decrease in non-performing loan. Likewise, interest rate has a negative relationship with non-performing loan. It indicates that higher the lending interest rate, lower would be the non-performing loan. Further, there is a negative relationship between gross domestic product and non-performing loan. It indicates that increase in gross domestic product leads to decrease in non-performing loan. However, there is a positive relationship between bank size and non-performing loan. It indicates that larger the bank size, higher would be the non-performing loan.

Similarly, the result also shows that inflation rate has a positive relationship with total loans and advances. It indicates that increase in inflation rate leads to increase in total loans and advances. In contrast, capital adequacy ratio has a negative relationship with total loans and advances. It indicates that increase in capital adequacy ratio leads to decrease in total loans and advances. Similarly, money supply has a negative relationship with total loans and advances. It indicates that increase in money supply leads to decrease in total loans and advances. Likewise, interest rate has a negative relationship with total loans and advances. It indicates that higher the lending interest rate, lower would be the total loans and advances. Further, there is a negative relationship between gross domestic product and total loans and advances. It indicates that increase in gross domestic product leads to decrease in total loans and advances. However, there is a positive relationship between bank size and total loans and advances. It indicates that larger the bank size, higher would be the total loans and advances.

Regression analysis

Having indicated the Pearson's correlation coefficients, the regression analysis has been carried out and results are presented in Table 4. More specifically, it shows the regression results of gross domestic product, money supply, inflation rate, interest rate, bank size and capital adequacy ratio with non-performing loan of Nepalese commercial banks.

Table 4

Estimated regression results of gross domestic product, money supply, inflation rate, interest rate, bank size and capital adequacy ratio with non-performing loans

The results are based on panel data of 16 commercial banks with 128 observations for the study period of 2016/17 to 2023/24 by using the linear regression model and the model is $NPL_{it} = \beta_0 + \beta_1 BS_{it} + \beta_2 CAR_{it} + \beta_3 IR_{it} + \beta_4 GDP_{it} + \beta_5 INFR_{it} + \beta_6 MS_{it} + e_{it}$, where, the dependent variable is TLA (Total loans and advances as measured by loan and advances disbursed by bank in particular year, Rs. in billions). The independent variables are GDP (Gross domestic product as measured by the annual percentage increase in the total value of goods and services produced in the economy, in percentage), MS (Money supply as measured by annual growth of broad money supply, in percentage), INFR (Inflation rate as measured by the annual percentage change in the general price level of goods and services in the economy, in percentage), IR (Interest rate as measured by the central bank's benchmark interest rate, in percentage), BS (Bank size as measured by the total assets of the banks, Rs. in billions) and CAR (Capital adequacy ratio as measured by the ratio of total capital to total risk weighted exposure, in percentage).

Model	Intercept	Regression coefficients of						Adj. R_bar^2	SEE	F-value
		BS	CAR	IR	GDP	INFR	MS			
1	-5.681 (4.695)**	1.440 (6.238)**						0.230	1.319	38.918
2	7.295 (5.843)**		-0.412 (4.397)**					0.256	1.405	19.334
3	-1.816 (2.218)*			-0.874 (4.508)**				0.332	1.401	20.323
4	2.196 (9.873)**				-0.790 (2.027)*			0.424	1.485	4.108
5	2.196 (9.873)**					0.371 (3.754)**		0.393	1.431	14.094
6	2.976 (6.688)**						-0.075 (2.686)**	0.447	1.468	7.217
7	3.884 (3.066)**	0.006 (5.701)**	-0.251 (2.841)**					0.301	1.257	28.334
8	3.884 (3.066)**	0.006 (5.427)**	-0.229 (2.730)**	-0.661 (3.951)**				0.374	1.189	26.301
9	1.234 (0.840)	0.005 (4.228)**	-0.239 (2.807)**	-0.666 (3.970)**	-0.025 (0.725)			0.372	1.191	19.781
10	0.535 (0.340)	0.005 (4.228)**	-0.235 (2.761)**	-0.654 (3.899)**	-0.002 (0.048)	0.127 (1.207)		0.374	1.189	16.175
11	-2.036 (0.752)	0.005 (4.391)**	-0.232 (2.722)**	-0.641 (3.816)**	-0.057 (0.899)	-0.057 (0.899)	-0.063 (1.166)	0.376	1.187	13.746

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. Non-performing loan is the dependent variable.

Table 4 shows that the beta coefficients for capital adequacy ratio are negative with non-performing loans. It indicates that capital adequacy ratio has a negative impact on non-performing loans. This finding is consistent with the findings of Bridges *et al.* (2014). Similarly, the beta coefficients for interest rate are negative with non-performing loans. It indicates that interest rate has a negative impact on non-performing loans. This finding is consistent with the findings of Ajayi and Atanda (2012). Likewise, the beta coefficients for money supply are negative with non-performing loans. It indicates that money supply has

a negative impact on non-performing loans. This finding is consistent with the findings of Ayodele (2014). Further, the beta coefficients for GDP growth rate are negative with non-performing loans. It indicates that GDP growth rate has a negative impact on non-performing loans. This finding is similar to the findings of Zheng *et al.* (2019). However, the beta coefficients for inflation rate are positive with non-performing loans. It indicates that inflation rate has a positive impact on non-performing loans. This finding is not consistent with the findings of Omondi (2014). In addition, the beta coefficients for bank size are positive with non-performing loans. It indicates that bank size has a positive impact on non-performing loans. This finding is similar with the findings of Shikumo and Mirie (2020).

Table 5 shows the regression results of gross domestic product, money supply, inflation rate, interest rate, bank size and capital adequacy ratio with total loan and advances of Nepalese commercial banks.

Table 5

Estimated regression results of gross domestic product, money supply, inflation rate, interest rate, bank size and capital adequacy ratio with total loan and advances

The results are based on panel data of 16 commercial banks with 128 observations for the study period of 2016/17 to 2023/24 by using the linear regression model and the model is $TLA_{it} = \beta_0 + \beta_1 BS_{it} + \beta_2 CAR_{it} + \beta_3 IR_{it} + \beta_4 GDP_{it} + \beta_5 INFR_{it} + \beta_6 MS_{it} + e_{it}$, where, the dependent variable is NPL (Non-performing loan as measured by the ratio of non-performing loan to total loan, in percentage). The independent variables are GDP (Gross domestic product as measured by the annual percentage increase in the total value of goods and services produced in the economy, in percentage), MS (Money supply as measured by annual growth of broad money supply, in percentage), INFR (Inflation rate as measured by the annual percentage change in the general price level of goods and services in the economy, in percentage), IR (Interest rate as measured by the central bank's benchmark interest rate, in percentage), BS (Bank size as measured by the total assets of the banks, Rs. in billions) and CAR (Capital adequacy ratio as measured by the ratio of total capital to total risk weighted exposure, in percentage).

Model	Intercept	Regression coefficients of						Adj. R_bar^2	SEE	F-value
		BS	CAR	IR	GDP	INFR	MS			
1	9.618 (2.619)**	0.624 (40.225)**						0.927	19.252	162.485
2	6.361 (15.769)**		-0.115 (3.812)**					0.896	0.454	14.533
3	4.470 (16.053)**			-0.087 (1.313)				0.566	0.476	1.724
4	5.101 (78.020)				-0.059 (5.111)**			0.865	0.436	26.120
5	3.955 (24.384)**					0.165 (5.559)**		0.591	0.429	30.897
6	5.374 (39.420)**						-0.035 (4.163)**	0.814	0.449	17.327
7	0.046 (0.277)	0.917 (45.869)**	-0.020 (0.037)					0.949	0.107	1180.517
8	0.208 (1.221)	0.927 (47.359)**	-0.020 (0.037)	-0.046 (3.111)**				0.952	0.104	844.859
9	0.190 (0.992)	0.929 (41.758)**	-0.001 (0.177)	-0.046 (3.106)**	-0.001 (0.213)			0.952	0.104	628.777
10	0.216 (1.124)	0.921 (37.862)**	-0.002 (0.216)	-0.045 (3.043)**	-0.001 (0.320)	0.011 (1.146)		0.952	0.104	504.564
11	0.655 (2.158)*	0.921 (37.862)**	-0.003 (0.347)	-0.043 (2.902)**	-0.010 (1.688)	0.044 (2.180)*	-0.035 (4.163)**	0.953	0.103	429.492

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. Total loan and advances is the dependent variable.

Table 5 shows that the beta coefficients for capital adequacy ratio are negative with total loan and advances. It indicates that capital adequacy ratio has a negative impact on total loan and advances. This finding is consistent with the findings of Arintoko (2021). Similarly, the beta coefficients for interest rate are negative with total loan and advances. It indicates that interest rate has a negative impact on total loan and advances. This finding is consistent with the findings of Adzis *et al.* (2018). Likewise, the beta coefficients for money supply are negative with total loan and advances. It indicates that money supply has a negative impact on total loan and advances. This finding is not consistent with the findings of Akinbobola (2012). Further, the beta coefficients for GDP growth rate are negative with total loan and advances. It indicates that GDP growth rate has a negative impact on total loan and advances. This finding is similar to the findings of Moussa and Chedia (2016). However, the beta coefficients for inflation rate are positive with total loan and advances. It indicates that inflation rate has a positive impact on total loan and advances. This finding is consistent with the findings of Hosen and Muhari (2019). In addition, the beta coefficients for bank size are positive with total loan and advances. It indicates that bank size has a positive impact on total loan and advances. This finding is similar with the findings of Alexandri and Santoso (2015).

4. Summary and conclusion

Bank stability, in the context of commercial banks, is a multifaceted concept closely tied to the management of credit risk. It is the risk that borrowers may fail to meet their contractual obligations. Effective control of credit risk is fundamental to maintaining the bank's ability to consistently meet its obligations, preserve profitability, and absorb economic or financial shocks. Since lending forms the core function of commercial banks, excessive or poorly managed credit exposure can directly threaten their solvency and operational continuity. Therefore, the stability of commercial banks hinges on their ability to assess, monitor, and mitigate credit risk through sound lending practices, robust credit appraisal systems, and effective risk-based supervision. A stable banking system built on prudent credit risk management ensures trust in financial intermediation, facilitates smooth monetary policy transmission, supports business and household financing, and safeguards the broader financial system from systemic disruptions.

This study attempts to examine the macroeconomic and institutional determinants of non-performing loans in Nepalese commercial banks. This study is based on the secondary data of 16 Nepalese commercial banks, leading to a total of 128 observations.

The major conclusion of this study is that capital adequacy ratio, money supply, interest rate and gross domestic product have negative impact on non-performing loans and total loan and advances. It indicates that increase in capital adequacy ratio, money supply, interest rate and gross domestic product lead to decrease in non-performing loans and total loan and advances. In contrast, inflation rate and bank size have positive impact on non-performing loans and total loan and advances. It indicates that larger the bank size and inflation rate, higher would be the non-performing loans and total loan and advances. Similarly, the study also concluded that bank size followed by interest rate is the most influencing factor that explains the changes in non-performing loans in the context of Nepalese commercial banks. Likewise, the study also concluded that bank size followed by inflation rate is the most influencing factor that explains the changes in total loan and advances in the context of Nepalese commercial banks.

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