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Research Article – Accounting

Impact of credit risk on profitability of commercial banks in Nepal

Shiva Raj Poudel*
Ph.D Scholar, Faculty of Management, Tribhuvan University, Kathmandu, Nepal

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*Corresponding author (E-mail: shivapoudyal@gmail.com)

Abstract

The main purpose of the study was to examine the impact of credit risk on profitability of the commercial banks in Nepal. Data were collected from the sample of 15 commercial banks operated in Nepali economy for the period of 2002/03 to 2014/15. One way Fixed Effect Model (FEM) of panel data analysis is used as a major tool of analysis. The profitability of the commercial banks is measured in terms of return on equity and is regressed on bank specific variables and macro-economic variables. The results confirmed that credit risk has the significant negative impact on profitability of commercial banks in Nepal. In addition, solvency ratio, interest spread rate, and inflation have the insignificant negative impact on profitability. In contrast, capital adequacy ratio, total assets, and GDP growth have the significant positive impact on profitability of commercial banks in Nepal. Finally, inter-bank interest rate has insignificant positive impact on profitability.

Keywords: Return on Equity, Credit Risk, Capital Adequacy, Total Assets, and Interest Spread

Introduction

As a financial institution, the primary function of a commercial bank is to collect the public deposits and invest them in to most profitable sectors. Such public deposits result in the forms of creative deposits by the means of credit creation to generate income as interest. The overall process is an important asset of commercial banks that not only multiplies the income of the individual banks, but also contributes to the growth of the economy. However, in certain circumstances, such assets may not perform in generating income and repay in due time as expected, known as credit risk (Poudel, 2018). Therefore, if such credit risk increases, banks may not perform well as expected. As cited in Kasana and Naveed (2016) argued that if the assets do not generate any income, the bank's ability would be in question and in this case asset of banks become weak and these types of banks normally lose their faiths and confidence of the customers. Among the various risks faced by the banks, credit risk plays an important role on banks' profitability since a large chunk of banks' revenue accrues from loans, from which interest is derived. However, interest rate risk is directly linked to credit risk implying that high or increment in interest rate increases the chances of loan default. Credit risk and interest rate risk are intrinsically related to each other and not separable (Drehman *et al.*, 2008).

Kargi (2011) argues that credit risk management maximizes banks' risk adjusted rate of return by maintaining credit risk exposure within acceptable limit in order to provide framework for understanding the impact of credit risk management on banks' profitability. Furthermore, bank's profitability is inversely influenced by the level of loans and advances, non-performing loans and deposits thereby exposing them to great risk of illiquidity and distress. Golden and Walker (1993) explained that contingencies are important for bankers in order to reduce incidence of bad loans. Bankers are supposed to look at everything that can happen thereafter deciding the likelihood of having bad loans, since the major concern of a lender is to get back both the principal and the interest. Banks manage problem loans through loan workouts. Loan workouts can take a number of forms: simple renewal or extension of the loan terms; extension of additional credit; formal restructuring of the loan terms with or without concessions; or, in some cases, foreclosure on underlying collateral. Banks should choose the alternative that will optimize the recovery and minimize the risk of troubled loans. Thus, credit risk is accessed through analyzing the financial performance of commercial banks in an attempt to mitigate impacts arising from credit defaults. The financial health of the commercial banks depends on the possession of good credit risk management dynamics. Commercial banks may have a keen awareness of the need to identify, measure, monitor and control credit risk as well as to determine that they hold adequate capital against these risks and that they are adequately compensated for risks incurred (Bhattarai, 2016).

Recently, many studies have focused on examining the effect of credit risk on bank profitability and found contradictory results in global context. Hosna *et al.* (2009) found a positive relationship between credit risk and profitability on commercial banks in Sweden. Similarly, Afriyie and Akotey (2012), Boahene *et al.* (2012) confirmed a significant positive impact of non-performing loan on profitability of commercial banks in Ghana.In contrast, Kolapo *et al.* (2012) found a negative relationship between credit risk and the bank profitability in Nigerian commercial banks. In the same way, Kishori and Sheeba (2017) showed a significant, negative impact of credit risk on profitability of commercial banks in India. Kaaya and Pastory (2013) examined the negative impact of credit risk on profitability in Tanzanian commercial banks. Whereas, Kithinji (2010) confirmed that the bulk of the profits of commercial banks are not influenced by the amount of credit and non-performing loans whereas, other variables other than credit and non-performing loans impact on profits.

Although, credit risk is the most influencing factor on bank profitability, empirical evidences have confirmed that there are so many other factors that affect banks' profitability. Haslem (1968) identified that bank management, time, location, and size influence on banks' profitability. Berger (1995) found a strong positive relationship between capitaladequacy ratio and profitability of US banks. However, the study further considered the relationship shouldbe negative under certain situations. Collins and Preston (1969) showed a positive association between firm size and profitability and it stems from implementing greater differentiation and specialization strategies and should therefore lead to higher efficiency. Contrarily, Redmond and Bohnsack (2007) examined the negative significant relationship between profitability and the volume of assets. In the same way, Kosimodou *et al.* (2005) concluded that, small banks showed higher performance in comparison to large ones. Regarding the liquidity, Khan and Ali (2016) examined a significant positive relationship of liquidity with profitability of the commercial banks. On the other hand, Abdullah and Jahan (2014) revealed that there is no significant relationship between liquidity and profitability.

Antwi and Apau (2015) confirmed that gross domestic product (GDP) and annual rate of inflation are significant drivers of profitability in Ghana. Raza *et al.* (2013) revealed a negative relationship between interest spread and bank profitability in Pakistani commercial banks. However, Musah *et al.* (2018) confirmed that there is a positive and statistically significant association between interest rate spread and bank profitability. Therefore, it is very important to identify how far the credit risk and other bank specific determinants affect profitability of the commercial banks in Nepal. This paper aims to examine the impact of credit risk, bank specific variables and macroeconomic variableson profitability in the Nepali commercial banks. The overall study is based on 195 observations from the sample of 15 commercial banks operated in Nepal for 13 years from 2002/03 to 2014/15. One way fixed effect model of panel data analysis is used as a major tool of analysis to identify the impact of credit risk on the profitability of commercial banks in Nepal. Return on Equity (ROE) has been regressed individually and jointly with the different explanatory variables. The study reveals that credit risk (the ratio between non-performing loan to total loan) has the significant negative impact on profitability of commercial banks in Nepal. Moreover, solvency ratio, interest spread rate and inflation have the insignificant negative impact on profitability. On the other hand, capital adequacy ratio, total assets, and GDP growth have the significant positive impact on profitability. The remaining sections of the study are; section two summarizes the findings of major studies relating to profitability in commercial banks. Section three describes the overall research methodology used in the study. Similarly, section four deals with the results derived from the analysis. Finally, section five presents conclusions of the study.

Literature Review

In this section of the study, findings from the recent studies which examines the profitability of the commercial bank has been reviewed. Collins and Preston (1969) showed that there is a positive association between firm size and profitability and it stems from implementing greater differentiation and specialization strategies and should therefore lead to higher efficiency. Mekasha (2001) examined the credit risk management and its impact profitability from Ethiopian commercial banks using the dataset of 10 years using panel data analysis and confirmed that there is a significant relationship between bank performance and credit risk management. Naceur (2003) investigated the impact of banks characteristics, final structure and macroeconomic indicators on banks net interest margin and profitability for the 1983-2000 period in Tunisia. The results confirmed that inflation and growth rates have negative impact while stock market development has positive impact on profitability and net interest margin.

Kosimodou *et al.* (2005) examined commercial banks effectiveness of UK using the bank size as a key factor categorized UK banks for two types, large and small according to assets volume. The results of their study concluded that, small banks showed higher performance in comparison to large ones. Further, the size of bank was proved to have an effect on profitability besides other factors such as liquidity. Redmond and Bohnsack (2007) examined the effect of bank size on profitability categorized banks into 5 categories according to their size of assets, the (ROE) ratio is used as a measure of profitability, however, two types of analysis were applied through their study: first; tests are run on the mean of (ROE) for the different bank categories, to capture if there is a statistical difference in profitability for the bank categories under their study. Second, a simple regression was applied using dummy variables to proxybanks asset size; the hypothesis questioned of their study was, if there is a statistical difference in profitability ratio for these different sized banks. The results of tests showed that, there is a negative significant relationship between profitability and the volume of assets.

Felix and Claudine (2008) analyzed the relationship between bank performance and credit risk management. The results confirmed that credit risk (a ratio of non-performing loan to total loan) has a significant negative impact on return on equity and return on assets both measuring profitability.

Tafri *et al*. (2009) examined the relationship between financialrisks and profitability of the conventional and Islamic banks in Malaysia for the period between 1996 and 2005. The measures of profitability that have been used in the study were the return on equity (ROE) and return on assets (ROA) while the financial risks are credit risk, interest rate risk and liquidity risks. This study employed panel data regression analysis of Generalized Least Squares (GLS) of fixed effects and random effects models. It was found that credit risk has a significant impact on ROA and ROE for the conventional as well as the Islamic banks. The relationship between interest rate risk and ROE were found to be weakly significant for the conventional banks and insignificant for the Islamic banks. The effect of interest rate risk on ROA is significant for the conventional banks. Liquidity risk was found to have an insignificant impact on both profitability measures.

Kithinji (2010) analyzed the effect of credit risk management on the profitability of commercial banks in Kenya using the data set from 2004 to 2008. The findings confirmed that the bulk of the profits of commercial banks are not influenced by the amount of credit and non-performing loans whereas, other variables other than credit and non-performing loans impact on profits. Afriyie and

Akotey (2012) examined the impact of credit risk on the profitability of rural and community banks of Ghana using the data from 2006 to 2010 from 10 banks. The panel regression model was employed for the estimation. The study confirmed that there is a significant positive impact of non-performing loan on profitability in commercial banks of Ghana. Kargi (2011) analyzed the impact of credit risk on the profitability of Nigerian banks using the data set from 2004-2008. Regression was used as a major tool to analyze the data. The result confirmed that that credit risk management has a significant impact on the profitability of Nigerian banks. More clearly, it was concluded that profitability is inversely influenced by the level of loans and advances and non-performing loans.

Boahene *et al.* (2012) attempted to identify the relationship between credit risk and profitability on commercial banks of Ghana. A panel data for the period 2005 to 2009 from six commercial banks was analyzed. The results confirmed that the credit risk has a positive and significant relationship with bank profitability. This indicates that banks in Ghana enjoy high profitability in spite of high credit risk, contrary to the normal view held in previous studies that credit risk indicators are negatively related to profitability. Kolapo *et al.* (2012) conducted an empirical investigation into the quantitative effect of credit risk on the performance of commercial banks in Nigeria over the period of 2000-2010 from the selected five commercial banks using panel data analysis. The findings showed that profitability is reduced by increase in non-performing loan. Poudel (2012) tried to explore various parameters pertinent to credit risk management as it affects banks' financial performance. The parameters covered in the study were; default rate, cost per loan assets and capital adequacy ratio. Financial report of 31 banks were used to analyze for eleven years (2001-2011) comparing the profitability ratio to default rate, cost of per loan assets and capital adequacy ratio. The study revealed that all these parameters have an inverse impact on banks financial performance; however, the default rate is the most predictor of bank financial performance. The author further recommended to the banks to design and formulate strategies that will not only minimize the exposure of the banks to credit risk but will enhance profitability.

Ogboi and Unuafe (2013) examined the impact of credit risk and capital adequacy ratio on banks financial performance in Nigeria using time series and cross sectional data from 2004-2009. Moreover, panel data model also was used to estimate the impact of loans and advances (LA), non-performing loans (NPL) and capital adequacy (CA) on return on asset (ROA). The findings showed that credit risk management and capital adequacy ratio have positive impact on performance whereas, loans and advances has a negative impact on bank's profitability. Kaaya and Pastory (2013) examined the impact of credit risk on profitability from the Tanzanian commercial banks using the regression analysis. The findings of the study revealed that the indicator of credit risk has negative impact on profitability. Omondi and Muturi (2013) suggested that firms should expand in a controlled way with the aim of achieving an optimum size to enjoy economies of scale that can ultimately result in higher level of profitability. Antwi and Apau (2015) investigated the determinants of financial performance of Rural and Community banks using 30 rural and community banks across the country from the data set of 2006-2010. The results confirmed that gross domestic product (GDP) and annual rate of inflation are significant drivers of RCBs' profitability in Ghana. Unlike GDP, inflation rate, in the economy over the period seems to have impacted profitability in a positive way showing how well managers in the sector are incorporating inflation in their price build-ups.

Samuel (2015) studied the effect of credit risk on the performance of the Nigerian commercial banks. The need for that study was driven by the negative consequences of the credit risk that affects profitability of the bank and their outcomes functioned as the base to deliver policy measures to the stakeholders on how to deal with the credit risk permissible to improve the value of assets of the bank and diminish bank risk. They used Non-performing loan and loan & Advances ratios as the measure of credit risk and ROA as a measure of profitability. The result showed that the ratio of Non-performing loan to loan & Advances and loan and advances to total deposit negatively affect the profitability. This study showed that there is a major association between bank performance and credit risk management.

Raza *et al.* (2013) examined the determinants of bank profitability in Pakistan and based on a sample of 18 banks for the periods of 10-years. The results revealed that there is a negative relationship between interests spread and bank profitability in Pakistani commercial banks. Marshal and Onyekachi (2014) investigated the effect of credit risk and bank performance in Nigeria for the period of 1997-2011 using the time series, cross sectional and panel data analysis. The result shows that there is a positive impact of ratio of non- performing loans to loan and advances on banks performance. In addition, ratio of loan and advances to total deposit has a positive impact on banks performance. The conclusion was that increase in loan and advances increases banks performance through interest income generated from loan and advance.

Khan and Sattar (2014) examined the impact of interest spread on profitability of commercial banks in Pakistan. The results revealed that there is a significant positive relationship between interest spread and profitability. Gizaw *et al.* (2015) examined the influence of credit risk on profitability from Ethiopia commercial banks from 2003 to 2014. Panel data analysis was used as the major tool of data analysis. The study revealed that the credit risk measured by nonperforming loan and capital adequacy ratio have significant impact on the profitability.

Noman *et al.* (2015) conducted an empirical study with the aims to find the effect of credit risk on profitability of the banking sectors of Bangladesh. The study used an unbalanced panel data and 172 observations from 18 private commercial banks from 2003 to 2013. The study found a negative and significant effect of credit risk on profitability. The analysis also found a negative and significant effect of capital adequacy ratio on profitability. Alshatti (2015) examined the influence of management of credit risk on financial performance of 13 commercial banks in Jordanian for the period of 2005 to 2013. Regression model was used to find the relationship between credit risk and profitability. Findings concluded that the indicators of credit risk management have an influence on financial performance of commercial banks in Jordanian.

Ebenezer and Omar (2016) investigated the effect of credit risk on profitability of commercial banks in Nigeria. Total 8 commercial banks were selected for the study, from the period 2011-2014. A panel data analysis was used as a major tool to analyze the data. The result revealed that there is a negative and significant relationship between non-performing loan ratio and the profitability; negative and insignificant relationship between debts to total assets ratio and profitability, and a positive and insignificant relationship between debts to equity ratio and profitability of banks during the period of study.

Khan and Ali (2016) aim at investigating the relationship between liquidity and profitability of commercial banks in Pakistan. The main objective of the study was to find the nature of relationship and the strength of relationship exists between the variables. Correlation and regression are used respectively to find the nature of the relationship and extent of relationship between dependent and independent variables. Secondary data was used for analysis that was extracted from the last five years (2008-2014) annual accounts of Habib Bank Limited. After conducting correlation and regression analysis it was found that there as significant positive relationship between liquidity with profitability of the banks. Since, the data of the banking sector was used, hence the results cannot be generalized to other sectors.

Kishori and Sheeba (2017) aimed at investigating various factors that influence credit risk and also aimed at investigating the impact of credit risk on the profitability of the bank. The secondary data was collected from the annual reports of the State Bank of India for twenty years (1996-1997 to 2015-2016). The data was analyzed using multiple regression. The result showed that credit risk has a significant, negative impact on profitability. Moreover, State Bank of India has been facing credit risk due to inefficient credit risk management. So, it was advised to improve credit risk management practices. State Bank of India can minimize the credit risk by reducing the nonperforming assets and managing the leverage properly.

Methodology

The research design used in this study is descriptive and causal comparative research design, which is used to deal with the issues relating to profitability associated with the commercial banks operated in Nepal.

Table 1. Name and sample banks for the study

SN	Name of the selected banks	Period Covers	Observations
1	Nepal Bank Limited	2002/03 – 2014/15	13
2	Rastriya Banijya Bank	2002/03 – 2014/15	13
3	Nabil Bank Limited	2002/03 – 2014/15	13
4	Nepal Investment Bank Limited	2002/03 – 2014/15	13
5	Standard Charted Bank Nepal Limited	2002/03 – 2014/15	13
6	Himalayan Bank Limited	2002/03 – 2014/15	13
7	Nepal SBI Bank Limited	2002/03 – 2014/15	13
8	Nepal Bangladesh Bank Limited	2002/03 – 2014/15	13
9	Everest Bank Limited	2002/03 – 2014/15	13
10	Nepal Credit and Commerce Bank Limited	2002/03 – 2014/15	13
11	NIC Asia Bank Limited	2002/03 – 2014/15	13
12	Machhapuchre Bank Limited	2002/03 – 2014/15	13
13	Kumari Bank Limited	2002/03 – 2014/15	13
14	Laxmi Bank Limited	2002/03 – 2014/15	13
15	Siddhartha Bank Limited	2002/03 – 2014/15	13

The overall study is based on the secondary sources of data. All the commercial banks operated in Nepali economy were considered as the total population. Total 29 commercial banks are operating until 31st January, 2018. Out of them, 15 commercial banks were selected as sample, which consists more than 50 percent of total population. Hence, total 195 observations from 15 commercial banks for 13 years from 2002/03 to 2014/15 were used for the analysis. Table 1 shows the name of the sample commercial banks selected for the study along with the study periods and number of observations. The study covers 13 years' period from mid-July, 2003 to mid-July, 2015 (2002/03 – 2014/15). Data of bank specific variables and inter - bank interest rate (IBIR) were collected from the annual publication bullet of Nepal Rastra Bank (NRB) (2015), whereas, data relating to macroeconomic variables such as GDP growth (GDPG) and inflation were collected from the database of world bank. All the commercial banks operated in Nepali economy were considered as the total population. Total 29 commercial banks are operating till 31st January, 2018. Out of them, 15 commercial banks were selected as sample, which consists more than 50 percent of total population. Hence, total 195 observations from 15 commercial banks for 13 years from 2002/03 to 2014/15 were used for the analysis. Table 1 shows the name of the sample commercial banks selected for the study along with the study periods and number of observations.

One way fixed effect model of panel data analysis is used as a major tool for data analysis to identify the major indicator of profitability in commercial banks operated in Nepali economy. The model used for the analysis is;

$$Y_{i,t} = \beta_1 + \beta' X_{i,t} + \varepsilon_{i,t} \quad \text{.....(1.a)}$$

Where, Y_{it} represents the dependent variable i.e. profitability of commercial banks for bank *i* at time *t.* β_1 is constant term assumed to be constant over the time for all the banks. B' represents the coefficients of independent variables. $\boldsymbol{X}_{it}$ represents the vector of independent variables and ε_{it} is stochastic error term assumed to be normally distributed with zero mean and constant variance.

The model can also be presented in detail as follows;

$$ROE_{it} = \beta_1 + \beta_2 NPL_{(it)} + \beta_3 Solvency_{it} + \beta_4 CAR_{it} + \beta_5 TAit + \beta_6 ISR_{it} + \beta_7 GDPG_{it} + \beta_8 INF_{it} + \beta_9 IBIR_{it} + \varepsilon_i \quad \text{.....(1.b)}$$

The detail definitions of the explained and explanatory variables used in this study have been explained as follows;

ROE (Return on Equity)

The dependent variable used for the study is profitability. The most commonly used measure of profitability in the literature is return on equity (ROE). Return on equity is measures of a company's profitability by revealing how much profit a company generates with respect to the shareholders' worth. More specifically, it is a ratio between earning earned by the company and the shareholders' equity. Symbolically;

$$ROE = \frac{Net\ Income\ After\ Tax}{Shareholder's\ Equity} \quad \ldots\ldots\ldots (2)$$

NPL(Non Performing Loan)

Non-performing loanalso known as credit risk represents the chance of losing investment or routine receivable instalments. More specifically, credit risk is the ratio between total amount of nonperforming loan and total loan. Symbolically;

NPL= Non Performing Loan / Total Loan …….. (3)

If a borrower fails to make a schedule payment on a mortgage or on any credit facility provided by bank, the collection costs and/or borrowing cost will increase. When the large portion of banks investment is engaged as non performing, banks capacity to invest on new profitable ventures and repayment to the depositors may affect negatively. Michael *et al* (2006) confirmed NPL in loan portfolio affect operational efficiency which in turn affects profitability, and solvency position of banks. Kargi (2011) examined that profitability is inversely influenced by the level of loans and advances and non-performing loans. Similarly, Kaaya and Pastory (2013) examined the impact of credit risk on profitability and revealed that the indicator of credit risk has the significant negative impact on profitability. Noman *et al.* (2015) confirmed a significant negative effect of credit risk on profitability. The analysis also found a negative and significant effect of capital adequacy ratio on profitability. Therefore, the research hypothesis for the study is proposed as;

H_1: Non-performing loan has the significant negative impact on banks' profitability.

Solvency

Solvency is the proxy of liquidity ratio. Solvency for a bank means the ability to meet its financial obligations when they come due. Solvency is the ratio between liquid assets and total deposit plus short term borrowing. Symbolically;

Solvency = Liquid Assets/(Total Deposit+Short-term borrowing) ……..(4)

Khan and Ali (201) investigated the relationship between the liquidity and profitability of the commercial banks. The result confirmed that there is a significant positive relationship between liquidity with profitability of the commercial banks. When the liquidity increases, the investment opportunity of the banks also will increase. An increased investment leads to increase in interest income. Thus, the research hypothesis for the study is as follows;

H_2: Solvency ratio has the significant positive impact on banks' profitability.

CAR (Capital Adequacy Ratio)

Capital adequacy is the measure of financial strength of the commercial banks. It is also a measure of ability to absorb the financial risk that may be incurred in the commercial banks. Thus, it is the pre-requisites of protection against the financial distress. In financial term, it is the ratio between capital funds to risk weighted assets is termed as capital adequacy ratio. Symbolically;

CAR = Capital fund / Risk weighted assets ……..(5)

Ogboi and Unuafe (2013) examined the impact of credit risk and capital adequacy ratio on banks financial performance in Nigeria using time series and cross sectional data from 2004-2009. Moreover, panel data model also was used to estimate the impact of loans and advances, non-performing loans and capital adequacy on profitability of the commercial banks. The findings showed that credit risk management and capital adequacy ratio have positive impact on performance therefore, the research hypothesis for the study is as follows;

H_3: Capital adequacy ratio has the significant positive impact on banks' profitability.

TA (Total Assets)

TA is used as the proxy of total assets from the balance sheet. Collins and Preston (1969) show that there is a positive association between firm size and profitability and it stems from implementing greater differentiation and specialization strategies and should therefore lead to higher efficiency.

On the other hand, Redmond and Bohnsack (2007) examined the effect of bank size on profitability and showed that, there is a negative significant relationship between profitability and the volume of assets. Similarly, Kosimodou *et al.* (2005) observed that small banks showed higher performance in comparison to large ones. Though, there are contradictory results observed in the literature, using the framework of Redmond and Bohnsack (2007) and Kosimodou *et al.* (2005) the research hypothesis for the study is proposed as follows;

H_4: Total assets has the significant negative impact on banks' profitability.

ISR (Interest Spread Rate)

Interest is the major source of income for the financial institution. Interest spread is interest rate spread between average interest received and average interest paid. The fluctuation of interest rates creates interest risk to the financial institutions. Interest rate risk has significant implications on borrowing cost of the borrowers, returns of the investors, and profitability of the banks. The greater the spread, the more profitable the financial institution is likely to be; and the lower the spread, the less profitable the institution is likely to be. Thus, there is a close relationship

between interest spread and profitability of the banks. Musah *et al.* (2018) confirmed that there is a positive and statistically significant association between interest rate spread and bank profitability. Therefore, the research hypothesis for the study is proposed as;

H_5: Interest spread rate has the significant positive impact on banks' profitability.

GDPG (GDP Growth)

GDP is an inflation-adjusted measure that reflects the value of all goods and services produced in a given year, expressed in base-year prices, often referred to as constant-price. Damena (2011) examined the positive effect of GDP, inflation and interest rate profitability. Likewise, Davydenko (2011) estimated that that both GDP and Inflation have a positive relationship with banks profitability. Therefore, the hypothesis purposed for the study is;

H_6: GDP growth has the significant positive impact on banks' profitability.

INF (Inflation)

Inflation is a sustained increase in the general price level of goods and services in an economy over a period of time due to the devaluation of the fiat currency being used. The inflation rate is the percent increase or decrease of prices during a specified period. Rate of inflation used for the study is as measured by the consumer price index reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services. Damena (2011) examined the positive effect of GDP, inflation and interest rate profitability. Likewise, Davydenko (2011) estimated that that both GDP and Inflation have a positive relationship with banks profitability. Therefore, the hypothesis purposed for the study is;

H_7: Inflation has a significant positive impact on banks' profitability.

IBIR (Inter Bank Interest Rate)

Interbank interest rate is the rate of interest charged on short term borrowing among banks. Sometimes this kinds of interest rate may specify by the central bank of the country, whereas, sometimes it depends on the availability of the liquidity in the market. Bajracharya (2015) confirmed that IBIR has the significant positive impact on performance in Nepali commercial banks. Therefore, the research hypothesis for the study is;

H_8: IBIR has the significant positive impact on banks' profitability.

Results

In this section of the study, the results from the secondary data for profitability in Nepali commercial banks have been presented. Different statistical and econometric models such as descriptive statistics, correlation matrix and panel data analysis were used as the major tools for the analysis.

Descriptive Statistics of the Variables

The descriptive statistics of the variables used in the study for the bank specific variables as well as macroeconomic variables have been presented and analyzed in this section of the study. The descriptive statistics used in the study consists of mean, standard deviation, number of observations, minimum and maximum values.

Table 2 presents the descriptive statistics of variables for the bank specific and macroeconomic variables associated with all 15 banks for the period 2002/03 to 2014/15. ROE is return on equity which is the measure of profitability. NPLis ratio of non- performing loan to total loan.Solvency is the proxy of liquid asset to deposit plus short term borrowing. CAR is capital adequacy ratio.TA represents the total assets.ISR is interest spread between average interest received and average interest paid. GDPG is GDP growth rate. INF is annual inflation rate. IBIR is the interbank rate.

Table 2. Descriptive statistics of the variables

Variables	N	Minimum	Maximum	Mean	Std. Deviation
ROE (%)	195	-190.67	194.80	20.42	31.69
NPL (%)	195	0.00	60.47	5.88	11.10
Solvency (%)	195	5.03	41.11	15.98	6.41
CAR (%)	195	-50.30	41.85	7.81	14.14
TA (NRs. in billion)	195	0.88	150.57	38.54	29.15
ISR (%)	195	0.40	7.75	4.16	1.02
GDPG (%)	195	2.73	6.10	4.26	0.98
INF (%)	195	2.84	11.08	7.87	2.14
IBIR (%)	195	0.16	8.22	3.08	2.38

Table 2 shows the descriptive statistics of the variables used in the study for the period 2002/03 to 2014/15. The average profitability (ROE) in Nepali commercial banks is 20.42%, which ranges from minimum -190.67% to maximum 194.80% with standard deviation 31.69%. The minimum and maximum value of credit risk are 0 and 60.47% with mean 5.88% and standard deviation 11.1%. Similarly, solvency ratio is ranges from 5.03% to 41.11% with mean 15.98% and standard deviation 6.41%.Furthermore, capital adequacy ratio ranges from -50.30% to 41.85% having mean 7.81% and standard deviation 14.14%. The average value of total assets in Nepali commercial banks is observed Nepali Rs. 38.54 billion with minimum Rs. 0.88 billion and maximum Rs. 150.57 billion. In the same way, the average interest spread rate obtained by Nepali commercial banks 4.16% with minimum and maximum of 0.4% and 7.75% respectively.

Regarding macro-economic variables, GDP growth ranges from 2.73% to 6.10% having mean 4.26% and standard

deviation 2.14%. Similarly, mean rate of inflation is 7.87% where minimum inflation rate is 2.84% and maximum 11.08%. The result further shows that inter-bank interest rate is ranges from 0.16% to 8.22% with mean 3.08% and standard deviation 2.38%.

Correlation Analysis

In this section of analysis, the bivariate correlation coefficient between different pairs of research variables have been analyzed. The Pearson correlation coefficients were calculated to examine the nature and direction of the relationship between the dependent variable i.e. ROE and the independent variables such as credit risk, liquidity, capital adequacy ratio, bank size, interest spread rate,GDP growth, inflation and inter-bank interest rate.

Table 3 presents thebivariate Pearson correlation coefficients among the bank specific and macroeconomic variables associated with all 15 banks for the period 2002/03 to 2014/15. ROE is return on equity which is the measure of profitability. NPL is ratio of non- performing loan to total loan. Solvency is the proxy of liquid asset to deposit plus short term borrowing. CAR is capital adequacy ratio. TA represents the total assets. ISR is interest spread between average interest received and average interest paid. GDPG is GDP growth rate. INF is annual inflation rate. IBIR is the interbank rate.

Table 3. Bivariate Pearson Correlation Coefficients

Variables	ROE	NPL	Solvency	CAR	TA	ISR	GDPG	INF	IBIR
ROE	1								
NPL	-.259**	1							
Solvency	-.055	.078	1						
CAR	.342**	-.763**	-.044	1					
TA	-.042	.161*	.109	-.412**	1				
ISR	-.145*	-.087	.221**	-.166*	.256**	1			
GDPG	.029	-.076	.117	-.024	-.003	.059	1		
INF	-.028	-.271**	-.045	.039	.282**	.096	.286**	1	
IBIR	.005	.032	-.209**	-.016	-.221**	-.089	-.192**	.241**	1

*–Correlation is significant at the 0.05 level (2-tailed); **–Correlation is significant at the 0.01 level (2-tailed)

The results show that the correlation coefficient of credit risk with return on equity is negative and significant (-0.259**). The negative correlation indicates that non-performing loan ratio (credit risk) has negative relationship with return on equity. The negative relationship further confirms that higher the credit risk, lower would be the profitability among the commercial banks in Nepal. Similarly, the correlation coefficients of solvency (-0.055), total assets (-0.042), interest spread rate (-0.145*), and rate of inflation (-0.028) are negative with return on equity. The negative coefficients further reveal that solvency, total assets, interest spread rate, and rate of inflation have negative relationship with return on equity. Which means, higher the solvency, total assets, interest spread, and rate of inflation, lower would be the profitability.

Contrarily, the result shows that there is a positive and significant relationship of capital adequacy ratio (0.342**) with return on equity. The positive relationship of capital adequacy ratio with return on equity further confirms that higher the capital adequacy ratio, higher would be the profitability among the commercial banks in Nepal. Similarly, the correlation coefficients of GDP growth (0.029) and inter-bank interest rate (0.005) are positive with return on equity. The positive correlation coefficients further confirm that higher the GDP growth and interbank interest rate, higher would be the profitability among the commercial banks in Nepal.

Regression Results

The regression results of profitability on bank specific variables and macro-economic variableshave been analyzed and presented in table IV. In order to check the robustness on the explanatory power of the explanatory variables, one way Fixed Effect Model (FEM) of panel data analysis were used, where return on equity has been regressed individually and jointly with different combinations of independent variables. The model specifications 1 through 8 report the simple regression results whereas, model specifications 9 through 16 report the multiple regressions results.

Table 4 shows the regression results ofprofitability on bank specific and macroeconomic variables using fixed effect model associated with all 15 banks for the period 2002/03 to 2014/15.NPL is ratio of non- performing loan to total loan. Solvency is the proxy of liquid asset to deposit plus short term borrowing. CAR is capital adequacy ratio. TA represents the total assets. ISR is interest spread between average interest received and average interest paid. GDPG is GDP growth rate. INF is annual inflation rate. IBIR is the interbank rate. The reported values are intercepts and slop coefficients of respective explanatory values with standard errors in the parentheses. The reported value also includes the values of coefficient of determination (Adj. R^2), F-test (F), and Durbin-Watson (DW). The double asterisk (**) sign indicates that the results are significant at 5% level of significance.

$$ROE_{it}=\beta_1+\beta_2 C\_Risk_{(it)}+\beta_3 Solvency_{it}+\beta_4 CAR_{it}+\beta_5 TA_{it}+\beta_6 IS_{it}+\beta_7 GDPG_{it}+\beta_8 INF_{it}+\beta_9 IBIR_{it}+\varepsilon_{it}$$

In table 4, the regression results of return on equity on NPL (credit risk) are negative and significant at 5% significance level. The significant negative coefficients confirm that credit risk has the significant negative impact on return on equity. Which means, higher the credit risk (i.e. non-performing loan), lower would be the profitability of commercial banks in Nepal.This result is consistent with the findings of Kargi (2011), Kaaya and Pastory (2013), and Noman *et al.* (2015).Therefore, there are sufficient evidences in favour of research hypothesis that non-performing loan has the significant negative impact on profitability of commercial banks in Nepal. Regarding the solvency ratio, all the regression coefficients are negative and statistically insignificant. The insignificant negative

Table 4. Regression results on profitability using one way fixed effect model

Sl. No.	Const	NPL	Solvency	CAR	TA	ISR	GDPG	INF	IBIR	|Adj R^2|	F	DW
1	24.78**	-0.74**								0.05	1.75	1.94
	(1.44)	(0.25)										
2	23.77**		-0.21							0.01	0.85	1.92
	(7.42)		(0.46)									
3	14.5**			0.76**						0.11	2.52	1.98
	(0.8)			(0.1)								
4	21.9**				-0.04					0.01	0.85	1.92
	(3.52)				(0.09)							
5	39.43**					-4.57				0.01	1.11	1.94
	(12.99)					(3.12)						
6	16.49**						0.92			0.01	0.84	1.92
	(5.69)						(1.34)					
7	23.68**							-0.41		0.01	0.84	1.91
	(9.39)							(1.19)				
8	20.22**								0.07	0.01	0.83	1.91
	(1.56)								(0.51)			
9	26.08**	-0.74**	-0.08							0.05	1.63	1.94
	(7.04)	(0.25)	(0.44)									
10	16.52**		-0.12	0.76**						0.10	2.36	1.99
	(6.95)		(0.43)	(0.1)								
11	8.5*			0.87**	0.13					0.11	2.56	1.97
	(4.47)			(0.14)	(0.1)							
12	23.52**							-0.46	0.17	0.02	0.78	1.91
	(9.23)							(1.25)	(0.56)			
13	23.4**	-0.74**			0.00		0.29			0.04	1.53	1.94
	(8.14)	(0.26)			(0.09)		(1.35)					
14	37.91**	-0.86**			0.05			-1.81		0.06	1.69	1.94
	(12.09)	(0.33)			(0.11)			(1.57)				
15	29.42*			0.73**		-2.62		-0.48		0.10	2.32	2.00
	(19.99)			(0.11)		(3)		(1.05)				
16	21	-0.13	-0.1	0.88**	0.26**	-3.72	3.75**	-2.58	1.53	0.12	2.22	2.05
	(24.87)	(0.58)	(0.33)	(0.3)	(0.13)	(2.93)	(1.87)	(2.2)	(1.03)			

coefficients further confirm that, solvency ratio has insignificant negative impact on profitability in Nepali commercial banks.The result contradicts with the findings of Khan and Ali (2016). Therefore, the research hypothesis that the solvency ratio has the significant positive impact on banks' profitability cannot be accepted. Moreover, all the regression results of interest spread are also negative. The negative coefficients suggest that there is a negative impact of interest spread on profitability. However, the coefficients are statistically insignificant. Likewise, all the results of inflation are also negative and insignificant. Therefore, the profitability of commercial banks is insignificantly affected by inflation.

On the other hand, all the regression coefficients of capital adequacy ratio are statistically significant and positive. The significant positive coefficients confirmed that capital adequacy ratio has the significant positive impact on profitability of the commercial banks in Nepal. This indicates that higher the capital adequacy ratio, higher would be the return on equity. The present finding is consistent withthe findings of Ogboi and Unuafe (2013). Therefore, there is sufficient evidences in support of research hypothesis that capital adequacy ratio has the significant positive impact on profitability in Nepali commercial banks. Similarly, the beta coefficients of total assets are also positive in almost all equations except model 1. The beta coefficient is also statistically significant at 5% significance level in model 16. Therefore, it confirms that higher the total assets, higher would be the profitability.The finding is consistent with the finding of Collins and Preston (1969), whereas contradicts with the findings of Redmond and Bohnsack (2007) and Kosimodou *et al* (2005). Furthermore, the results of GDP growth are also positive in all models and statistically significant at 5% in model 16. Therefore, it indicates that higher the GDP growth, higher would be the profitability of commercial banks in Nepal. Finally, in the case of inter-bank interest rate, all the beta coefficients are positive but insignificant. Therefore, it is confirmed that inter-bank interest rate has insignificant positive impact on profitability.

Conclusions

This study is conducted specially with the aim of investigating the impact of non-performing loan, bank specific variables, and macroeconomic variables on profitability of commercial banks in Nepal. The study is conducted using the sample of 15 commercial banks operated in Nepali economy. One way Fixed Effect Model (FEM) of panel data analysis is used as a major tool of

analysis. All the data for the study were obtained from the database of Nepal Rastra Bank for bank specific variables and database of world bank for macroeconomic variables for the year 2002/03 to 2014/15. The profitability of the commercial banks is measured in terms of return on equity and is regressed on bank specific variables such as non-performing loan ratio (NPL), solvency ratio, capital adequacy ratio, total assets, and interest spread. Similarly, the effects of macro-economic variables such as GDP growth, rate of inflation and interbank interest rate are also examined along with bank specific variables in identifying profitability in Nepali commercial banks.

The study reveals that non-performing loan ratio has the significant negative impact on profitability of commercial banks in Nepal. In addition, solvency ratio, interest spread rate, and inflation have the insignificant negative impact on profitability. In contrast, capital adequacy ratio, total assets, and GDP growth have the significant positive impact on profitability of commercial banks in Nepal. Finally, inter-bank interest rate has insignificant positive impact on profitability.

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