Credit Risk Management and Financial Performance of Indian Commercial Banks: A Study

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Abstract

Credit risk is a major risk to commercial banks and financial institutions. Credit risk of financial institutions is inherent with the nature of the business, and should be managed well for their survival. The present study examines the role of credit risk management and its impact on the financial performance of commercial banks in India. For the study, secondary financial data are collected from published annual reports of 20 commercial banks, consisting of 12 public sector commercial banks and eight private sector commercial banks, covering six years, from 2013-14 to 2018-19. Risk of commercial banks is measured through non-performing loan ratio, capital adequacy ratio, loan loss provision ratio, cost per loan ratio, and leverages of sample banks. Financial performance of banks is measured through three alternative measures of profitability, namely return on assets, return on equity, and net interest margin. Pooled data are used for panel regression analysis. Empirical study results revealed mixed and varied indication about credit risk management and its influence on the financial performance of commercial banks. The study results indicate that profitability of the banks is falling due to increasing NPAs. However, the capital adequacy ratio enhances the profitability of public sector banks more than the private sector commercial banks.

Keywords: Commercial Banks, NPAs, Profitability, Credit Risk Management, Panel Regression Analysis, India

Introduction

Commercial banks are considered an important part in the rising economy around the world, as they reflect the country's economic status. Banking stability of a country over some time indicates the financial stability of the nation (Parab & Patil, 2018). In an emerging economy, commercial banks are social agents of the government. Credit risk arises from the activity of credit creation, which is linked to the daily transaction of business. For example, if a borrower fails to repay the principal and interest amount, it has an adverse impact on the financial performance of banks. High credit risk in the financial sector causes a slowdown in the economic growth rate (Chaibi & Ftiti, 2014), low financial performance (Wagner & Marsh), reduces cost efficiency (Berger & Young, 1997), and is a threat to all successful lending (Angelini et al., 2007). Excessive rapid loan growth and fast decline in bank capital are the indicators of deterioration of financial health of banks, and may be an early indication of loan loss (Das & Ghosh, 2007).

Timely credit disbursement can enhance profitability (Kaaya & Pastory, 2013) and share price of banks (Bhaumik & Piesse, 2008). Therefore, evaluation of credit risk is a key factor of successful financial institutions, because a huge loss can be recovered by implementing a proper evaluation process (Lahsasna et al., 2010). Anthony (2012) recommends that the government should be concerned about the financial sector, because financial dependency will motivate savings. An effective regulatory system can build a sound banking environment (Galloway et al., 1997).

Various types of risks are faced by commercial banks, out of this credit risk is essential because it may convert into bad loan, which directly hurts the profitability of banks. Credit risk management is directly associated with the financial stability of commercial banks (Wagner & Marsh, 2006). Therefore, researchers are interested to know the relationship between credit risk management

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and financial performance of banks. A few of them (Li & Zou, 2014; Bhattarai, 2016; Kaaya & Pastory, 2013) found that different types of credit risk variables play a significant impact on ROA and ROE in banks. However, these results are not consistent, so further study can be conducted in the Indian context to know the position of credit risk.

The Indian banking industry consists of a central bank (RBI), commercial banks, co-operative banks, development banks, and so on. All banks are regulated by the Reserve Bank of India. Commercial banks are categorised as public sector banks, private sector banks, and foreign banks. These banks are considered as major and competitive financial institutions that earn revenue by providing financial services to their customers and managing different types of credit risk. Contribution of these bank have a substantial impact on the country's GDP. Non-performing loan is rapidly increasing in Indian commercial banks since the last few years; it has a negative impact on the financial performance of banks, as well as the Indian economy. Basel III was developed after the financial crisis of 2007-2008 by the Basel committee on banking supervision, to improve the banking system around the world. It was implemented in India in 2019. Basel III is a regulatory framework on banks that helps improve capital adequacy, supervisory, and promote transparency. A high capital adequacy enhances the risk-taking ability of banks (Zong-Yi et al., 2008). As a result, credit risk management of commercial banks becomes essential in India.

In this study, we investigate the impact of credit risk management on the financial performance of commercial banks in India. Additionally, a comparison has been made between public sector banks and private sector banks.

The remainder of this paper is structured as follows. Section 2 presents the review of literature and section 3 discusses the development of hypothesis. Section 4 contains the research methodology of the study, describing the data and models of the study. The empirical results are presented and discussed in section 5. Finally, section 6 presents the concluding remarks.

Literature Review

A bank not only accepts deposits, but also provides credit facilities. As a result, these facilities are vulnerable to credit risk. It is the most important risk suffered by banks and the growth of the banking business depends on its ability to accurately identify and properly manage credit risk, to a larger extent, than any other risk (Gieseche, 2004). Numerous empirical investigations have been undertaken in the area of credit risk management, which revealed that credit risk management and financial performance have a strong relationship. However, some studies mention that credit risk management and bank performance are weakly related to each other. These exploratory studies are reviewed here for deep insights from the cross-country perspective of Ghana, Kenya, Nigeria, India, and Nepal.

Management of credit risk is a very popular issue among practitioners, as well as academicians, because of its importance in bank's management. In India, empirical studies are also undertaken to study the nexus among credit risks and financial performance of Indian commercial banks. Jeslin (2017) conducted a study to determine the influence of credit risk on the profitability of SBI. Credit risk of the bank is identified though capital adequacy ratio, non-performing assets ratio, loan to deposit ratio, cost per loan ratio, provision coverage ratio, leverage ratio, and non-performing assets to asset ratio, whereas profitability of the bank is measured through return on equity. The study results revealed that only non-performing assets to assets ratio has a significant negative impact on the profitability of the sample banks. In another study, Haque and Wani (2015) examined the relevance of financial risk with the financial performance of Indian commercial banks. These empirical findings reveal that credit risk, capital risk, and solvency risk are statistically significant to the financial performance of Indian commercial banks. Singh and Sharma (2018) also examined the impact of credit risk on the profitability of 26 Indian public sector banks. Return on assets (ROA) is used as a proxy measure for profitability, and credit risks are measured through capital adequacy ratio (CAR), loan provisions to non-performing loan ratio (LPNPL), and non-performing loans to the total loan (NPLR). Their empirical study shows that CAR and LPNPL significantly and positively influence the return of assets of the sample banks under study. Recently, Parab and Patil (2018) asses the influence of credit risk on the performance of 40 Indian commercial banks. The financial performance of the sample banks is measured by ROA, ROE, and net interest margin ratio. Their panel regression results revealed that only the loan loss allowance and credit deposit ratio positively influence the three measures of profitability. Ali and Dhiman (2019) made a study between credit risk management and

financial performance of selected public sector banks in India. ROA is used as the dependent variable, whereas independent variables are NPLR, LLPR, CAD, asset quality, management, earnings, and liquidity. The panel regression result shows that credit risk has a significant relationship with financial performance. Another study was conducted by Gupta and Sikarwar (2020), to measure credit risk on bank's profitability of selected commercial banks in India. In this study, ROA and ROE were used as dependent variables, whereas capital adequacy, debt equity, and leverage were employed as independent variables. The study recommended that a higher level of supervision is required to manage credit risk, and banks should continuously monitor the credit risk indicators.

Few studies have been conducted to know the impact of credit risk management on banks' performance with respect to Ghana in different time periods (Afriyie & Akotey, 2012; Annor & Obeng, 2018; Akomeah et al., 2020). They found that loan loss provision ratio is negatively related to bank performance and capital adequacy ratio is positively related to performance. They argued that higher capital adequacy increased firm performance (Afriyie & Akotey, 2012; Annor & Obeng, 2018; Akomeah et al., 2020), while non-performing loans has shown mixed results. Akomeah et al. (2020) found non-performing loan (NPL) to be negatively related to bank performance due to high loan default. Afriyie and Akotey (2012) and Annor and Obeng (2018) stated that non-performing loan is positively related to bank performance. In brief, with respect to Ghana's banking industry, credit risk shows mixed behaviour with bank performance.

Some other studies were conducted in the Nigerian context to know the relationship between credit risk management and bank performance (Kolapo et al., 2012; Abiola & Olausi, 2014; Ajayi & Ajayi, 2017). Loan loss provision ratio (LLPR) reduces financial performance due to high provision against profit (Kolapo et al., 2012). In this country's context, non-performing loan (NPL) also shows mixed evidence. Abiola and Olausi (2014) reported that NPL is positively related to financial performance due to high interest rate on loan to other customer, while Kolapo et al. (2012); Ajayi and Ajayi (2017) concluded that NPL is negatively related to bank performance due to high credit default. These studies mostly reported that poor credit risk management leads to huge loan default.

Nonetheless, in the Kenyan context, Fredrick (2012) and Muriithi et al. (2016) examined the linkage between credit risk management and bank performance. They also found that NPL reduces bank performance due to high loan default. Capital adequacy ratio is negatively related to bank performance (Fredrick, 2012). A similar type of study in the Nepal context conducted by Bhattarai (2016) also reported that NPL reduces financial performance due to high loan default, and cost per loan ratio is positively related to bank performance.

From the above discussion, it may be concluded that limited studies are conducted to examine the relationship between credit risk and financial performance of commercial banks in India, though they are inter-related. Additionally, no study is undertaken to make a comparison between public sector banks and private sector banks with respect to credit risk management. To maintain sustainability in the competitive environment, private commercial banks are more effective and serious in their banking activities than state-owned banks. However, our research objectives are presented below.

Objectives of the Study

The present study examines the impact of credit risk management on the financial performance of commercial banks. Additionally, a comparison is to be made between private and public sector banks in India, with respect to credit risk management.

Hypothesis Development

Following hypotheses are formulated for our empirical study.

Non-Performing Loan Ratio (NPLR)

In the banking industry, credit creation is the main source of income. However, when a lender is unable to refund the regular amount to the bank after more than 90 days, then that portion of the loan is treated as a non-performing loan. That means, increasing NPLR indicates larger credit risk. High NPL ratio suggests lower credit quality, and more loan loss will be charged against income, which in turn reduces the profitability of banks. Empirical studies revealed that a higher incidence of non-performing loans

negatively affects cost, efficiency, and profitability (Kolapo et al., 2012; Karim et al., 2010). Empirical evidence of Bhattarai (2016) and Serwadda (2018) also found that NPLR reduced bank performance during the study period. However, Kurawa and Garba (2014) and Afriyie and Akotey (2012) mentioned that there is a positive association between NPLR and bank performance. Based on the discussion, we hypothesise that:

H_1: Non-performing loan ratio has a significant negative relation to financial performance.

Capital Adequacy Ratio (CAD)

This ratio is alternatively known as capital to risk-weighted assets ratio. It protects banks' depository and promotes capital stability and efficiency of banks around the world. A high capital adequacy ratio of a bank indicates that the risk-taking ability of the bank is high. Therefore, the capital adequacy ratio is a determinant of credit risk. According to Basel norms, minimum maintaining capital adequacy is 8%. However, in India, it is 9%. Adequate capital creates an avenue for better functioning, ensures safe operations of banks for retaining public confidence, and provides infrastructural support for sound operations (Ho & Hsu, 2010). Zhang et al. (2008) mentioned in their study that change in capital and change in risk is associated negatively with each other. A strong capital adequacy ratio can increase financial performance, as well as the financial stability of a bank (Akomeak et al., 2020; Annor & Obeng, 2017). However, Noman et al. (2015) and Fredrick (2012) found in their studies that CAD is negatively associated to ROE. Very few studies found capital adequacy ratio has no meaningful relationship with financial performance (Abiola & Olausi, 2014; Bhattarai, 2016). Based on the above discussion, we hypothesise that:

H_2: *Capital adequacy ratio has a positive relationship to financial performance.*

Loan Loss Provision Ratio (LLPR)

Loan loss provision is created from the earnings of the bank to protect it from high credit risk. A high LLPR indicates that the banks are protected from future loss, but this hampers the future growth of banks. A regular high non-performing loan ratio indicates that the credit risk assessment techniques are weak. So, it is considered as a determinant of credit risk. A high ratio decreases the profitability of banks (Tahir et al., 2014).

Kolapo et al. (2012) and Noman et al. (2015) found that loan loss provision ratio reduced financial performance significantly due to high provision. On the other hand, Ahmad and Mohamed (2007) explained that LLPR has a positive relation to credit risk of banks in Australia, Japan, Mexico, and Thailand. Based on the above discussion, we hypothesise that:

H_3: *Loan loss provision is negatively related to financial performance.*

Cost Per Loan Ratio (CPLR)

Cost per loan is measured by total operating cost to total amount of loan. This variable measures the efficiency in terms of cost of distributing loans to customers (Ahmed et al., 1999). Therefore, the cost per loan is an indicator of bank performance. A high cost per loan ratio indicates that a high amount of cost is involved for loan purposes.

Bhattarai (2016) opined that the cost per loan ratio is positively related to the performance of commercial banks in Nepal. In a similar type of study, Kurawa and Garba (2014) mentioned that the relationship between cost per loan asset and bank performance is significant and positive. However, study results of Poudel (2012) revealed that the cost per loan ratio has no meaningful relationship to performance. On the basis of the above argument, we hypothesise that:

H_4: *Cost per loan ratio is negatively related to financial performance.*

Public and Private Sector Banks and Their Credit Risk Management

There are mainly two types of commercial banks in operation in India: private sector and public sector banks. Public sector banks are those in which at least 50 per cent of the banks' share is owned by the government. Therefore, the controlling power of those banks is in the hands of the government. On the other hand, private sector banks are those banks which are owned by individuals or groups of

people. Therefore, the controlling power of those banks is in the hands of the major shareholders. These types of banks are mainly driven by the profit motive. Arora and Singh (2014) believed that the main obstacle of public sector banks is credit risk due to rapid increase of bad loans. Oino (2016) opined that private sector banks are more efficient in managing their credit risk compared to public sector banks. On the basis of the above argument, we hypothesise that:

H_5: *Private sector banks are better at managing their credit risk compared to public sector banks.*

Research Methodology

Data

The study is based on secondary data collected over a six-year period, from 2013-14 to 2018-19, and consists of 20 commercial banks in India, of which 12 are public sector banks and eight are private sector banks. We select 20 commercial banks based on market capitalisation and availability of all types of data. All secondary data is taken from the annual report of the relevant banks.

Econometric Model

We select 20 commercial banks to examine the effect of credit risk management on the financial performance. In our dataset, cross-sectional data and time-series data are present. Therefore, in this study, we applied the following panel regression model to determine the objectives.

Model 1

$$ROA = \alpha + \beta_1 (NPLR_{it}) + \beta_2 (CAD_{it}) + \beta_3 (LLPR_{it}) + \beta_4 (CPLR_{it}) + \beta_5 (BS_{it}) + \beta_6 (DR_{it}) + \beta_7 (LEV_{it}) + \varepsilon_{it}.$$

Model 2

$$ROE = \alpha + \beta_1 (NPLR_{it}) + \beta_2 (CAD_{it}) + \beta_3 (LLPR_{it}) + \beta_4 (CPLR_{it}) + \beta_5 (BS_{it}) + \beta_6 (DR_{it}) + \beta_7 (LEV_{it}) + \varepsilon_{it}.$$

Model 3

$$NIM = \alpha + \beta_1 (NPLR_{it}) + \beta_2 (CAD_{it}) + \beta_3 (LLPR_{it}) + \beta_4 (CPLR_{it}) + \beta_5 (BS_{it}) + \beta_6 (DR_{it}) + \beta_7 (LEV_{it}) + \varepsilon_{it}.$$

Here, $_{it}$ represents bank 'i' in year 't'.

Dependent Variables: Profitability of commercial banks is the dependent variable in this study. The proxy measures of profitability are Return on Assets (ROA), Return on Equity (ROE), and Net Interest Margin (NIM). Here, return on asset (ROA) is the main measure of profitability and return on equity (ROE) and net interest margin (NIM) are the alternative measures of profitability. The measurement procedures of different measures of profitability are explained below.

ROA: It is a proxy measure of the profitability of the overall business. It is measured as Net profit / Total assets (Bhattarai, 2016; Kolapo et al., 2012).

ROE: Return on equity is a measure of the profitability of a business related to equity. It is measured as Net profit / Shareholders fund (Bhattarai, 2016; Kolapo et al., 2012).

NIM: Net interest margin is the ratio which measures how successful a firm is from its investment. It is measured as (Interest earned − Interest expenses) / Earning assets (Noman et al., 2015).

Independent Variables: Independent variables and their measurement descriptions are given below.

Non-Performing Loan Ratio (NPLR): It is measured as Non-performing loan / Loan and advance (Bhattarai, 2016; Kolapo et al., 2012; Serwadda, 2018).

Capital Adequacy Ratio (CAD): It is measured as (Tier 1 capital + Tier 2 capital) / Risk-weighted assets (Bhattarai, 2016; Kurawa & Garba, 2014).

Loan Loss Provision Ratio (LLPR): It is measured as Loan loss provision/Non-performing loan (Ahmad & Mohamed, 2007; Kolapo et al., 2012).

Cost per Loan Ratio (CPLR): It is measured as Operating cost / Loan and advance (Kurawa & Garba, 2014; Poudel, 2012).

Control Variable: The following two variables are used in our study as the control variables.

Size of Bank (BS): Bank size is measured as log of the total asset (Bhattarai, 2016; Kaaya & Pastory, 2013).

Deposit Ratio (Dr): Depository ratio is measured as Deposit / Total asset.

Leverage (LEV): It is measured as Total liability / Total assets.

Empirical Results

Descriptive Statistics: In Table 1, descriptive statistics are presented to give a brief overview of the dependent and independent variables (ROA, ROE, NIM, NPLR, CAD, LLPR, CPLR, BS, DR, and LEV) of 12 public sector commercial banks, eight private sector commercial banks, and 20 commercial banks (combined), in India, from 2013-14 to 2018-19.

Table 1: Descriptive Statistics

	12 Public Sector Banks			8 Private Sector Banks			20 Commercial Banks		
	N	*MEAN*	*S. D*	*N*	*MEAN*	*S. D*	*N*	*MEAN*	*S. D*
NPLR	72	0.0611	0.03677	48	0.0162	0.01295	120	0.0431	0.03687
CAD	72	0.1168	0.01220	48	0.1529	0.01629	120	0.1312	0.02256
LLPR	72	0.5697	0.28422	48	1.2389	1.14689	120	0.8374	0.82224
CPLR	72	0.0257	0.00580	48	0.0319	0.00459	120	0.0282	0.00615
SIZE	72	12.8219	0.77549	48	12.1940	1.15503	120	12.570	0.99053
DR	72	0.8409	0.04951	48	0.9040	1.12937	120	0.8661	0.71147
LEV	72	0.8829	0.10564	48	0.9044	0.01693	120	0.8915	0.08296
ROA	72	-0.0031	0.01035	48	0.0121	0.00477	120	0.0030	0.01133
ROE	72	-0.0496	0.16103	48	0.1257	0.04607	120	0.0205	0.15409
NIM	72	0.0240	0.00384	48	0.0335	0.00675	120	0.0278	0.00699

Mean value of ROA of private sector banks is greater than the public sector banks. This means that the profitability of private sector banks is better. Though, the mean value of return on assets is not satisfactory, because of the negative values. The table shows that mean ROE of public sector banks, private sector banks, and 20 commercial banks are −0.0496, 0.1257, and 0.0205, respectively. It indicates that the earning capacity of private sector banks is better than the public sector banks. Mean value of NPLR of public sector banks is 0.0611, which is much higher than the private sector banks' mean of 0.0162. This shows that the loan recovery capacity of private sector banks is better than public sector banks. On the other hand, mean value of CAD of public sector banks is 11.68%, whereas the mean value of CAD of private sector banks is 15.29%. This indicates that private sector banks are capitally stronger than public sector banks. Mean value of LLPR of private sector banks is 1.2389, which is much higher than that of public sector banks (0.5679). This indicates that private sector banks are more protective than public sector banks. The mean value of CPLR of public sector banks is 0.0257, which is lower than that of private sector banks (0.0319). This shows that public sector banks are more cost-effective than private sector banks.

Table 2: Correlation (20 Commercial Banks) (N = 120)

	ROA	*ROE*	*NIM*	*NPLR*	*LEV*	*CAD*	*LLPR*	*CPLR*	*BS*	*DR*
ROA	1									
ROE	0.954**	1								
NIM	0.548**	0.426**	1							
NPLR	−0.805**	−0.830**	−0.497**	1						
LEV	−0.196*	−0.265**	0.079	0.247**	1					
CAD	0.654**	0.584**	0.669**	−0.606**	0.001	1				
LLPR	0.222*	0.197*	0.502**	−0.318**	0.090	0.378**	1			
CPLR	0.125	0.022	0.442**	0.050	0.237**	0.366**	0.390**	1		
BS	0.081	.066	0.225*	−0.134	−0.128	0.213*	0.234**	0.038	1	
DR	0.046	0.036	0.085	−0.025	0.002	0.031	−0.069	−0.031	−.230*	1

** denotes 1% level of significance and * denotes 5% level of significance.

Table 2 shows the correlation matrix of 20 commercial banks. CAD has a positive relationship with ROE and ROA. This indicates that the more capitalised are the more profitable. A high capital adequacy ratio can protect the bank from unexpected losses. However, NPLR is negatively related to ROE and ROA. This implies that an increase in non-performing loans is a major cause of lower profitability. Bank size has a positive correlation with ROA and NIM. This shows that large banks earn more profit. Loan loss provision ratio is positively related to ROE and ROA. Perez et al. (2008) found that the loan loss provision ratio is used to manage earnings, but not manage the capital, in the case of a Spanish bank, during the study period.

Diagnostic Test: Before conducting panel regression, Hausman test is conducted to check our dataset. Here, Hausman test results are used to select the best panel model, i.e., fixed-effect model or random-effect model. The test statistics of this test with p values are given in Table 3 for all samples (20 banks), public sector banks (12 banks) and private sector banks (eight banks). From the results of Table 3, it is seen that fixed model is the best panel model for the 20 sample banks and the private sector banks, and random effect model is the best for the sample public sector banks.

Table 3: **Results Hausman Test for Sample Banks**

S.r No.	All Samples (20 Banks)		Dependent Variables		
	TEST	*Results*	*ROA*	*ROE*	*NIM*
1	Hausman Test (20 Banks)	Best panel model is a fixed-effects model	44.0113*(0.0000)	18.1585*(0.0113)	17.603*(0.0139)
2	Hausman Test (12 Public Banks)	Best panel model is the random-effects model	10.34475(0.1699)	8.490639(0.2913)	2.30722(0.9409)
3	Hausman Test (8 Private Banks)	Best panel model is the fixed-effects model	43.7048*(0.0000)	39.3311*(0.0000)	120.217*(0.0000)

Note: * denotes 5% level of significance.

Regression Results

In this section, panel regression results are categorised into three parts for all sample banks, public sector banks, and private sector banks, respectively. Due to the existence of heteroscedasticity in our models, we applied while's cross-section standard error and covariance method for estimating our panel regression result in all three cases. Table 4 shows the fixed effect regression results of 20 sample banks.

Table 4: **Fixed Effect Regression Results of 20 Sample Banks**

Variables	Model 1 (ROA)		Model 2 (ROE)		Model 3 (NIM)	
	Coefficient	*T-Statistics*	*Coefficient*	*T-Statistics*	*Coefficient*	*T-Statistics*
(constant)	0.009880	0.233320	0.271643	0.375848	0.069490	2.08018**
NPLR	−0.086926	−1.88497**	−1.819860	−3.335979*	−0.047945	−2.875758*
CAD	0.142974	2.25733**	2.295863	2.619602*	0.003516	0.103915
LLPR	−0.001087	−0.896304	−0.004188	−0.276986	−0.000427	−2.08665**
CPLR	−0.587505	−1.462251	−7.264663	−1.89758**	−0.034099	−0.277428
BS	7.9205	0.011638	−0.025363	−0.209998	−0.008662	−1.467933
DR	−0.000361	2.10573**	−0.006994	−2.665095*	0.000214	1.566371
LEV	−0.005116	0.966530	−0.139938	−1.458824	0.008026	4.382589*
R^2 Valle	0.8576		0.822064		0.888087	
F-Stat	17.10689*		13.11482*		22.52669*	
D-W Stat	1.726415		2.095599		1.297653	

** denotes 5% level of significance and * denotes 1% level of significance.

Table 4 shows the relationship between the bank's specific credit risk factors with the financial performance of 12 public sector banks in India. Coefficient of determination, also known as R^2, has the value of 85.76%, 82.21%, and 88.81% of the financial performance of sample commercial banks measured by ROA, ROE, and NIM, respectively. It indicates that 85.76%, 82.21%, and 88.81% of variance is explained by the independent and control variables collectively in financial performance proxied by ROA, ROE, and NIM, respectively. All values of F-statistics are significant and indicate that models are best-fit models.

Non-performing loan ratio (NPLR) is negatively related to ROA, ROE, and NIM, and its coefficient is statistically significant. It indicates that high NPLR reduces financial performance of commercial banks. Our study is consistent with that of Bhattarai (2016), Kolapo et al. (2012), and Serwadda (2018), and inconsistent with Kurawa and Garba (2014).

Capital adequacy ratio has a significant positive relationship to ROA and ROE. It means that capital strength in banks help accelerate ROE and ROA. Our studies are in line with that of Akomeak et al. (2020) and Annor and Obeng (2017), and contradict Noman et al. (2015).

LLPR is negatively related to NIM, and its coefficient is statistically significant. It means that high provision is required against non-performing loans, due to low interest collection. Our study is in line with that of Kolapo et al. (2012) and Noman et al. (2015).

Cost per loan ratio has a negative relationship to ROE. It implies that high operating cost per loan decreases financial performance.

The study results show that bank size has no significant relationship to all dependent variables. Depository ratio is negatively related to ROA and ROE, and its coefficient is statistically significant. It implies that huge deposit in the bank causes interest expenses to the bank, and negatively impacts the banks' financial performance.

Leverage is positively related to net interest margin (NIM), and its coefficient is statistically significant. However, leverage is insignificantly related to ROA and ROE. It means that high leverage reduces interest earnings.

Table 5 presents the relationship between the bank-specific credit risk factors with the financial performance of 12 public sector banks in India. As per Hausman results, the random effect regression model is used to examine the said relationship. Coefficients of determination value of the three models are 84.23%, 76.34%, and 17.52%, respectively. Significant F values indicate the construction of the models. From the table, it is shown that non-performing loan ratio (NPLR), capital adequacy ratio (CAD), and loan loss provision ratio (LLPR) are significantly related with the measures of financial performance of sample public sector banks. The relationship of NPLR and LLPR are negative with the dependent variables, and the relationship of CAD is positive with ROA, ROE, and NIM. Our study is consistent with that of Li and Zou (2014), Bhattarai (2016); Kaaya and Pastory (2013), and inconsistent with that of Ali and Dhiman (2019). Therefore, the relationship of these three variables are according to our assumption.

Table 5: Random Effects Regression Results of 12 Public Sector Banks

	Model 1 (ROA)		Model 2 (ROE)		Model 3 (NIM)	
Variables	*Coefficient*	*T-Statistics*	*Coefficient*	*T-Statistics*	*Coefficient*	*T-Statistics*
(constant)	−0.0058	−0.172074	0.388777	0.937840	0.00058	0.030168
NPLR	−0.14428	−8.053591*	−2.73051	−6.152731*	−0.01739	−0.943796
CAD	0.124871	2.778449*	2.262648	2.417223**	0.036315	0.682612
LLPR	−0.02321	−19.81258*	−0.26654	−5.419301*	−0.003554	−3.045463*
CPLR	0.000072	0.06440	1.787191	0.815279	0.015504	0.098688
BS	0.002961	1.327101	−0.00936	−0.326329	0.001004	0.379769
DR	−0.00293	−0.099969	−0.30035	−0.912699	0.007286	0.695207
LEV	−0.00385	−0.643863	−0.14419	−1.027367	−0.007142	−3.30480*
R^2 Value	0.842341		0.763401		0.175296	
F-Stat	48.84864*		29.49995*		1.943375**	
D-W Stat	1.99074		2.038682		0.902347	

** denotes 5% level of significance and * denotes 1% level of significance.

Table 6 presents the random effect regression results of credit risk management and financial performance of eight private commercial banks operating in India. The R^2 values of the three models are 86.58%, 81.39%, and 93.32%, with respect to the three dependent variables, i.e., ROA, ROE, and NIM, respectively. Therefore, more than 80% variances of dependent variables are explained by independent and control variables. From the regression results, it is also seen that the non-performing loan ratio and leverage have a significant and negative relationship with all dependent variables. Therefore, the study results confirm two hypothesis – H_1 and H_2. Study result also shows that the constant of three models is positive and statistically significant. Our study agrees with the study by Li and Zou (2014) and Oino (2016). The Durbin-Watson statistics of all three models is more than two, which indicates the non-existence of autocorrelation.

Table 6: **Fixed Effect Regression Results of Eight Private Sector Banks**

	Model 1 (ROA)		Model 2 (ROE)		Model 3 (NIM)	
Variables	*Coefficient*	*T-Statistics*	*Coefficient*	*T-Statistics*	*Coefficient*	*T-Statistics*
(constant)	0.278817	5.032287*	1.72876	2.20114**	0.271596	3.614525*
NPLR	−0.14014	−2.25792**	−1.3612	−2.10116**	−0.08613	−2.874028*
CAD	−0.04628	−1.080137	−0.34688	−0.619901	−0.0644	−1.032277
LLPR	−0.00032	−0.527873	0.001983	0.278309	−0.00034	−1.008982
CPLR	−0.23632	−0.745247	−2.8502	−0.811293	−0.25904	−1.201139
BS	−0.00847	−0.991235	−0.13123	−1.197484	−0.0146	−2.52335**
DR	0.00011	0.880406	0.000649	0.419451	8.7505	1.119460
LEV	−0.22645	−6.204896*	−0.82378	−1.74951**	−0.15577	−2.71599**
R^2 Value	0.865855		0.813983		0.933255	
F-Stat	9.512061*		6.448605*		20.60565*	
D-W Stat	2.238270		2.255485		2.402792	

**denotes 5% level of significance and * denotes 1% level of significance.

Managerial Implications of the Study

The study results provide several implications for the management of Indian commercial banks. The findings of the present study will be helpful for policy implications. The positive association between capital adequacy ratio and financial performance of commercial banks suggests that bank profitability can be enhanced by following restrictive capital requirement norms. Therefore, Indian commercial banks should strictly follow the Basel III accord for enhancing their performance. Non-performing loan ratio and loan loss provision ratio negatively impact the banks' financial performances. Therefore, strict regulations relating to loan selection is required, and bank managers should be cautious in sanctioning any loan, to minimise bad loans. Again, the negative relationship of leverage with profitability indicates that external debt in the capital structure reduces the earnings of the Indian commercial banks. Cost per loan ratio has a negative relationship to the measures of financial performance; it indicates that high operating cost reduces bank financial performances. Therefore, the bank should minimise loan operating and monitoring cost for boosting financial performance. However, these suggestions should be interpreted with extreme caution. Moreover, for better financial performance, Indian commercial banks should have a favourable internal business environment, as well as appropriate credit risk policy.

Conclusion

The main purpose of the study is to study the impact of credit risk management on financial performance. Additionally, a comparison has been made between the private and public sector in this respect. We employ a panel regression model to measure the relationship.

The study results highlighted some interesting facts about the credit risk management and financial performance of

Indian commercial banks. The profitability of commercial banks suffers due to the existence of excessive NPAs. Our study results confirm that high non-performing loan ratio (NPLR) reduces every measure of profitability, in both private and public sector banks. However, the conservative capital requirement norm enhances the profitability of commercial banks, particularly in public sector banks. Another interesting insight from the present study is that utilisation of debt capital in the capital structure impacts negatively on the commercial banks, especially in the private rather than the public sector banks.

The finding of the study indicates that cost of advancing loan is another constraint for enhancing the profitability of commercial banks. Loan loss provision is the major problem of public sector commercial banks, and it decreases the financial performance of public sector commercial banks. Bank deposit also creates a problem on the profit earning capacity of commercial banks.

On the basis of the empirical findings, a comparison can be made between public sector banks and private sector banks regarding credit risk management. From the study results, it is clear that the profitability of both categories of banks is eroding due to the NPAs. Additionally, leverage also creates a problem on the profitability of private sector banks rather than of the public sector banks. Similarly, loan loss provision creates a problem in the financial performance of public sector banks. However, the capital adequacy ratio enhances the profitability of Indian public sector commercial banks compared to private sector commercial banks.

Credit risk management has a direct influence on the financial performance of commercial banks. Increasing non-performing loans in commercial banks is alarming. Banks should develop a restricted lending policy for reducing the default rate. Bank size plays an important role in managing credit risk and in improving financial performance (Bhattarai, 2016; Kaaya & Pastory, 2013). Though, our study results fail to prove any nexus between bank size and financial performance of sample banks.

The present study is not free from limitations and suffers from a few. The main limitation of our study is the use of sample banks. We consider only 20 Indian commercial banks, consisting of 12 public sector and eight private sector banks. Another limitation of the study is the use of credit risk management variables. We employed only five dimensions of credit risk factors. Therefore, further studies can be conducted with a different model and a wide range of data set and with different types of credit risk variables.

Declaration of Conflicting Interests

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