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RESEARCH ARTICLE

Nexus between Interest Spread and Non-Performing Loans: The Mediating Role of Lending in Nepali Banks

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Abstract

This study examined how the loans mediate the linkage between interest spread and non-performing loans (NPLs) in Nepali banks. The study took data from both public and private commercial banks currently operating in Nepal, and secondary data were sourced from Nepal Rastra Bank (NRB) over the period 2021Q3-2025Q2. Utilizing the stepwise regression estimator, finding discloses that interest spread substantially augment NPLs. The result shows that one percent increase/decrease in interest spread trigger 0.213 percent increase/decrease in NPLs. Conversely, the Capital Adequacy Ratio (CAR) reduces the credit risk. It showed that one percent increase/decrease in the CAR trigger 1.505 percent decrease/increase in NPLs. By contrast, liquidity, agriculture loans, and micro, cottage, small, and medium industries (MCSEM) loans amplify NPLs. It signifies that a one percent increase/decrease in liquidity, agriculture loans, and MCSEM triggers 0.891, 0.110, and 0.215 percent, respectively. The sensitivity, subgroup, and heterogeneity analysis also confirmed these findings. Finally, the result also confirmed that a rise in interest spread accelerates loan volume, and a rise in loan volume augments NPLs in Nepalese banks. The mediation effect is 0.097, which accounts for 45.54 percent of the total effect. The policymaker, such as NRB, could fix the lower limit and upper cap for interest spread, which can prevent banks from decreasing profitability and suffering higher NPLs. Bankers, on the other hand, could take more precautions about loan assessment and monitoring while granting loans with high interest spread.

Keywords: adverse selection hypothesis, asymmetric information hypothesis, credit risk, moral hazard hypothesis, panel data

Introduction

The rise in the cost of funds increases credit risk, adversely impacting banks' profitability by increasing loan loss provisions (Akhter, 2023; Kwashie et al., 2022). This supports the notion that profitability is inversely related to NPLs and loan loss provision is directly related to profitability (Alnabulsi et al., 2022). The increase in default loans also erodes the banks capital, which in turn reduces their lending capacity and has an adverse impact on the economic well-being of individuals, firms, and nations. Similarly, the deterioration of loan quality also raises the risk for depositors. Owners have limited liability and take on more risk to earn higher returns, but depositors' deposits would be worthless if banks become insolvent. This brings financial instability, and better banks can also go bankrupt. Therefore, regulators impose a deposit insurance scheme to protect small depositors. This scheme can stimulate banks' risk-taking behavior because depositors do not monitor the lending activities of banks (Cullen, 2023). It also increases banks' cost of funds, as banks must pay a deposit insurance fee for deposit insurance, which can motivate banks to take on more risk and increase NPLs.

Furthermore, the protection of depositors' deposits by deposit insurance schemes can increase deposit rates because they only consider deposit rates and do not consider whether banks are sound or not (Jameaba, 2018). However, empirical findings of Cullen (2023) found that deposit insurance does not influence the risk-taking behavior of banks. On the other hand, credit guarantees for prescribed sector lending, such as agriculture loans and MCSME, can bring moral hazard issues for banks because the government is liable to pay when loans turn into default.

The arguments for the impact of excess liquidity on NPLs are still conflicting. The excess liquidity, on the one hand, brings more competition within the banking sector and increases banks' risk-taking behavior (Nguyen et al., 2024). More competition increases deposit rates and decreases lending rates, which can increase deposit and loan volumes. The decrease in lending rates and the relaxing of credit standards increase loan volume and NPLs simultaneously. Therefore, competition motivates banks to hold a lower level of liquidity by channeling deposits to loans, which can increase NPLs of banks (Wang, 2018). Conversely, excess liquidity, on the other hand, offers more lending opportunities in expansionary economic periods, which increase banks' profitability and reduce NPLs of banks (Abu Khalaf & Awad, 2024).

The effect of agricultural loans on NPLs remains uncertain. From one perspective, loans to farmers and agro-farms by banks can diversify their loan portfolios, which reduces the credit risk of banks. Additionally, fulfilling their social obligation enhances banks' reputation, which in turn attracts more deposits at a lower cost and contributes to reducing the NPLs of banks. Additionally, credit guarantees for agriculture loans or putting agricultural lands as collateral or lending by group members can reduce credit risk in developing countries (Waheb et al., 2024). For instance, in Nepal, agriculture loans are up to NPR 30 million; the Deposit and Credit Guarantee Company compensates 80 percent for loan losses under NPR 5 million and 70 percent for loan losses between NPR 5 million and NPR 30 million (Deposit & Credit Guarantee Fund, 2024). The moral pressure exerted by group members may further reduce the NPLs of banks. Contrary to this perspective, the agriculture sector is more vulnerable, and the cash flows of farmers could not be predicted accurately due to climate change risk. This can increase the NPLs of banks. However, credit volume supplied by banks would not be affected by NPLs because the government provides credit guarantees for these loans (Yeasmin et al., 2024). For instance, commercial banks should compulsorily lend at least 15percent

of loan volume to the agriculture sector by mid-July 2027 (Nepal Rastra Bank, 2023).

Similarly, the influence of SME loans on NPLs is still unclear. From one perspective, the banks can diversify their loan portfolio and reduce default risk by offering short-term loans to the large number of SME borrowers. The SMEs primarily depend upon bank loans and maintain a good relationship with banks, and also banks provide financial and other advice to SME borrowers, which improves borrowers' income and thus reduces NPLs of banks. Similarly, in developing countries like Nepal, the government and central bank provide credit guarantees and interest subsidies for SME loans, which eliminate credit risk for the banks. For instance, in Nepal, MCSME loans are guaranteed up to NPR 30 million; the Deposit and Credit Guarantee Company compensates 80 percent for loans under NPR 5 million and 70 percent for loans between NPR 5 million and NPR 30 million (Deposit & Credit Guarantee Fund, 2024). Additionally, all commercial banks should compulsorily lend at least 15 percent of their loan volume to MCSME (Nepal Rastra Bank, 2023). This indicates that the guarantee funds only cover a maximum of 80 percent of the loan volume, and the remaining portion must be borne by banks whether the MCSME loan turns into a bad loan. Also, the SME sector boosts economic growth, which improves the debt service capacity of borrowers and thus decreases NPLs. Contrary to this perspective, SMEs can have higher production costs and lower profitability due to diseconomies of scale, inadequate information for credit evaluation, and a lack of quality collateral, which can increase banks' NPLs (Aysan & Disli, 2019).

This study, to the best of our knowledge, is the first attempt to investigate the mediating role of loan volume on the linkage between interest spread and NPLs, especially in the Nepalese context. The other contribution of this study has mainly three folds. First, this study offers a new evidence on the influence of CAR and liquidity on NPLs by using a recent dataset. Second, this study also poses new insight into the nexus between agriculture loans and NPLs and between the MCSME and NPLs in Nepal. Finally, this study offers policy implications to mitigate the credit risk of banks that foster financial stability.

This study presents the remaining sections of the study as follows. The theoretical and empirical review are presented in Section 2 under the subheading of literature review. Section 3 presents research design, variable description, and model specification under the subheading of methods. Section 4 presents the results. Sections 5 and 6 present discussion and conclusion, respectively.

Literature Review

Theoretical Review

This section presents the theoretical reviews that can help to develop a theoretical framework. First, the linkage between spread and NPLs can be explained by the "Adverse Selection and Moral Hazard" hypotheses initially formalized by Stiglitz and Weiss (1981). The "Adverse Selection Hypothesis" states that different borrowers have different debt service capabilities. The good borrowers are reluctant to take loans from the banks, while the interest rate spreads hike up because it increases costs and decreases profitability. Conversely, the borrowers who take loans from banks while the lending rate is high have to face more default risk due to the higher cost of funds and lower profitability. Hence, banks can leave angel borrowers and take devil borrowers due to a rise in interest spread. This happens because banks can have "asymmetric information" about borrowers.

Similarly, the "Moral Hazard" issue can develop due to high interest spread because borrowers can invest borrowed funds in risky project/s, which can produce high loan defaults to the banks. Additionally, banks can lend more funds to borrowers

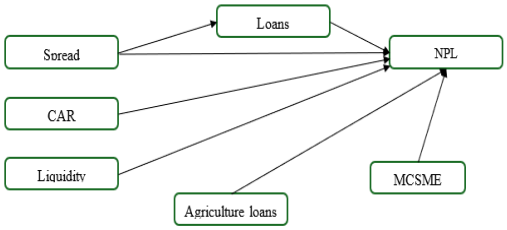
by relaxing credit standards, which can produce high NPLs in the banking sector. Similarly, the "Moral Hazard Hypothesis" propounded by Pauly (1968) can explain the linkage between the CAR and NPLs. It states that banks with lower equity capital motivate their managers and shareholders to participate in risky lending (Louzis et al., 2012) because they will get more returns while loans perform well, but depositors and creditors should bear losses when loans turn into NPLs. Nonetheless, the "Regulatory Capital Hypothesis" states that bank capital requirements solely depend upon the riskiness of lending portfolios, and therefore, banks can reduce risky loan portfolios to reduce regulatory capital (Shrieves & Dahl, 1992), which can reduce NPLs of banks.

In a similar vein, the "Moral Hazard Hypothesis" can explain the tie between liquidity and NPLs. The performance of managers is usually gauged by the ability to extend more credit, and their financial benefits are directly tied to lending volume (Acharya & Naqvi, 2012; Jiménez & Saurina, 2006). The excess liquidity provides the space for more lending to earn a high return by reducing interest rate (Borio & Zhu, 2012; Dell'Ariccia et al., 2014). Moreover, banks can grant more loans by easing credit standards without proper screening of the loan applications of new borrowers. Furthermore, they can provide loans by accepting substandard collateral, and can pay less attention to follow-up borrowers' activities, which can increase the NPLs of banks. Additionally, Acharya and Naqvi (2012) point out that those savers hesitate to invest directly in the corporate sector when "macroeconomic risk" is high and put their savings at banks as deposits that increase banks' liquidity. Moreover, banks channel these deposits into projects when "macroeconomic risk" is high, which can increase the NPLs of banks.

Finally, the "Information Asymmetric Hypothesis" and "Moral Hazard Hypothesis" can explain the link between agricultural loan and MCSEM. The "Information Asymmetric Hypothesis" states that simply agriculture sectors (e.g., farmers) and the SMEs lack audited financial statements, past credit history, and proper business plans (Berger & Udell, 2006). The banks face the challenges of distinguishing between angel and devil borrowers due to insufficient information about borrowers, which can increase default risk. The perceived risk of SMEs is high (Beck et al., 2005) because they cannot provide sufficient high-quality collateral, which makes loans vulnerable and increases the likelihood of default loans. Similarly, the government may run a credit guarantee program for both the agricultural sector and SMEs, which makes banks less sensitive about credit risk. The weak evaluation of loan applications and the monitoring mechanism due to credit guarantee can increase the NPLs of banks. The abovementioned theoretical review offers the ground to develop a theoretical framework, which is displayed in Figure 1.

Figure 1

Theoretical Framework



Note. Developed by authors based on theoretical review.

Empirical Findings

Interest Spread and Non-performing Loans

Earlier studies have shown that the spread can either increase/ decrease the NPLs of banks. For instance, Amuakwa-Mensah et al. (2017) analyzed the factors that affect NPLs in Ghana, covering the period 1997-2011. This study confirmed that an increase in the lending rate decreases NPLs in Ghana.

They noted that a better loan application screening and monitoring system reduces loan default and thus decreases NPLs. Das Gupta et al. (2021) analyzed the linkage between cost of financial intermediation, risk, and efficiency using a sample of 32 banks from Bangladesh for the period 2000-2016. Notably, utilizing the system Generalized Method of Moments (GMM) estimator, this study found that interest spread stimulates NPLs in Bangladesh. This finding suggests that banks' lending with a higher spread may increase their profitability, and this profit can be utilized to develop more sophisticated credit evaluation and monitoring mechanisms. Likewise, strong profitability can enhance banks' reputation and lend to more creditworthy borrowers; as a result, NPLs can decrease. The improved profitability enables banks to supply necessary capital to borrowing firms regularly, even during crisis periods, which increases firms' debt service capability and reduces the NPLs of banks. Umar et al. (2021) drew the same finding of interest, namely that the spread of interest reduces NPLs in the EU context. Similarly, Golitsis et al. (2022) concluded that interest rates have a positive impact on NPLs. In the context of Bangladesh, Waheb et al. (2024) found that a rise in interest spread boosts the cost of loans for farmers and makes them reluctant to hold these costly loans and repay their bank loans, which reduces banks' credit risk. Based on the above-reported current literature, this study proposes the first hypothesis as:

H_1: The interest spread positively impacts the NPLs of banks.

Loans and Non-performing Loans

Recent empirical evidence has shown conflicting outcomes, ranging from a negative to a positive impact of loan volume on NPLs of banks. For instance, Kuzucu and Kuzucu (2019) analyzed the factors of NPLs using 83 sample countries from both the emerging and advanced economies for the period 2001-2015. This study found that loan volume did not influence NPLs in both economies. Similarly, Golitsis et al. (2022) analyzed the determinants of non-performing loans in North Macedonia for the period 2005Q1-2022Q2 and concluded that gross loans do not show any impact on NPLs. Moreover, Akhter (2023) reported that the loan-to-deposit ratio makes it possible to reduce NPLs in Bangladesh. Conversely, Alnabulsi et al. (2022) draw the opposite conclusion that loan-to-deposit ratios increase NPLs in the Middle East and North Africa (MENA) region. Amuakwa-Mensah et al. (2017) analyzed the factors that affect NPLs in Ghana, covering the period 1997-2011. They found that an increase in loans decreases NPLs in Ghana. Loan-to-assets also negatively affects NPLs in Ghana. Wu and Zhang (2025) concluded that loan-to-deposit ratios do not significantly increase credit risk in China. Based on these more recent reviews of the above literature, this study proposes the second hypothesis as:

H_2: The volume of loans positively impacts the NPLs of banks.

Capital Adequacy Ratio and Non-performing Loans

The relationship between loans and NPLs has been the subject of conflicting findings in recent empirical research. For instance, Kuzucu and Kuzucu (2019) analyzed the factors of NPLs using 83 sample countries from both the emerging and advanced economies for the period 2001-2015. Applying the system GMM estimator, the study found that the capital did not impact NPLs in the emerging economies; however, it negatively impacted NPLs in advanced economies. Similarly, Akhter (2023) analyzed how the various determinants that affect NPLs in Bangladesh using a sample of 30 banks for the period 2011-2020. Notably, this study found that the CAR was able to reduce NPLs in Bangladesh. Suljić Nikolaj et al. (2022) also

found that capital ratio (equity/total assets) increases banks' stability significantly and NPLs insignificantly. Contrary to this finding, Umar et al. (2021) and Alnabulsi et al. (2022) drew the same conclusion that the CAR reduces NPLs in the MENA region. The majority of the current study revealed that the CAR reduces NPLs of banks. Hence, this study proposes the third hypothesis as

H_3: The CAR negatively affects the NPLs of banks.

Liquidity and Non-performing Loans

The liquidity, on the one hand, protects banks from unexpected liquidity crises, enables payment for unexpected deposit withdrawals, and can renew loans for regular borrowers, which can boost banks' reputation. Additionally, it allows banks to obtain deposits at lower interest rates and lend at favorable rates, thereby decreasing banks' NPLs. The liquidity, on the other hand, offers banks negligible income, which can motivate them to engage in risky lending activities because managers' performance is evaluated by achieving greater profit for the banks. The risky lending portfolio offers a higher return, but it can increase the NPLs of banks.

In this context, Suljić Nikolaj et al. (2022) analyzed the effect of deposit insurance on banks' stability and NPLs in 34 EU countries. They found that deposit insurance brings stability but also increases NPLs. It suggests that banks can take more risk with deposit insurance because depositors do not closely monitor the risk-taking behavior of banks. This study also examined the impact of liquidity on stability and NPLs and found, using the GMM estimator, that liquidity decreases stability but increases credit risk in EU member and non-member countries. This finding signified that the excess liquidity motivates banks to invest in risky loans because liquid assets generate negligible returns. Nguyen et al. (2024) also supported this finding. They argued that excess liquidity motivates banks to take on more risk by compromising financial stability to earn a higher return when a country's growth is high and the regulator (especially the Central Bank) follows an expansionary monetary policy.

Additionally, depositors and other fund suppliers often overlook the banks' risk-taking behavior when favorable economic conditions prevail. Similarly, Wang (2018) found that holding less liquidity by lending more increases the NPLs of banks. The above-mentioned empirical findings suggested that liquidity increases NPLs of banks. Hence, this study proposes the fourth hypothesis as:

H_4: The liquidity positively influences the NPLs of banks.

Agriculture Loans and Non-performing Loans

The recent empirical literature reveals conflicting outcomes regarding the relationship between loans to the agriculture sector and NPLs. For instance, Umoren et al. (2016) analyzed the impact of agriculture loans on NPLs in Nigeria for the period 1980-2015. The findings revealed that agricultural loans did not affect NPLs in the short run, but they had a positive impact on it in the long run. It indicated that the agriculture sector produced more credit risk in the developing countries, such as Nigeria. The possibility of such effects may be the reason loans are granted to poor farmers without sufficient collateral. Their agricultural outputs might be affected by drought, production costs might be high, the output price is comparatively low, and the inflation rate is very high. Wahab et al. (2024) examined the influence of climate change on the total recovery of agriculture loans in Pakistan for the period 2000-2020. The result showed that a favorable climate improves farmers' total disposable income and decreases bad loans for banks. Zhang et al. (2025) analyzed the impact of the credit incentive policy (CIP) on agricultural

output growth in China for the period 2000-2019. The outcome showed that CIP increases agro-output by 15.4 percent and the formal credit offered to the agriculture sector fosters its productivity. Furthermore, this study pointed out that formal credit to agribusiness reduces NPLs, increases credit by the formal sector, and promotes modernization of the agricultural industry by enhancing investment in machinery. The fifth hypothesis is as follow:

H_5: The agriculture loans positively impact the NPLs of banks.

Micro, Cottage, Small, and Medium Industries Loans and Non-performing Loans

As pointed out by Moore and Craigwell (2003), the cost of lending to SMEs is higher compared to large firms because the information collection costs are high for SMEs as they are not easily available, and loan administrative and monitoring costs are high. Moreover, the per-unit loan assessment costs are high due to scale diseconomies, and SMEs do not have alternative sources of funds and are forced to accept the terms and conditions of the commercial banks. These facts collectively might increase spread rates to the SMEs and can increase NPLs of banks. However, Shihadesh et al. (2019) found that loans to SMEs reduce NPLs in Palestine and confirmed this with both estimators, such as the panel VAR and FE estimators. This finding indicated that the bank could supply needed funds to SMEs that could help to foster their business and offer new opportunities to enter into new markets, upgrade their technology, and empower their management and employees. Furthermore, the success of SMEs has a multilayer effect on the economy by creating job opportunities and reducing poverty, which could further help to reduce the overall NPLs of banks. This study proposes a sixth hypothesis after examining the above-mentioned literature as

H6: The MCSME of loans positively impacts the NPLs of banks.

Methods

This study is guided by objective reality and uses a quantitative approach to investigate the linkage between spread and NPLs via loan volume in Nepalese banks. To attain this objective, the study collected secondary data for the respective banks from the NRB website for the period from 2021Q3 to 2025Q2, and used summary statistics (mean, SD, min, and max) to describe the basic features of the variables used in the study. Furthermore, a graph of the outcome and the main predictor variable is presented to show the current trend in these variables. The multicollinearity problem is evaluated by using both correlation analysis and VIF tests, with a cutoff point of 0.8 for Pearson's correlation (Gujarati & Porter, 2009; Field, 2024) and 10 for VIF (Gujarati et al., 2009; O'Brien, 2007). If this study finds multicollinearity issues among the explanatory variables, this study does not use both variables in the same regression model. Finally, this study uses a stepwise regression estimator to explain the above-mentioned nexus between outcome and explanatory variables.

Variables and Their Description

Table 1 presents the variables in the current study, their measurements, symbols, and previous studies in which they have been used. The outcome variable is NPLs, measured as non-performing loans divided by total loans, and a higher NPLs indicates a higher credit risk. The main explanatory variable is SPREAD, measured as the difference between the lending and deposit rates; a higher interest spread signals that banks charge borrowers a higher lending rate than they pay on deposits. This study used LOAN as a mediating variable, and loan volume is measured in NPR. Other explanatory variables are CAR, LIQUIDITY, AGRILOAN, and MCSME. The CAR is measured as total capital fund divided by total risk-weighted exposure, and a higher value of this indicator indicates a

greater loss-absorbing capacity of banks and vice versa. Similarly, another explanatory variable, LIQUIDITY, is measured as net liquid assets divided by total deposits. Similarly, another explanatory variable is AGRILOAN, which is measured as the agriculture loan divided by total loans. The final explanatory variable is MCSME, which is measured as micro, cottage, small, and medium industries loans divided by total loans. The higher value of these two variables-AGRILOAN and MCSME-indicates that banks are given greater priority to lend in prescribed sectors.

Table 1
Variable Description

Variables	Measurements	Symbol	Sources
Non-performing loans	$\frac{\text{Non - performing loans}}{\text{Total loans}}$	NPLs	Amuakwa-Mensah et al. (2017), Shihadeh et at. (2019), Kuzucu and Kuzucu (2019),
Spread	Lending rate – deposit rate	SPREAD	Wahab et al. (2024)
Loan	Loan volume in NPR	LOAN	Amuakwa-Mensah et al. (2017), Golitsis et al. (2022), Akhter (2023)
Capital adequacy ratio	$\frac{\text{Total capital fund}}{\text{Total risk weighted exposures}}$	CAR	Alnabulsi et al. (2022, Akhter (2023), Wu and Zhang (2025)
Liquidity	$\frac{\text{Net liquid assets}}{\text{Total deposits}}$	LIQUIDITY	Suljić Nikolaj et al. (2022)
Agriculture loan	$\frac{\text{Agriculture loan}}{\text{Total loans}}$	AGRILOAN	Umoren et al. (2016), Wahab et al. (2024)
Micro, cottage, small, and medium industries loans	$\frac{\text{Micro, cottage, small, and medium industries loan:}}{\text{Total loans}}$	MCSME	Aysan and Dilsi (2019), Shihadeh et at. (2019)

Model Specification

Baseline Regression

This study examined how the loans mediate the linkage between interest spread and non-performing loans (NPLs) in Nepalese banks over the period 2021Q3-2025Q2. Hence, the study analyzed the influence of SPREAD, LOAN, CAR, LIQUIDITY, AGRILOAN, and MCSME on NPLs. This study expresses the following function to accomplish the research objectives.

NPLs= *f*(SPREAD, LOAN, CAR, LIQUIDITY, AGRILOAN, MCSME)

To achieve the research objective, the study presents the baseline regression as:

$$\text{LnNPLs}_{it} = a_1 + \beta_1 \text{LnSPREAD}_{it} + \eta_1 X_{it} + \lambda_i + \varepsilon_{it} \quad \ldots\ldots\ldots (1)$$

Where NPLs represent credit risk. SPREAD denotes interest spread. X_{it} denotes other predictor variables, which include CAR, LIQUIDITY, AGRILOAN, and MCSME. CAR denotes regulatory capital. LOAN represents the loan volume expressed in NPR. LIQUIDITY represents liquid assets relative to deposits held by banks. AGRILOAN represents loans to the agriculture sector relative to total loans. MCSME denotes loans to micro, cottage, small, and medium industries loans relative to total loans. λ_i and ε_{it} represent individual fixed effects and random error term (Wu & Zhang, 2025, p.3). t denotes the year, and i denotes the bank. β and η denote the coefficients of main and other predictor variables, respectively.

Mediating Effect Model

This study employs a stepwise regression estimator to investigate the impact of SPREAD on NPLs via LOAN. As noted by Wu (2025), this study proposed the following three models to examine the mediation effect.

$$LnNPLs_{it} = a_1 + \beta_1 LnSPREAD_{it} + \eta_1 X_{it} + \lambda_i + \varepsilon_{it} \ldots\ldots\ldots (2)$$

$$LnLOAN_{it} = a_2 + \beta_2 LnSPREAD_{it} + \eta_2 X_{it} + \lambda_i + \varepsilon_{it} \ldots\ldots\ldots (3)$$

$$lnNPLs_{it} = a_3 + \varphi LOAN + \beta_3 LnSPREAD_{it} + \eta_3 X_{it} + \lambda_i + \varepsilon_{it} \ldots\ldots\ldots (4)$$

Results

Descriptive Statistic

The basic characteristics of the main study variables-interest spread and NPLs-are displayed in Figure 2, for 20 banks individually covering the period from 2021 to 2025. The blue line and red line denote the trend lines of NPLs and interest spread, respectively. The result demonstrated that almost all banks have a rising trend of NPLs, mainly from 2023, which indicates that loan quality is deteriorating or credit risk is rising across the Nepalese banks. Similarly, the red line depicts that the interest spread is rising to the year 2023, and it became stable (or slightly declined) after 2023. More specifically, NPLs of HBL, KBL, NICASIA, and Prabhu have begun to increase after 2023, but their interest spreads remain approximately flat. Similarly, the rising trend of NPLs of EBL, GIMB, and MBL shows their higher credit risk exposure. The rising trend of NPLs and either flat or decreasing trend of spreads of ADBL, Citizen, NABIL, NBL, RBB, SBL, and PCBL indicate that they are facing an adverse situation due to deteriorating profitability and asset quality. In a nutshell, the result indicates that an increase in interest spread can also increase NPLs in the Nepalese banks.

Figure 2

Basic Characteristics of Interest Spread and NPLs

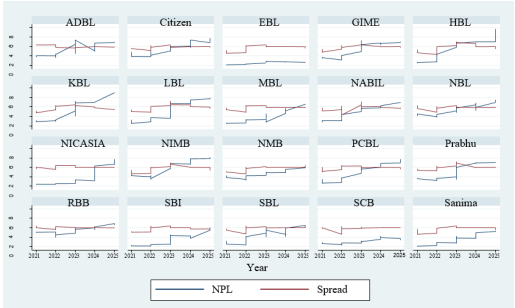


Table 2 displayed the results of the descriptive characteristics such as mean, standard deviation (SD), min, and max value of response variable-NPLs-and predictor variables-spread, loans, CAR, liquidity, agriculture loans, and MCSME of Nepalese banks. Results reveal that the spread of NPLs is 7.57 percent, with mean and SD of 2.665 percent, and 1.684 percent, respectively. This spread value 7.57 percent indicates that NPLs is highly dispersed in Nepalese banks. On the contrary, the spread of interest spread is 2.92 percent, with mean and SD of 3.919 percent, and 0.477 percent, respectively. It imply that interest spread is comparatively less volatile in Nepalese banks. The spread of loans is NPR 366926 with a mean and SD of NPR 205045.6 and NPR 76840.02, respectively. It demonstrates that loans volume of Nepalese banks is highly volatile. The spread of CAR is 13.15 percent, with the mean and SD of 13.172 percent and 1.369 percent. The lower value of SD signifies that the CAR is less volatile. The spread of liquidity is 31.81percent, with mean and SD of 27.457 percent and 5.722 percent, respectively. Similarly, the spread of agriculture loans is 33.17 percent, with mean and SD of 13.172 percent and 5.195 percent. Finally, the spread of MCSME is 40.22 percent, with mean and SD of 9.834 percent and 6.277 percent, respectively.

Table 2

Descriptive Statistics

Variables	Observations	Mean	SD	Min	Max
NPLs (%)	320	2.665	1.684	0.11	7.68
SPREAD (%)	320	3.919	0.477	2.28	5.2
LOAN (in NPR)	320	205045.6	76840.02	71906	438832
CAR (%)	320	13.172	1.369	10.16	23.31
LIQUIDITY (%)	320	27.457	5.722	15.44	47.36
AGRILOAN (%)	320	13.172	5.195	8.32	41.49
MCSME (%)	320	9.834	6.277	0.69	40.91

Note. NPLs denotes non-performing loans. SPREAD represents interest spread. LOAN denotes loan volume in NPR. CAR represents the capital adequacy ratio. LIQUIDITY denotes liquid assets relative to total deposits. AGRILOAN represents the share of agriculture sector loans relative to total loans. MCSME denotes loans to "micro, cottage, small, and medium industries loans" relative to total loans. SD, Min, and Max represent standard deviation, minimum, and maximum, respectively.

Correlation Analysis

Table 3 displayed the outcome of the analysis of correlation and VIF, and was specially designed to check multicollinearity issues within predictor variables.

Table 3

Correlation Analysis

Variables	NPLs	Spread	Loans	CAR	Liquidity	Agricultural loans	MCSME
NPLs	1						
SPREAD	0.261***	1					
	(0.000)						
LOAN	0.553***	0.275***	1				
	(0.000)	(0.000)					
CAR	-0.264***	-0.007	-0.369***	1			
	(0.000)	(0.895)	(0.000)				
LIQUIDITY	0.293***	0.155***	0.019	0.240***	1		
	(0.000)	(0.005)	(0.733)	(0.000)			
AGRILOAN	0.082	0.029	-0.084	0.274***	0.132**	1	
	(0.143)	(0.594)	(0.136)	(0.000)	(0.018)		
MCSME	0.217***	0.067	0.118**	0.110**	-0.013	0.452***	1
	(0.000)	(0.231)	(0.029)	(0.049)	(0.813)	(0.000)	
VIF		1.11	1.33	1.37	1.13	1.35	1.34

Note. NPLs denotes non-performing loans. SPREAD represents interest spread. LOAN denotes loan volume in NPR. CAR represents the capital adequacy ratio. LIQUIDITY denotes liquid assets relative to total deposits. AGRILOAN represents the share of agriculture sector loans relative to total loans. MCSME denotes loans to "micro, cottage, small, and medium industries loans" relative to total loans. VIF represents variance inflation factor. ***, **, and * denotes $p < 0.01$, $p < 0.05$, and $p < 0.1$, respectively.

The association between predictor variables is less than 0.8, and VIF is lower than 5. It indicates that no multicollinearity issues prevail across the predictor variables for further statistical analysis. Moreover, the correlation between predictors and the response variable also shows the direction and strength of association and

the likelihood of the impact of predictor variables on the response variable. The relationship between the primary predictor variable, spread, and NPLs is positive and significant, which indicates that spread and NPLs move in the same direction. Similarly, the association between loans and NPLs is detected as positive and significant. It reveals that extending more credit without proper credit evaluation and monitoring can increase NPLs in Nepalese banks. Nonetheless, the correlation between the CAR and NPLs is negative, and it signals that an increase in CAR, can mitigate credit risk. On the contrary, the association between liquidity and NPLs, and MCSME and NPLs is positive and significant, and these indicate that an increase in liquidity volume and MCSME loans can stimulate NPLs in Nepalese banks. Similarly, the relationship between agricultural loans and NPLs is positive; however, it is insignificant. It indicates that agriculture loans can have a minimal impact on NPLs.

Baseline Regression Analysis

Table 4 displays the results of baseline regression analysis. This study deploys stepwise regression to examine the impact of spread on NPLs (or, credit risk) in Nepalese banks.

Table 4

Baseline Regression Result

Variables	Response variable: NPLs				
	(1)	(2)	(3)	(4)	(5)
SPREAD	0.332*** (0.000)	0.329*** (0.000)	0.261*** (0.000)	0.262*** (0.000)	0.213*** (0.000)
CAR		-1.102*** (0.000)	-1.473*** (0.000)	-1.591*** (0.000)	-1.505*** (0.000)
LIQUIDITY			0.849*** (0.000)	0.815*** (0.000)	0.891*** (0.000)
AGRILOAN				0.219** (0.018)	0.110 (0.216)
MCSME					0.215*** (0.000)
Constant	-0.120 (0.589)	2.728*** (0.000)	1.155 (0.115)	1.008 (0.167)	0.553 (0.427)
F-statistics	34.59*** (0.000)	34.57*** (0.000)	35.15*** (0.000)	28.17*** (0.000)	32.15*** (0.000)
Observation	320	320	320	320	320
Adj. R^2	0.095	0.095	0.243	0.251	0.328

Note. NPLs denotes non-performing loans. SPREAD represents interest spread. CAR represents the capital adequacy ratio. LIQUIDITY denotes liquid assets relative to total deposits. AGRILOAN represents the share of agriculture sector loans relative to total loans. MCSME denotes loans to "micro, cottage, small, and medium industries loans" relative to total loans. VIF represents the variance inflation factor. ***, **, and * denotes $p < 0.01$, $p < 0.05$, and $p < 0.1$, respectively.

Result showed that interest spread stimulate NPLs in Nepalese banks and consistent across all five regression models. The model (5) implies that as one percent increase in interest spread trigger 0.213 percent increase in NPLs since the coefficient is positive. By contrast, the CAR adversely affects NPLs in Nepalese banks and is consistent across all four models. The model (5) suggests that a one percent increase in the CAR trigger 1.505 percent decrease in NPLs. On the contrary, the liquidity positively affects NPL and is consistent across three models. This implies that a one percent increase in the liquidity trigger 0.891 percent increase in NPLs. Similarly, the agriculture loans positively affect NPLs and are consistent across two models, but are insignificant in model five. This implies that as one percent increase in the agriculture loans results in a 0.110 percent increase in NPLs. Finally, the MCSME significantly stimulates NPLs in Nepalese banks. This suggests that as one percent increase in the MCSME trigger 0.215 percent increase in NPLs.

Sensitivity Analysis

Table 5 reports the results of the consistency test for the validation of baseline regression results. In the first model, this study used the natural logarithm of the spread instead of the spread in percentage form. In the second model, lag of LnSPREAD is used as the primary predictor variable. The result of the first model presented in Table 4 shows that the spread has a positive effect on NPLs, which is consistent with the findings of baseline results.

Table 5

Robustness Check

Variable	Response variable: NPLs	
LnSPREAD	0.784***	
	(0.000)	
Lag SPREAD		0.949***
		(0.000)
CAR	-1.494***	-1.510***
	(0.000)	(0.000)
LIQUIDITY	0.875***	0.810***
	(0.000)	(0.000)
AGRILOAN	0.111	0.0832
	(0.213)	(0.348)
MCSME	0.212***	0.194***
	(0.000)	(0.000)
Constant	0.357	0.513
	(0.613)	(0.498)
F-statistics	32.06***	33.88***
	(0.000)	(0.000)
Observation	320	300
Adj. R^2	0.328	0.355

Note. NPLs denotes non-performing loans. SPREAD represents interest spread. CAR represents the capital adequacy ratio. LIQUIDITY denotes liquid assets relative to total deposits. AGRILOAN represents the share of agriculture sector loans relative to total loans. MCSME denotes loans to "micro, cottage, small, and medium industries loans" relative to total loans. VIF represents the variance inflation factor. ***, **, and * denotes $p < 0.01$, $p < 0.05$, and $p < 0.1$, respectively.

Similarly, the results of predictor variables such as CAR, liquidity, Agriculture loans, and MCSME are similar to the baseline results. The outcome of the second model depicted in Table 4 shows that the lag of spread also increases NPLs in Nepalese banks. Also, the impact of other predictor variables on NPLs is in line with the baseline results. In a nutshell, the sensitivity analysis validates the baseline regression results.

Subgroup Analysis

Table 6 reports the results of subgroup analysis. This study divides the Nepalese commercial banking industry into public banks and private (Joint Venture Banks).

Table 6

Subgroup Analysis

Variable	Response variable: NPLs	
	Public Banks	Joint Venture Banks
SPREAD	-0.190* (0.083)	0.226*** (0.000)
CAR	-1.012*** (0.000)	-1.722*** (0.000)
LIQUIDITY	0.479*** (0.001)	0.941*** (0.000)
AGRILOAN	0.144** (0.035)	0.122 (0.465)
MCSME	-0.259* (0.056)	0.182*** (0.001)
Constant	3.646*** (0.000)	0.927 (0.416)
F-statistics	14.90*** (0.000)	23.64*** (0.000)
Observation	48	272
Adj. R^2	0.597	0.295

Note. NPLs denote non-performing loans. SPREAD represents interest spread. CAR represents the capital adequacy ratio. LIQUIDITY denotes liquid assets relative to total deposits. AGRILOAN represents the share of agriculture sector loans relative to total loans. MCSME denotes loans to "micro, cottage, small, and medium industries loans" relative to total loans. VIF represents the variance inflation factor. ***, **, and * denotes $p < 0.01$, $p < 0.05$, and $p < 0.1$, respectively.

The findings depict somewhat unexpected outcomes in public banks compared with the whole sample of banks and with the results of joint venture banks. For instance, the coefficient of interest spread has shown a positive effect on NPLs in the whole sample and joint venture banks; however, in public banks, they have a negative but insignificant impact on NPLs. Moreover, the CAR and liquidity have shown the same results in both the whole sample and the subgroup (public and joint venture banks). Similarly, the results are similar for agriculture loans in whole banks, public banks, and joint venture banks. However, some discrepancies were found in the impact

of MCSME on NPLs. For instance, MCSME has a negative impact on NPLs for public banks, and it has shown positive results for joint venture banks. In a nutshell, the impact of interest spread and other variables is almost the same in the whole sample and the subsample, mainly in joint venture banks. However, some discrepancies were found in public banks, and this discrepancy may be a result of the small number of observations and their own distinct attributes.

Mediating Effect Analysis

Table 7 presents the outcome of mediation analysis based on the models (2), (3), and (4) described in the methodology section. The result of model 2 shows that the coefficient of spread (β_1 = 0.213, p < 0.01), which measures the total effect of spread on NPLs is 0.213, is positive and significant.

Table 7

Mediating Analysis

Variables	Model(2)	Model(3)	Model(4)
SPREAD	0.213***	0.166***	0.117***
	(0.000)	(0.000)	(0.000)
LOAN			0.584***
			(0.000)
CAR	-1.506***	-1.603***	-0.569**
	(0.000)	(0.000)	(0.026)
LIQUIDITY	0.891***	0.125	0.819***
	(0.000)	(0.150)	(0.000)
AGRILOAN	0.111	-0.045	0.138*
	(0.209)	(0.478)	(0.087)
MCSME	0.215***	0.169***	0.116***
	(0.000)	(0.000)	(0.000)
Constant	0.554	14.997***	-8.205***
	(0.426)	(0.000)	(0.000)
F-statistics	32.23***	33.49***	43.82***
	(0.000)	(0.000)	(0.000)
Observation	320	320	320
Adj. R^2	0.328	0.299	0.445

Note. NPLs denotes non-performing loans. SPREAD represents interest spread. LOAN denotes loan volume in NPR. CAR represents the capital adequacy ratio. LIQUIDITY denotes liquid assets relative to total deposits. AGRILOAN represents the share of agriculture sector loans relative to total loans. MCSME denotes loans to "micro, cottage, small, and medium industries loans" relative to total loans. VIF represents variance inflation factor. ***, **, and * denotes p < 0.01, p < 0.05, and p < 0.1, respectively.

This indicates that a rise in interest spread also accelerates NPLs in Nepalese banks. Similarly, in models (3) and (4), β_2 and β_3 are positive and significant (β_2 = 0.166, p < 0.01, and β_3 = 0.584, p < 0.01), which indicates that a rise in interest spread also accelerates loan volume and a rise in loan volume increases NPLs in Nepalese banks. Finally, in model (4), β_3 is still positive;

however, the value of β_3 is lower than that of β_1, which indicates that interest spread can reduce NPLs by influencing loan volume, such as rising CAR, decreasing liquidity, and lending more to MCSME. Furthermore, the result reveals that the total mediation effect is 0.097, that is ($\varphi\beta_2 = 0.584\ x\ 0.166 = 0.097$), which represents 45.54% (that is $\frac{\varphi\beta_2}{\beta_1} = 0.097/0.213$) of the total effect.

Discussion

This study primarily analyzes the impact of the spread on NPLs via loan volume. The result revealed that interest spread stimulates NPLs in Nepalese banks. This finding supports both "Adverse Selection Theory" and "Moral Hazard Theory". Similarly, this finding is similar to the earlier empirical finding of Golitsis et al. (2022) and dissimilar to the findings of Amuakwa-Mensah et al. (2017), Das Gupta et al. (2021), Umar et al. (2021), and Waheb et al. (2024). This result suggests that a rise in interest spread motivates managers to lend more aggressively by relaxing credit standards, as their manager capability is directly judged by their ability to meet loan targets, and their salaries and other financial benefits are tied to their lending capacity. This ultimately can lead to an increase in NPLs. Similarly, loan volume increases NPLs in Nepalese banks. This finding also supports the "Moral Hazard Theory". This finding does not match the earlier findings of Kuzucu and Kuzucu (2019), Golitsis et al. (2022), and Wu and Zhang (2025). This suggests that lending higher loans without proper loan screening and monitoring can increase NPLs volume.

Conversely, the CAR adversely affects NPLs in Nepalese banks, supporting the "Moral Hazard Hypothesis" and "Regulatory Capital Hypothesis". This finding is the same as the earlier findings of Akhter (2023), Umar et al. (2021), and Alnabulsi et al. (2022). But contradict the previous results of Kuzucu and Kuzuku (2019) and Suljić Nikolaj et al. (2022). This suggests that a higher level of CAR imposed by the regulatory authority can reduce NPLs because owners directly observe the lending behavior of managers and become more cautious when they invest more. Conversely, liquidity stimulates NPLs in Nepalese banks, which supports the "Moral Hazard Hypothesis". This finding is the same as the previous findings of Suljić Nikolaj et al. (2022) and Nguyen et al. (2024). This suggests that liquid assets earn negligible returns and financial and non-financial benefits of managers are directly linked with bank performance, and they engage in risky lending by reducing liquidity, which can increase NPLs of banks.

Similarly, agriculture loans boost NPLs in Nepalese banks, which supports the idea of "Information Asymmetric Hypothesis". This finding does not match the findings of Umoren et al. (2016), Waheb et al. (2024), and Zhang et al. (2025). This suggests that the agricultural sector is more vulnerable, especially due to climate change risks, by which farmers' cash flow cannot be predicted with greater accuracy. Likewise, the price of agricultural products is highly volatile in developing countries like Nepal. Furthermore, banks may face the problems of loan monitoring due to high costs. All these factors can increase banks' NPLs. Similarly, MCSME boosts NPLs in Nepalese banks, which supports the idea of "Moral Hazard Theory". This finding matches the finding of Moore and Craigwell (2003) but does not match the results of Shihadesh et al. (2019). This suggests that the costs of loan assessment and monitoring could be high for banks, which can increase banks' lending rate, distorting borrowers' debt service capacity, and increasing the NPLs of banks. Likewise, the MCSMEs do not have other sources of financing and must rely on bank financing, which increases banks' bargaining power. They can charge a higher interest rate to MCSME, which stimulates costs, reduces debt-paying capability, and

increases NPLs.

Conclusion

This study investigates the mediating role of interest spread in the link between spread and NPLs. This study employs the sample of both public and joint venture commercial banks currently operating in Nepal. It has collected quarterly secondary data from the NRB's website for the period from 2021Q3 to 2025Q2. The descriptive statistics, correlation analysis, and VIF are performed as pre-estimation tests before applying the stepwise regression estimator. The study concludes that the interest spread positively impacts NPLs. The mediation analysis confirms that both interest spread and loan volume positively impact NPLs in Nepali banks. The CAR, on the other hand, negatively impacts NPLs. The liquidity, loans to the agriculture sector, and MCSEM positively and significantly impact NPLs.

Regulators/policymakers and bankers should be aware of the rising interest spread and make efforts to lower it. It can be done by either fixing the upper cap on spreads or increasing competition within the banking system by lowering entry barriers and increasing incentives to open new branches. Similarly, rising loan volume resulting from relaxed credit standards also increases NPLs; therefore, Nepalese banks should implement strict credit evaluation and follow-up mechanisms to reduce NPLs. Additionally, bankers should run a financial literacy program for borrowers to help them use borrowed money properly. The negative impact of CAR on NPLs indicates that the regulator must increase or maintain minimum capital requirements prescribed by banking regulation. The positive impact of liquidity on NPLs suggests that banks should hold an optimal level of liquidity. Similarly, loans to the agriculture and MSME sectors also increase NPLs, suggesting that the government should implement a credit guarantee program to protect banks from higher credit risk.

Though this study offers new insights into the nexus between spread and NPLs via loan, it opens a new space for future research. Future studies can include more variables, such as green finance (for instance, hydroelectricity loans, loans for electric vehicles, and loans for clean energy), macroeconomic variables, and more extended sample periods. Furthermore, future studies can use new econometric models that can address endogeneity issues and offer more robust results.

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Availability of Data and Materials

Data are safely stored. They will be made available in special request.

Conflict of Interest

The authors declare that there is no conflict of interest in relation to this manuscript.

Ethical Compliance

This study used the secondary sources of data. We declare that the study was conducted in accordance with accepted ethical standards.

Consent for Publication

"Not applicable"

Plagiarism and AI Use

The manuscript is free from plagiarism and improper use of AI-generated content.

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