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Bank Specific and Macroeconomic Determinants of Non-Performing Loans of Nepalese Commercial Banks: A Balanced Panel Data Analysis

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Abstract

The determinants of credit risk need to be established because non-performing loans (NPLs) are a major threat for the stability and performance of commercial banks. This study aims to explore the factors that influence the NPLs of the commercial banks of Nepal with the help of a balanced panel data with 10 commercial banks and 120 bank-year observations for the period 2013/14 to 2024/25. It uses the Panel data regression analysis techniques with the Random Effects Model being chosen by the findings of the Breusch-Pagan Lagrange Multiplier Test and Hausman Specification test. The result revealed that the overall model explains almost 59.5 percent of the variations in NPLs of the commercial banks in Nepal. This further showed that among the variables used in the study, Return on Assets and Capital Adequacy Ratio have negative influence on the NPLs whereas Bank Size has positive influence on NPLs, but Credit Growth does not have any influence on NPLs. Conversely, GDP Growth, Inflation and Unemployment have a positive impact on NPLs while Weighted Average Lending Rate (WALR) has a negative impact on NPLs. Therefore, it is concluded that the credit risk of Nepalese commercial banks is affected by both bank specific and macroeconomic factors and that bank specific factor has the greater effect on the credit risk of commercial banks in Nepal in comparison to macroeconomic factor. This study supplements the knowledge on risk management practices of commercial banks of Nepal and particularly on NPL in Nepal. The study's findings have several managerial and policy implications regarding improvement of the credit risk management strategies of commercial banks and Nepal Rastra Bank respectively.

Keywords: Non-performing loans; Credit risk; Commercial banks; Bank-specific determinants; Macroeconomic determinants; Random Effects Model; Panel data.

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1. INTRODUCTION

The credit portfolio represents the biggest asset item of commercial banks and is the most important element of the stability of the banking sector and the functioning of the financial system. At an international level, non-performing loans (NPLs) are emerging as one of the most serious risk factors that threaten the stability and economic development of the banking sector. NPLs are a part of credit risk and it has an impact on the profitability, liquidity, capitalization, and lending capacity of the banks. The continuous increase of NPLs weakens the financial intermediation role of banks, which has negative growth impact on investment, jobs and economic growth. The need to keep asset portfolios of high quality has gone through a dramatic transformation since the Global Financial Crisis of 2007-08, COVID-19 pandemics and recent inflationary and geopolitical shock waves affecting financial systems in many countries around the world. Thus, the determinants of NPLs have come into focus for the regulators, policy makers and commercial banks to maintain

financial stability and efficient banking sector (Abuka, et al., 2019; Chileshe, 2018; Denderski & Paczos, 2021; Ferreira, 2022).

Commercial banks are the engine that drives the modern financial system, and thus they move money from surplus economic agents to deficit agents. Commercial banks thus help to channel money into the economy, where it is used to create capital, to foster innovation, entrepreneurship, job creation and thus economic development (Schumpeter, 1934; Gurley & Shaw, 1955; King & Levine, 1993). Meanwhile, banks' capacity to contribute to economic growth is hinged on their ability to sustain a good-quality loan portfolio. Poor credit appraisal, low asset quality, in particular, impact the performance of the banks, reducing their capacity to finance the development of the economy. In addition to the amount of credit supplied, the quality of credit is also crucial for the financial development and sustainable economic growth (Adu et al., 2013; Alom, 2018; Bist, 2018; Acharya, 2020; Paudel & Acharya, 2020; Sarwar et al., 2021; Sumaira & Bibi, 2022).

There is an emerging consensus in the literature that financial development and credit availability is beneficial to economic growth. However, if credit is expanded too much it can result in financial imbalances which can eventually harm the stability of the banking sector and economic growth. For instance, Arcand et al. (2015) proved that the financial development-economic growth link is indeed non-linear and that an excessive level of financial development can have negative impacts on economic growth. However, Ibrahim and Alagidede (2020) reported evidence of the asymmetric effects of shocks to financial development on economic growth, and Li and Wei (2021) showed that the effect of financial development is a nonlinear function of financial development. Thus, the issue of keeping the loan portfolio quality is as significant as the issue of growing credit is. Therefore, it is important to examine the factors influencing NPLs of financial institutions.

Nepal has a bank-dominated financial system; hence, the country’s commercial banks are the key players in the financial system. From FY 2025, Nepal Rastra Bank (Nepal Rastra Bank, 2025) has licensed 20 commercial banks. The commercial banks dominate the financial market as they mobilize savings and lend to productive sectors of the economy and contribute significantly to the country’s overall economic growth. However, with the boom in credit, banks’ assets have turned bad, and there has been a liquidity crisis in the financial system. Thus, examining the factors that determine non-performing loans is critical to enhancing credit risk management in the commercial banking sector.

The previous study proved the importance of financial development and bank credit in Nepal's economy. The research finding shows that financial development and the availability of credit encourage investment, capital formation and economic growth (Acharya, 2020; Paudel & Acharya,2020; Lamichhane, 2024; Subedi, 2025). Likewise, access to bank credit facilitates agricultural production, industrialization, and infrastructure development, which promotes overall economic development (Torutein, 2025). Most of the previous studies, on the other hand, focused on the influence of financial development and credit on economic growth, but not on the factors that are determining the non-performing loans. In this context, the international literature review reveals that the profitability of banks, capital structure, bank size, and bank credit expansion have a significant impact on NPLs, while economic growth, inflation rate, unemployment, and lending rate

have a significant impact on the expansion of bank credit (Abuka et al., 2019; Bayar, 2019; Denderski & Paczos, 2021; Ferreira, 2022). But the contribution of these variables in the context of non-performing loans in Nepal remains uncertain. Thus, it is necessary to explore the determinants of NPL of commercial banks in Nepal.

Although the literature review has revealed the relationship between credit risk, financial development and economic growth, there are some gaps in the literature. First, while the role of financial development, credit availability and economic growth has been established, the factors determining the non-performing loans in Commercial Banks have not attracted much research attention. Secondly, most of the studies conducted in Nepal have been on the effect of financial development and Bank credit on economic development rather than the effect of Bank-specific and macro-economic factors on non-performing loans. Third, there exist ambiguous results in the literature on the relationship between NPLs and bank profitability, capitalization, size, credit growth, inflation, unemployment and lending rates in commercial banks. Third, most of the studies in Nepal were based on aggregate time-series analysis, which failed to recognize the heterogeneity among commercial banks. Hence, the aim of the present study is to fill the above-mentioned gaps in the literature.

This article provides empirical analysis of determinants of commercial bank's non-performing loans in Nepal based on the balanced panel data analysis. The research adds value to the existing studies on the non-performing loans in Nepal, while contributing towards the limited evidence on the dynamics of non-performing loans determinants in emerging banking-dominated economies like Nepal. The study could provide the Nepal Rastra Bank, commercial banks and policy makers ideas to control credit risk, prudential supervision and policies for development of the banking sector in Nepal.

1.1 Research Questions

RQ1: How do bank-specific factors (Return on Assets, Credit Growth, Capital Adequacy Ratio, and Bank Size) influence non-performing loans in Nepalese commercial banks?

RQ2: To what extent macroeconomic factors (GDP Growth, Inflation, Weighted Average Lending Rate, and Unemployment Rate) affect non-performing loans in Nepalese commercial banks?

1.2 Research Objectives

RO1: To measure the influence of bank-specific factors (Return on Assets, Credit Growth, Capital Adequacy Ratio, and Bank Size) on non-performing loans in Nepalese commercial banks.

RO2: To analyze the impact of macroeconomic factors (GDP Growth, Inflation, Weighted Average Lending Rate, and Unemployment Rate) on non-performing loans in Nepalese commercial banks.

2. LITERATURE REVIEW

2.1 Theoretical Review

2.1.1 Financial Intermediation Theory

Financial Intermediation Theory was developed by Schumpeter (1911), Gurley and Shaw (1955), and Diamond (1984). The theory states that banks are essential in promoting savings, allocating credit, lowering the cost of transactions, and monitoring borrowers. The theory emphasizes the

banks' comparative advantage in screening and monitoring that will lead to better loan portfolios and reduce market failures. But non-performing loans have a negative effect on banks' profitability, lending ability and performance. Therefore, Financial Intermediation Theory can be used as a theoretical background for analyzing the effect of the bank specific variables on the NPL in the Nepalese commercial banks.

2.1.2 Information Asymmetry Theory

George Akerlof (1978) and Stiglitz and Weiss (1981) develop the concept of asymmetric information in the context of the information aspect theory of the lender-borrower relationship. The theory also implies that the more capitalized the bank, profitable, and effective its monitoring systems, the more it can mitigate information asymmetry and enhance the quality of its loan portfolio. Therefore, the Information Asymmetry Theory explains why and how the impact of banks' characteristics on NPLs is different from other factors in the Nepalese commercial banks.

2.1.3 Moral Hazard Theory

Moral hazard theory was first developed by Meckling and Jensen (1976) and later extended by Stiglitz and Weiss (1981). According to the theory, any borrower has an incentive to take higher risks than usual since the negative consequences of their actions will be suffered mainly by lenders. The emphasis of the theory is that if monitoring by the borrower is not adequate, it will lead to loan default. Therefore, according to the moral hazard theory, sound lending, good governance, capital structure, and profitability can help lower credit risk (Ferreira, 2022). For this reason, the impact of capital adequacy, profitability (ROA), bank size and credit growth on NPL may be analyzed using the moral hazard theory.

2.1.4 Credit Risk Theory

According to Credit Risk Theory, credit risk arises from borrowers' defaulting on loans. The theory also suggests that prudent lending, proper capitalization of the bank, monitoring and periodic credit evaluation lower the default risk level, but the characteristics of the bank and macroeconomic variables like economic growth, rate of inflation, unemployment, and lending rates contribute to increase the default risk level, which leads to non-performing loans (Abuka et al., 2019; Ferreira, 2022). Hence, the theoretical framework is Credit Risk Theory to explore the factors influencing the NPL in the commercial banking sector in Nepal.

In addition to the above theories, the next step will be to find out the factors influencing the level of NPL in commercial banks in Nepal.

2.2 Empirical Review

Based on the theoretical background presented above, the following section elaborates on the empirical literature on the determinants of NPLs.

2.2.1 Return on Assets (ROA) and Non-Performing Loan

One of the important measures of banks profitability and performance is Return on Assets (ROA). Empirical studies on the subject matter reveal that there is a negative relationship between Return on Assets and non-performing loans. The argument is that banks that have a high ROA will have a good appraisal and monitoring system, leading to reduced levels of NPLs (Ferreira, 2022; Abuka et

al., 2019; Denderski & Paczos, 2021; Chileshe, 2018).The empirical studies executed in Nepal in the last few years reveal that profitability is a significant factor in the development of financial sector and credit growth, which is consistent with the policy of Nepal Rastra Bank (NRB) (Lamichhane, 2024; Subedi, 2025).Existing literature does not extensively discuss the role of ROA and non-performing loans. Overall, the empirical literature tends to confirm a negative relationship between ROA and NPLs.

H1: Return on Assets (ROA) has significant and negative effect on non-performing loans in Nepalese commercial banks.

2.2.2 Capital Adequacy Ratio (CAR) and Non-Performing Loan

The capital adequacy ratio (CAR) indicates a bank's capital i.e., its ability to withstand credit losses. The Basel Accords set requirements about capital adequacy which protect the banks from unexpected losses and promote prudent credit lending (Basel Committee on Banking Supervision, 2006). All empirical studies conducted are similar in their results regarding the relationship between capital adequacy and NPLs. The basic rationale is that banks that operate with higher capital adequacy have a lower level of non-performing loans because their ability to withstand credit risk exposure and cushion losses is higher (Ferreira, 2022; Abuka et al., 2019; Denderski and Paczos, 2021; Chileshe, 2018). Nepal Rastra Bank has announced the commercial banks to keep a minimum capital adequacy ratio to keep the banking sector stable in Nepal. Likewise, the recent research also shows that a sound and sustainable financial system is also supported by adequate levels of capital in the financial system and credit growth (Lamichhane, 2024; Subedi, 2025). But the study revealed, there is not much information about the relationship of CAR and NPL. Based on this, a hypothesis was created that a higher CAR would lead to a lower NPL.

H2: Capital Adequacy Ratio (CAR) has significant and negative effect on non-performing loans in Nepalese commercial banks.

2.2.3 Credit Growth and Non-Performing Loan

The rate of change of total bank lending, called the credit growth, is an important factor in the credit risk and non-performing loans. High credit growth and poor credit quality could lead to deteriorating lending standards and credit quality, but it could also leverage the banks' performance, capitalization and profitability. So, it is not surprising to find mixed evidence in the credit growth literature regarding the relationship between credit growth and NPLs. In fact, some studies have revealed a positive link between credit growth and non-performing loans (NPLs) (Abuka et al., 2019; Bayar, 2019) while others have found a negative or no association (Denderski & Paczos, 2021; Chileshe, 2018). There are some empirical studies about the financial inclusion and credit growth in the context of Nepal which show that credit expansion has a significant contribution to economic development, sustainability of banking system and financial stability of the country. However, no explicit linkage between the credit growth and NPLs exists in the past studies carried out in Nepal. Overall, the link between credit growth and NPLs is not conclusive and empirical evidences available in Nepal are still limited.

H3: Credit growth has significant and positive effect on non-performing loans in Nepalese commercial banks.

2.2.4 Bank Size and Non-Performing Loan

The Bank Size is determined by the natural logarithm of the overall banks asset size (total assets). Generally, the bigger the banks are, the more diversified their operations are aswell as the better access to financial market they have, enabling them to implement effective risk management strategies and minimize credit default risk. Nonetheless, increased level of organizational complexity might result in higher level of information asymmetry in credit markets and negative impact on monitoring and screening of credit applicants. Consistently, from the empirical studies on factors affecting NPLs that are reviewed, there is mixed evidence regarding the relationship between the size of banks and NPLs. In detail, several articles report negative relationship between the natural logarithm of total assets and level of NPLs, arguing that big size of commercial banks contributes to their better performance, sufficient credit risk management, and minimized default risk (Abuka et al., 2019; Bayar, 2019). Other studies, however, indicate a positive or no correlation between commercial bank size and the level of NPLs due to poor credit risk management, complexity of the organizational structure and information asymmetry (Denderski & Paczos, 2021; Chileshe, 2018). Particularly, in Nepal, there is a lack of empirical evidence on the relationship between the size of the commercial banks and their level of NPLs. Based on the reviewed articles, it can be concluded that the relationship between size of commercial banks and their NPLs in Nepalese context is not clear.

H4: Bank size has significant effect on non-performing loans in Nepalese commercial banks.

2.2.5 GDP Growth and Non-Performing Loan

GDP growth is a percentage change in the Gross Domestic Product and indicates the degree of growth and development of the country. Overall, economic development and level of economic development have an impact on the default risk of the borrowers because the higher level of income of individuals and businesses will be able to pay back their loans. On this account, the studies reviewed show a negative relationship between GDP growth and the amount of NPLs. Specifically, certain articles state that there is a negative relationship between the % change of GDP and NPLs, suggesting that economic development lowers the chances of loans and advances becoming non-performing (Louzis et al., 2012; Klein, 2013; Nkusu, 2011). However, based on the heterogeneity of financial markets, economies, and banking systems across countries, there are some arguments that argue for a positive association between GDP growth rate and level of non-performing loans. Conversely, there are some arguments suggesting positive association between GDP growth rate and level of non-performing loans due to heterogeneity of financial markets, economies, and banking systems across different countries (Bayar, 2019; Ferreira, 2022). On the whole, the reviewed articles indicate that, in an economy, economic development is a factor that will help to decrease the share of non-performing loans. But evidence is not consistent and empirical research is still limited on the Nepalese context. Thus, the following hypothesis is formulated.

H5: GDP Growth has significant and negative effect on non-performing loans in Nepalese commercial banks.

2.2.6 Inflation and Non-Performing Loan

Inflation is defined as a "percentage change in the general price level" and is the rate at which the price of goods and services change over time. Since inflation rate influences the level of income and individuals' purchasing power, it can impact the ability of individuals and businesses to repay their loans. Higher level of inflation can deteriorate people's purchasing power and increase operating costs of businesses, leading to higher level of defaults and NPLs. Nonetheless, other factors such as monetary policy and changes in income and interest rates should be taken into consideration when analyzing the association between inflation and level of NPLs. In line with this argument, there are several empirical works that show that there exists a positive relationship between the inflation rate and NPLs, with inflation rate being an explanation for the high level of defaults (Nkusu, 2011; Klein, 2013). However, other research studies conclude that positive association is not found, and that the effect of inflation on default risk is negligible because the economies, financial markets and monetary policies are heterogeneous among countries (Louzis et al., 2012; Bayar, 2019). A number of empirical studies have been done in Nepal to examine the relationship between inflation and the likelihood of default and these studies show that inflation is negative on financial performance and sustainability of the banking system. In fact, the majority of the research reports on inflation/d default rates have been negative or insignificant, suggesting that inflation has a negative impact on financial performance and sustainability. In general, the examined literature indicates that inflation generally leads to a decline in NPLs. But, available empirical evidence in Nepal is limited. Therefore, the following hypothesis is proposed.

H6: Inflation has significant and positive effect on non-performing loans in Nepalese commercial banks.

2.2.7 Unemployment and Non-Performing Loan

Unemployment is the percentage of the labor force that would like to have jobs but doesn't have them. Higher level of unemployment decreases the level of income of individuals, which, in turn, affects their ability to repay their loans. This is why there are some empirical studies that show that there is positive relation between unemployment and level of NPLs. Louzis et al (2012), Nkusu (2011) and Klein (2013) have determined that there exists positive correlation between NPLs and percentage of unemployed population in detail. In contrast, some studies have reported that there was no relation between the unemployment rate and the NPL level due to the fact that the unemployment rate was influenced by the country specific characteristics including economic development, the banking system structure and financial system organization (Bayar,2019; Ferreira,2022). In the Nepalese context, several studies conducted on determinants of NPLs do not explicitly address the association between unemployment and level of NPLs. However, the overall effect of unemployment on NPLs can be deduced from studies of macro-economic drivers of default risk. In general, previous studies indicate that a higher unemployment rate tends to be correlated with a higher ratio of NPLs. Thus, the following hypothesis is put forward.

H7: Unemployment has significant positive effect on non-performing loans in Nepalese commercial banks.

2.2.8 Weighted Average Lending Rate and Non-Performing Loan

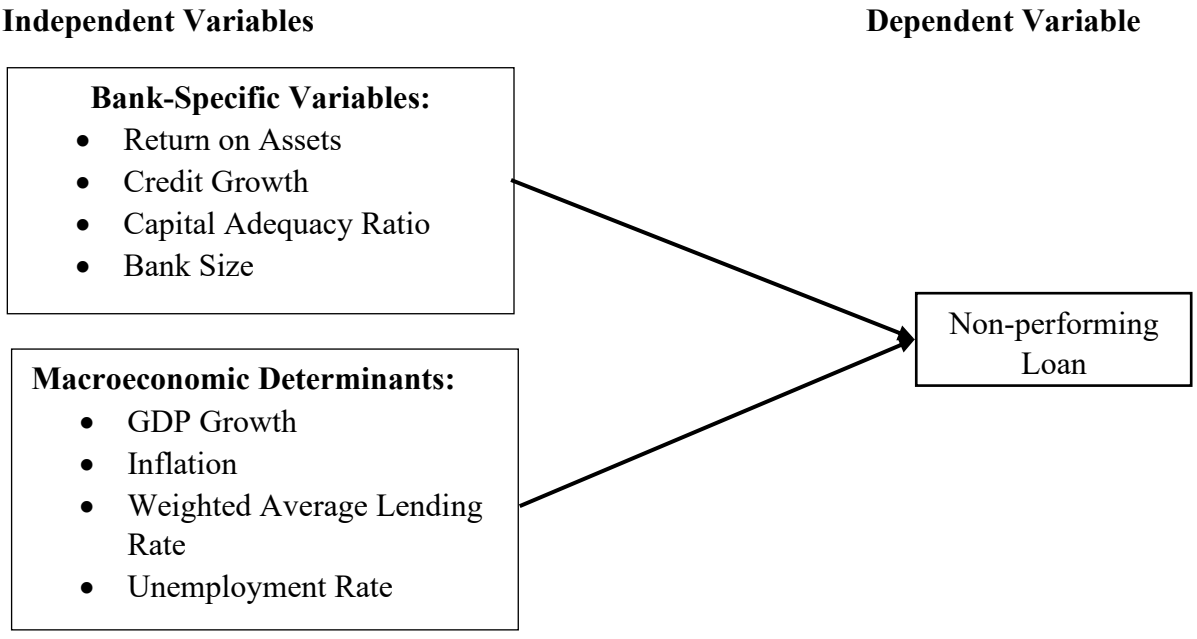
The weighted average lending rate refers to average interest rate charged by commercial banks for taking out loans and advances from borrowers. The higher the weighted average lending rate is, the higher the chances for default are since increased cost of borrowing decreases the ability of individuals and businesses to repay the loans. At the same time, higher lending rates can indicate that banks apply more stringent requirements for granting credit, thus improving their credit appraisal and screening systems. Some empirical research finds a positive relationship between weighted average lending rate and the NPLs level, with an increase in the cost of credit causing a decline in credit quality and an increase in level of default (Nkusu, 2011; Louzis et al., 2012). But there are studies that contradict this and state that there is a negative but insignificant relationship between the weighted average lending rate and NPLs. It is noteworthy that such a mixed result may differ from one country to another since the financial and macroeconomic environment is not the same (Bayar, 2019; Ferreira, 2022). Therefore, it can be concluded from the above review that with the increase in the lending rate the NPLs will be increasing. So, the following hypothesis is formulated.

H8: Weighted average lending rate *has significant and positive effect on non-performing loans of commercial banks in Nepal.*

2.3 Conceptual Framework

Based on the above discussion, the following hypothesis can be formulated that both the nature of bank and macroeconomics factors will affect in the level of non-performing loans in the commercial banks in Nepal. Figure 1 below represents the conceptual framework of the study.

Figure 1 - *Conceptual Framework*



Note: *Adapted Abuka et al. (2019), Bayar (2019), Ferreira (2022), Denderski and Paczos (2021), Nkusu (2011) and refined by the author based on the reviewed literature.*

3. RESEARCH METHODOLOGY

3.1 Research Design

The study has a quantitative and explanatory (causal) research design to find out the impact of bank-specific and macroeconomic variables on the level of non-performing loans (NPL) of commercial banks in Nepal. The quantitative approach facilitates the empirical testing of hypothesized relationship between the independent variables, including bank-specific and macroeconomic factors, and the dependent variable, that is, non-performing loans by using numerical data. Explanatory research design was used because it investigates the causal relationship between the independent and dependent variables. In addition, the study uses a balanced panel data design which includes cross-sectional and time-series data. A distinguishing feature of the design employed in this study is the large number of observations, which allows the use of more efficiently and accurately estimators for the cross-sectional and time-series studies, given that the former suffers from several drawbacks such as heterogeneity and poor efficiency (Baltagi, 2021; Gujarati et al., 2012; Wooldridge, 2020). Hence, the study has applied a balanced panel design to examine the determinants of NPLs of commercial banks in Nepal.

3.2 Population

The commercial banks of Nepal are the population of the study which included 20 commercial banks during the study period. Commercial banks are the most important banks in Nepal because they are the agents for both mobilizing deposits and supplying credit for economic growth. Hence, the commercial banks are an appropriate population to study the determinants of non-performing loans (NPL) in Nepalese banking system. The study covers the fiscal years 2070/71 to 2081/82 (2013/14-2024/25).

3.3 Sample and Sampling Technique

The study uses purposive sampling to get 10 commercial banks (a balanced panel) yielding a total of 120 observations per bank year. Purposive sampling was used to obtain banks that were representative of the commercial banking industry in Nepal in terms of ownership structure, size of the market, the size of the bank's assets, lending activities and credit risk characteristics. The sample banks and their characteristics and reasons for being included in this study are summarized in Table1.

Table 1 - *Sample Selection and Characteristics of the Selected Commercial Banks*

Category	Sample Banks	Selection Rationale
Government owned	Nepal Bank Ltd., Rastriya Banijya Bank	Large public banks with historical importance and relatively higher NPL exposure
Large Private	Nabil Bank Ltd., Global IME Bank Ltd., NIC Asia Bank Ltd.	Market leaders with large asset and loan portfolios
Joint Venture	Standard Chartered Bank Nepal Ltd., Everest Bank Ltd.	Strong governance and comparatively low NPL trends
Medium-sized	Himalayan Bank Ltd., Siddhartha Bank Ltd.	Representative medium-sized commercial banks
High Growth	Prabhu Bank Ltd.	Rapid credit expansion during the study period

3.4 Nature and Source of Data

The research methods employed are Secondary Data which is obtained from authentic and published sources of information. Using secondary data in this study is valid because the secondary data has information to the study variables that is accurate and reliable. The study employed balanced panel data with total sample size of 10 commercial banks over the study period (FY 2070/71 to FY 2081/82) giving total of 120 bank-year observations.

The bank-specific variables of the study were collected from the annual report of the commercial banks under study and Nepal Rastra Bank (NRB). The macroeconomic variables were obtained from the National Statistics Office (Central Bureau of Statistics), Nepal, Nepal Rastra Bank, and World Bank. The secondary data sources were reliable as they were published by well-known and reputable institutions. Besides that, the reliability of secondary data is very high to be used in this study because they are widely used in empirical studies in banking and finance sector.

3.5 Method of Data Analysis

The data were analyzed using descriptive statistics, correlation analysis, panel regression and model selection in the software EViews. Also, SPSS software was used to test multicollinearity. Descriptive statistics including Mean, Median, Minimum, Maximum, Standard Deviation, Skewness, Kurtosis and Jarque-Bera were calculated to summarize the data. A Panel Regression analysis was then performed to investigate how bank-specific and macroeconomic variables affect NPLs, by estimating Model 1, Model 2 and Model 3. Model 1, respectively, investigated the influence of bank-specific factors, Model 2 investigated the influence of the macroeconomic factors, and in Model 3 the influence of the bank-specific and macroeconomic factors on the NPLs were estimated. In order to choose the appropriate model, the Fixed Effects Model (FEM) and the Random Effects Model (REM) were both estimated and the Breusch-Pagan Lagrange Multiplier (LM) test were conducted along with Hausman specification test. These tests indicated that REM would be a suitable model for the analysis. Furthermore, t-statistics, p-values, F-statistics, R squared and adjusted R squared were also presented to explain the results statistically.

4. RESULTS AND ANALYSIS

4.1 Descriptive Statistics

Table 2 - *Descriptive Statistics of the Study Variables*

Statistics	ROA	CAR	Bank Size	Credit Growth	GDP Growth	Inflation	Unemployment	WALR	NPL
Mean	1.46	12.89	25.87	19.33	4.35	6.18	10.94	10.44	2.12
Median	1.42	12.52	25.86	16.46	4.73	5.80	10.65	10.33	1.53
Maximum	3.22	22.99	27.26	81.50	8.98	9.94	13.04	12.47	7.97
Minimum	0.00	4.55	24.34	-16.12	-2.37	3.60	10.44	7.85	0.07
Std. D.	0.63	2.41	0.68	15.50	3.02	1.91	0.79	1.50	1.74
Skewness	0.06	0.72	-0.07	1.54	-0.69	0.57	1.91	-0.19	1.02
Kurtosis	3.31	7.85	2.23	6.41	2.96	2.27	5.01	1.78	3.37
Jarque-Bera	0.55	128.20	3.04	105.24	9.40	9.29	93.39	8.11	21.47
Probability	0.76	0.00	0.22	0.00	0.00	0.01	0.00	0.02	0.00
Observations	120	120	120	120	120	120	120	120	120

Source: Author's computation using EViews

Descriptive statistics for the study variables are also provided in Table 2. The study uses 120 balanced panel data from 10 Nepalese commercial banks over the period FY 2070/71 to FY 2081/82 (2013/14-2024/25). The descriptive statistics offer a preliminary sense of the central tendency, variability and distribution of sample data utilized in this study.

Table 2 shows that the highest NPL ratio in the commercial banks is 7.97% while the lowest NPL ratio is 0.07%. On the other hand, ROA ranged between 0.00%and3.22%, and the average ROA was 1.46%. Similarly, CAR had an average percentage of 12.89%, ranging between 4.55% and 22.99%. The sample banks' size is measured by the natural log of total assets and had an average value of 25.87. In the same way, credit growth had an average of 19.33%, varying between -16.12% and 81.5%.

At the sometime, the average rate of GDP growth was 4.35%, ranging between -2.37%and 8.98%. Similarly, the variation between the minimum and the maximum was 6.18% with an average inflation figure of 6.18%. The rate of unemploymentwas10.94%, on average, rangingbetween10.44%and 13.04%. Moreover, WALR totaled 10.44% on average, varying between 7.85% and 12.47%.

Jarque-Bera tests showed that Bank Size and ROA are close to a normal distribution because their p-values are above the threshold of 0.05, while the other variables had p-values below the threshold. However, because of the balanced panel data (120 observations), it is unlikely that any of the variables will affect the consistency of the regression estimates if they are not normally distributed.

4.2 Correlation Analysis

Pearson correlation analysis was done to explore the nature and direction of the relationship between the study variables before developing the model. Also, the Pearson correlation has helped to identify the collinearity problem which could affect the regression estimates. Table 3 shows the results.

Table 3 - *Pearson Correlation Matrix*

Variables	NPL	ROA	CAR	Bank Size	Credit Growth	GDP Growth	Inflation	Unemployment	WALR
NPL	1.000	-0.464***	-0.436***	0.381***	-0.153	-0.055	0.132	-0.265***	-0.232**
ROA	-0.464***	1.000	0.252***	-0.522***	-0.038	0.176*	0.092	-0.081	0.242***
CAR	-0.436***	0.252***	1.000	-0.037	-0.033	-0.017	-0.325***	0.134	0.130
Bank Size	0.381***	-0.522***	-0.037	1.000	-0.133	-0.154*	-0.319***	0.170*	-0.093
Credit Growth	-0.153	-0.038	-0.033	-0.133	1.000	0.025	-0.015	0.172*	0.118
GDP Growth	-0.055	0.176*	-0.017	-0.154*	0.025	1.000	-0.480***	0.165*	0.356***
Inflation	0.132	0.092	-0.325***	-0.319***	-0.015	-0.480***	1.000	-0.320***	-0.125
Unemployment	-0.265***	-0.081	0.134	0.170*	0.172*	0.165*	-0.320***	1.000	-0.160*
WALR	-0.232**	0.242***	0.130	-0.093	0.118	0.356***	-0.125	-0.160*	1.000

*Notes: ***p < 0.01, **p < 0.05, *p < 0.10.*
Source: Author's computation using EViews.

From Table 3 above, it is clear that there is negative and significant correlation between ROA and NPL ($r = -0.464$; $p < 0.01$), which suggests a negative relationship between the profitability and NPL. Likewise, there is a negative and significant relationship between CAR and NPL ($r=-0.436$, $p<0.01$), suggesting that the higher the CAR, the lower the credit risk. On the other hand, Bank Size has a positive and significant correlation with NPL ($r=0.381$, $p<0.01$). Though, Credit Growth has a negative but insignificant correlation with NPL ($r=-0.153$)

Moreover, there is a positive, but negligible correlation between Inflation and NPL ($r=0.132$). But GDP Growth is negatively correlated with NPL ($r=-0.055$) but not significant. Furthermore, Unemployment is significantly and negatively correlated with NPL ($r=-0.265$, $p<0.01$) while WALR is significantly and negatively correlated with NPL ($r=-0.232$, $p<0.05$).

All of the independent variables are moderately to low correlated with each other except the strongest one, that is ROA-Bank Size ($r=-0.522$). The correlations are not strongly correlated, and do not go beyond 0.8, so there is no reason to think that the multicollinearity issue is a significant problem in the study. This conclusion is further supported by the results of the Variance Inflation Factor (VIF) test.

4.3 Model Selection and Diagnostic Tests

4.3.1 Breusch-Pagan LM Test

To decide which model to use, (REM) or (Pooled OLS), a study was conducted to use the Breusch-Pagan Lagrange Multiplier (LM) test (Breusch and Pagan, 1980). The null hypothesis assumes that there are no panel effects, and therefore, the Pooled OLS model is appropriate while the alternative hypothesis states that the REM is appropriate. The results of the Breusch-Pagan LM test are as presented in table 4.

Table 4 - *Breusch-Pagan Lagrange Multiplier Test Results*

Test Statistic	Value
Breusch-Pagan (Cross-section)	134.286
Probability	0.000
Decision	Random Effects Model Preferred

Source: Author's computation using EViews

The Breusch-Pagan Lagrange Multiplier test indicated cross-section Breusch-Pagan statistic value of 134.286 with probability value of 0.000 which is less than the 5% significance level. As a result, the null hypothesis was rejected, implying that there are panel effects; thus, the Pooled OLS model is not appropriate. Thus, RE model was chosen for analysis. Thus, the Fixed Effects Model was compared with the REM by the Hausman specification test.

4.3.2 Hausman Specification Test

To compare the Fixed Effects Model with the Random Effects Model and to determine which is the most suitable model for analysis, Hausman specification test was performed. The null hypothesis assumes that the REM is appropriate while the alternative hypothesis assumes that the FEM is appropriate. The results of the Hausman specification test are presented in table 5.

Table 5 - *Hausman Specification Test Results*

Test Statistic	Value
Chi-square Statistic	0.000
Degrees of Freedom	8
Probability	1.000
Decision	Random effect Model Preferred

Source: Author's computation using EViews

From the Hausman Specification test (Table 5) it can be observed that the value of the Chi-square is 0.000 with a probability of 1.000, which is not less than 5 percent. Therefore, the null hypothesis is not rejected and the Random Effects Model should be used as opposed to the Fixed Effects Model for the panel data. Therefore, for the final regression analysis, the Random Effects Model was used, according to which all the regression results are determined. The Random Effects Model was chosen based on the results of the Breusch-Pagan LM test and Hausman specification Test.

4.3.3 Variance Inflation Factor (VIF) Test

To check whether the explanatory variables had any multicollinearity problem, the Variance Inflation Factor (VIF) test was carried out before estimating the panel regression models. The VIF statistic is used to detect the degree of linear dependence among the regressors (collinearity) which inflates the variance of the regression coefficient estimates. The rule of thumb is that VIF < 5 or tolerance > 0.10, which indicates that there is no reason for concern of multicollinearity (Hair et al., 2019). The following table gives the test results with respect to the variance inflation factor.

Table 6 - *Variance Inflation Factor (VIF) Test Results*

Variable	Tolerance	VIF
Return on Assets (ROA)	0.607	1.647
Capital Adequacy Ratio (CAR)	0.698	1.433
Unemployment	0.789	1.267
Inflation	0.433	2.309
Weighted Average Lending Rate (WALR)	0.742	1.348
Bank Size	0.614	1.630
GDP Growth	0.417	2.398
Credit Growth	0.882	1.134

Source: Author's computation using SPSS

The variance inflation factor (VIF) ranges from 1.134 to 2.398 and the tolerance ranges from 0.417 to 0.882 (see Table 6). Since VIF is less than 5 and tolerance is greater than 0.10, it can be concluded that there is no significant multicollinearity between explanatory variables. So, multicollinearity doesn't affect the estimated regression models.

4.4 Regression Results

Table 7 - *Random Effects Regression Results for the Determinants of Non-Performing Loans*

Variables	Model 1 (Bank-Specific)	Model 2 (Macroeconomic)	Model 3 (Combined Model)
Constant	-3.901 (0.502)	13.231** (0.022)	-9.308* (0.093)

Return on Assets (ROA)	-0.833*** (0.001)	-	-0.715*** (0.001)
Capital Adequacy Ratio (CAR)	-0.245*** (0.000)	-	-0.104* (0.063)
Bank Size	0.414* (0.064)	-	0.888*** (0.000)
Credit Growth	-0.017** (0.020)	-	-0.004 (0.472)
GDP Growth	-	0.082 (0.485)	0.168*** (0.000)
Inflation	-	0.052 (0.776)	0.203*** (0.003)
Unemployment	-	-0.715* (0.076)	-0.742*** (0.000)
Weighted Average Lending Rate (WALR)	-	-0.380* (0.077)	-0.283*** (0.000)
Model Statistics			
R^2	0.387	0.048	0.595
Adjusted R^2	0.366	0.015	0.566
F-statistic	18.148	1.453	20.368
Prob (F-statistic)	0.000	0.221	0.000
Durbin-Watson	0.899	0.570	0.879
Observations	120	120	120

*Notes: ***p < 0.01, **p < 0.05, *p < 0.10.*
Source: Author's computation using EViews

In this regard, Table 7 shows the Random Effects regression result of determinants of non-performing loans (NPLs) of commercial banks in Nepal. The three models are defined in the table: “bank specific variables” is Model 1, “macroeconomic variables” is Model 2 and "both bank-specific and macroeconomic variables" is Model 3. The results of the Breusch-Pagan Lagrange Multiplier test and Hausman specification test showed that the Random Effects Model was suitable for use, so it was decided to continue the discussion for Model 3, which offered the most complete explanation of the determinants of non-performing loans.

The percentage of variance that can be explained by each of the models is widely different, as shown in Table 7, using the coefficient of determination, R^2. No. = 0.006), Model 2 accounts for 26.7% of the variation in the dependent variable (R^2 = 0.267) which is not statistically significant (Prob. No. = 0.091). The macroeconomic variables only are included in Model 2 giving it an R^2 of 0.048 and explaining only 4.8% of the variation in NPLs (F=0.000). Furthermore, this Model 2 is not significant (Prob. The correlation between macroeconomic variables and NPLs for the period of time (F = 0.221), indicating that there is no significant correlation between the two variables during this period of time.

Again, the fit of the model is greatly improved when both sets of variables are used in conjunction. As shown in Table 7, Model 3 accounts for 59.5% of the variance of NPLs at a high level of statistical significance (Prob. F = 0.000). The relationship between NPLs and is significant statistically (Prob. = 0.595). F = 0.000). So, it can be concluded that model 3 is the best among all the three models mentioned as it has the best fitted data. It is this model that will be used for the subsequent analysis and discussion.

Based on the combined model (Model 3) in Table 7, it was found that ROA has a negative relationship with NPLs. This means that every 1% rise in ROA will lead to a 0.715% fall in NPLs ratio. Specifically, the ROA has a significant negative relationship with NPLs in the 1% level (β = -0.715; p = 0.001). In addition, CAR was found to have a negative relationship with NPLs as well. Thus, for every 1% increase in CAR, the NPLs decreased by 0.104%. However, it was found that the relationship between CAR and NPLs is only significant in the 10% level (β = -0.104; p = 0.063). Combined model shows that Bank Size has a positive correlation with NPLs at 1% level (β = 0.888; p<0.001). In the meantime, the Credit Growth showed a negative relationship with NPLs, but was revealed as insignificant (β = -0.004; p = 0.472).

In terms of macro-economic variables, the combined model (Model 3) shows that GDP Growth has a positive relationship with NPLs at the 1% level (β=0.168, p<0.001), while in the same way, Inflation has a positive relationship with NPLs at the 1% level (β=0.203, p=0.003). Whereas, Unemployment has a negative relationship with NPLs at the 1% level (β=-0.742, p < 0.001), and WALR also has a negative relationship with NPLs at the 1% level (β = −0.283, p < 0.001).

In general, the overall model shows that bank-specific variables (ROA, Bank Size) and macroeconomic variables (GDP Growth, Inflation, Unemployment, WALR) have joint effect on NPLs for the Nepalese commercial banks. Particularly, ROA, CAR, Unemployment, and WALR are negatively related to NPLs at the 1% level, whereas Bank Size, GDP growth, and Inflation are positively related to NPLs at the 1% level. But Credit Growth is not correlated to NPLs at 10% level. Table 8 contains the results of the hypothesis tests; the results of the hypothesis tests are discussed in the next section.

Table 8 - *Summary of Hypothesis Testing*

Hypothesis	Variable	Predicted Relationship	Empirical Relationship	Decision
H1	ROA	Significant and negative effect	Negative (p=0.001)	Supported
H2	CAR	Significant and negative effect	Negative (p=0.063)	Supported (10%Level)
H3	Credit Growth	Significant and positive effect	Negative, Insignificant (p = 0.472)	Not Supported
H4	Bank Size	Significant effect	Positive (p<0.001)	Supported
H5	GDP Growth	Significant and negative effect	Positive (p<0.001)	Not Supported
H6	Inflation	Significant and positive effect	Positive (p=0.003)	Supported
H7	Unemployment	Significant and positive effect	Negative (p<0.001)	Not Supported
H8	WALR	Significant and positive effect	Negative (p<0.001)	Not Supported

*Notes: ***p < 0.01, **p < 0.05, *p < 0.10.*
Source: Author's interpretation based on the Random Effects regression results (Model 3).

5. DISCUSSION OF FINDINGS

This section aims to interpret the results with regard to the study's goals, theory and literature on the determinants of non-performing loans. The results reveal that the non-performing loans of the commercial banks in Nepal are determined by bank-specific and macroeconomic factors, but the

former has more influence than the latter. Some of the results are in line with existing literature while others are contradicting; therefore, this study discusses the results in the context of the theoretical framework and the empirical literature. The discussion is broken up into the following subsections:

5.1 Bank specific determinants of NPLs

The results of the study reveal that the bank-specific factors have a significant influence on the level of non-performing loans of the commercial banks in Nepal. In particular, the study finds that Return on Assets (ROA) has a significant negative effect on non-performing loans, implying that the more profitable the banks are, the lower the level of non-performing loans, and vice versa. This finding is in line with the results of Abuka et al. (2019), Bayar (2019) and Ferreira (2022). It also conforms with the argument of the Financial Intermediation Theory. It is this theory that asserts that commercial banks, whose profitability is high, can effectively employ their financial resources. As a result, the banks can control the credit risk in their loan portfolios and thus reduce the level of non-performing loans.

Likewise, the study shows that the Capital Adequacy Ratio (CAR) has a negative and significant effect on non-performing loans. This means that the higher the value of the CAR the lower the level of NPLs and vice versa. This is in line with the Credit Risk Theory that states that well-capitalized banks can weather credit losses and continue to make prudent loans. Therefore, they are more likely to avoid the risk of loan default and have lower non-performing loan rates.

The study also reveals that Bank Size has a significant positive effect on non-performing loan. This indicates that a higher percentage of NPLs is prevalent in the larger commercial banks, while the smaller commercial banks have a lower percentage of NPLs. This result is in line with Information Asymmetry Theory and Moral Hazard Theory. For example, the larger banks are, the more difficult it will be to keep track of and control credit risk, and the more likely the bank is to make bad loans.

However, contrary to expectations, the outcome is that there is no significant impact of Credit Growth on non-performing loans. The findings of the study indicate that in the context of Nepalese commercial banks, profitability, capital adequacy and prudent lending are important factors for reducing the NPLs.

5.2 Discussion of Microeconomic determinants of Non-performing loans

The results of the study also reveal that the level of non-performing loans is significantly determined by macroeconomic factors but to a lower extent than the bank-specific factors. In particular, the result shows that Inflation has a significant positive effect on non-performing loans, suggesting that the higher the inflation rate, the higher the level of non-performing loans, and vice versa. This finding is consistent with that of Nkusu (2011). The surprisingly result of this study is that GDP Growth has a positive and significant relationship with non-performing loans, meaning that there is a positive correlation between GDP Growth and non-performing loans: the higher the GDP Growth, the higher the level of non-performing loans, and vice versa. Based on the result, the economy of Nepal started to recover after the outbreak of COVID-19 and commercial banks also resumed their lending operations to various sectors such as real estate, wholesale and retail, tourism

and other service sectors. But the income and thus the capacity to pay back loans haven't grown in lockstep with the growth in loans, making default more likely. This result is opposite to the results of Louzis et al. In the context of Nepal's institutional and economic conditions, the two authors (2012 and 2011) have provided the following reasons.

Interestingly the study reveals Unemployment has a significant negative effect on non-performing loans, which means the higher the number of people that are out of work, the lower the number of bad loans, and vice versa. In the same way, the findings show that the Weighted Average Lending Rate (WALR) has a significant impact on non-performing loans such that the higher the WALR, the lower the non-performing loans, and the reverse is true as well. The outcome suggests that under high unemployment and high interest rates, the commercial banks in Nepal are more conservative in their lending, select their credit worthy borrowers carefully and strictly monitor their existing loans, thereby lessening the risk of defaults. Overall, the findings indicate that the commercial banks in Nepal reduced risk of default by fine tuning their lending and monitoring positions in line with the variations in the joblessness rates and interest rates.

6. CONCLUSION AND IMPLICATION

6.1 Conclusion

The objective of this study was to find out the determinants of NPL of commercial banks in Nepal at bank level and macroeconomic level. Specifically, this study utilized the balanced panel data of ten commercial banks over the FY 2070/71 to FY 2081/82 period (2013/14 - 2024/25) and employed the Random Effects panel regression model for performing the estimation of individual and combination effect of the chosen bank specific and macro-economic variables on non-performing-loans.

The results of the study reveal that both the bank-specific and macroeconomic factors jointly determine the level of non-performing loans of the commercial banks in Nepal, but the former has more influence than the latter. The study also reveals that the profitability, or capitalization, and prudent lending practices lower the level of NPLs and a larger bank size raises the level of NPLs. The study found that credit growth does not have a significant impact on NPLs, which is unexpected. Likewise, higher inflation and economic growth lead to higher non-performing loans (NPLs) and higher unemployment and interest rates lead to lower non-performing loans (NPLs). Overall, the results suggest that credit risk is jointly determined by the bank-specific and macroeconomic factors, and thus commercial banks should consider both in their lending and credit risk management practices.

6.2 Implications

6.2.1 Theoretical implications

The findings of the study help to deepen the theoretical understanding of the causes of NPL in multiple ways. First, the results are empirical evidence to support the theoretical framework adopted for this study, but the study does not specify a theory which can explain the level of non-performing loans fully in context of the commercial banks in Nepal. The results give special

support to the Financial Intermediation Theory, the Credit Risk Theory, the Information Asymmetry Theory and the Moral Hazard Theory.

The negative correlation among ROA, CAR and non-performing loans and the positive correlation between Bank Size and non-performing loans are in line with the Financial Intermediation Theory and Credit Risk Theory. In the same manner, the positive correlation between Bank Size and NPLs is also in line with the Information Asymmetry Theory and the Moral Hazard Theory. Also, as a result of the study it has been concluded that the credit risk is affected not only by bank-specific characteristics but also by macroeconomic factors.

6.2.2 Practical and policy implications

The study has several practical and policy implications for commercial banks, Nepal Rastra Bank (NRB) and the policy makers. Specifically, the results indicate that improvement of the risk assessment practice in the commercial banks, adequate capitalization, screening and monitoring the creditworthiness of borrowers and establishing early warning systems and suitable recovery measures are needed to lower the credit risk alongside of the level of NPLs in the commercial banks.

The findings suggest that NRB should increase the prudential supervision and oversight of commercial banks, especially the larger banks as it is found that bigger commercial banks are more likely to suffer Non-Performing Loans (NPLs). Furthermore, NRB must take macroeconomic indicators into account when regulating and supervising its institutions, especially with regard to inflation, interest rates, and growth rates, as they impact the level of NPLs. In conclusion, results indicate that it is necessary for the commercial banks, NRB, and policymakers to work together to reduce the non-performing loans.

7. LIMITATIONS AND FUTURE RESEARCH DIRECTION

7.1 Limitations of the study

The current study has several limitations associated with it. The research aims to focus on the first stage on the major commercial banks of the commercial banking industry in Nepal. Hence, the findings cannot be generalized to cover the characteristics and behavior of other institutions, including the development, finance companies, or to banking system in other countries. Second, this study uses a selected few credit risk determinants in analyzing the non-performing loans (NPL)of the banking sector. Even though the chosen variables help to explain the main factors within the corporate governance and macroeconomic environmental forces, there are several other issues that may contribute to the lending risks in the study area such as, corporate governance, institutional governance, composition of loan portfolios, and regulatory reforms and policies. Third, this study employs a balanced panel data of the commercial banks used for the analysis using annual observations, where the findings portray the long run relationship between the independent and dependent variables, whereas they cannot show the short-run dynamics or endogeneity problems affecting the variables. Thus, the results are to be read in the institutional and economic context in Nepal.

7.2 Directions for future research

This study can be extended in many ways in the future. First, the future researchers should take into account more banks in the analysis, including development banks, finance companies, and microfinance companies, depending on the characteristics and risk of the sector and interpret the results based on the characteristics and risk of the sector. Second, future researchers might want to take other explanatory factors more explicitly into account as they study the determinants of NPLs, including governance indicators, institutional indicators, ownership structure, loan portfolio concentration, digitalization, and regulatory policies.

Third, future research should be able to analyze the study's variables by applying other econometric techniques such as the System Generalized Method of Moments, Dynamic Panel and other robustness check models, in interpreting of the results. Fourthly, future research could be done in other countries to compare the effect of various governance, policy, regulatory and macro-economic factors on NPLs and banking systems in general, particularly in South Asian countries.

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