




A STUDY ON IMPACT OF CREDIT RISK MANAGEMENT ON THE PROFITABILITY OF INDIAN BANKS

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ABSTRACT

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The main aim of this study is to find a statistical association between credit risk management (CRM) and profitability within Indian banks. Secondary data from 38 Indian scheduled commercial banks was collected, for the time period from 2005-2019 and examined using a panel data regression. For the purpose of this study, return on assets (ROA) is considered a dependent variable and an indicator of profitability, while the credit to deposit ratio (CDR), net interest margin (NIM), operating profits to total assets (OPA), capital adequacy ratio (CAR), provision coverage ratio (PCR) and net non-performing assets to net advances (NNPA) are considered the determinants of CRM and classified as independent variables. The statistical finding indicates that the CDR, OPA and CAR are all positively related to the profit rate (ROA) while NIM, NNPA and PCR all found to be negatively related to the profit rate (ROA) and statistically show a significant association except PCR.

Contribution/Originality: This study covered 38 Indian scheduled commercial banks for a period of 15 years, for which only a small amount of research was available. The CRM indicators like CDR, OP, and PCR, which are used in the study, have been unexplored by previous research in India.

1. INTRODUCTION

The banking sector is critical to a country's economic growth and development. The banking services in India have undergone a massive evolution due to the changes and developments that have emanated as a result of the Reserve Bank of India's release of regulatory changes to strengthen the financial markets. Institutions focused their attention on the assessment and management of credit risk and its implications for a bank's efficiency or profitability. Over the last decade, there has been a major transformation in the assessment, monitoring, controlling, and reviewing of credit risk in the banking sector. This is partly due to the new tools like credit information reports, risk scoring models, etc. that have been introduced. Lending is one of the vital businesses of banks to generate revenue, which carries an outright default risk owing to the unwillingness or inability of a borrower or debtor to keep his promises or obligations related to lending, settlement, trading, and other financial transactions. This specific risk is termed "credit risk" and attracts the concern not only of banks and financial institutions, but also of banking regulators to formulate and strengthen credit risk management (CRM) policies in order to mitigate the associated risk to the greatest possible extent. The Reserve Bank of India (2002) states that "the effective management of credit risk is a critical component of comprehensive risk management and is essential for the long-term success of any banking organization" (Reserve Bank of India, 2002). CRM entails identifying,

quantifying, monitoring, and controlling credit risk exposures. The [Basel Committee on Banking Supervision \(1999\)](#) states credit risk as "the potential that a bank borrower or counterparty will fail to meet its obligations in accordance with agreed terms. The goal of CRM is to maximize a bank's risk-adjusted rate of return by maintaining credit risk exposure within acceptable parameters" ([Basel Committee on Banking Supervision, 1999](#)). Therefore, banks must be aware of the risk variables that impact profitability significantly in order to expand their business and increase profitability ([Shetty & Yadav, 2019](#)). The guideline note of the Reserve Bank of India on CRM defines "credit risk as the possibility of losses associated with a diminution in the credit quality of borrowers or counterparties" ([Reserve Bank of India, 2002](#)). Thus, it is crucial for banks to assess and analyze the financial soundness or creditworthiness of the borrowers. The expansion of the credit derivative market has increased the probability of credit risk in the banking industry.

According to the [Basel Committee on Banking Supervision \(2000\)](#) "the basis for an effective CRM process is the identification and analysis of existing and potential risks inherent in any product or activity. Consequently, it is important that banks identify all credit risks inherent in the products and services they offer. Such identification stems from a careful review of the existing and potential credit risk characteristics of the product or activity" ([Basel Committee on Banking Supervision, 2000](#)). Credit risk indicators are crucial in the regulation and governance of the profitability of the banking industry but are also an effective measure to indicate profitability of return.

Previous research revealed that CRM is a critical factor in determining profitability, future existence, and the growth of financial institutions for different tenures with mixed findings. This study examines the statistical impact of key CRM parameters on bank profitability in India, both public and private. As a result, the drivers of profitability have been calculated.

2. LITERATURE REVIEW

[Poudel \(2012\)](#) set out to investigate various aspects of CRM and how they affect bank profitability. The secondary data was collected for 11 years (2001–2011) from the financial statements of 31 banks in Nepal and was analyzed using descriptive, correlation, and regression statistics. Some of the parameters used were capital adequacy ratio, cost per loan asset, and default rate. According to the study, all of these factors show a negative impact on the financial performance of banks. The best predictor of bank economic success, however, was determined to be default risk. The investigation recommended that banks formulate and design strategies to minimize their credit risk exposure to increase their profitability ([Poudel, 2012](#)).

[Said \(2013\)](#) examined the correlation between risks, namely credit risk, operating risk, liquidity risk, and efficiency across Islamic banks in the Middle East and North Africa through three levels of examination. The data was collected for a three-year period ranging from 2006 to 2009 and was analyzed by using data envelopment analysis (DEA). A nonparametric technique was used in the first stage; ratios were analyzed in the second stage; and in the third stage, the correlation between credit, operating, and liquidity risks and efficiency was performed using Pearson Correlation. According to the findings, operating risk and credit risk both have a negative association with efficiency, whereas liquidity risk has a negligible link with the performance of banks under study ([Said, 2013](#)).

[Li and Zou \(2014\)](#) investigated the association between CRM and the profitability of European commercial banks. The data was gathered for five years, covering the period from 2007–2012, from 47 largest commercial banks in Europe. Profitability metrics such as ROE and ROA are used, while CRM determinants such as NPLR and CAR are also used. The data was analyzed by using multiple regression analysis along with other statistical tests. The findings demonstrated that CRM had a significant impact on the profitability of banks. NPLR shows a crucial impact on both ROE and ROA, whereas, on both, CAR has minimal impact ([Li & Zou, 2014](#)).

[Alshatti \(2015\)](#) conducted a study on the impact of CRM on the financial performance of Jordanian commercial banks. Secondary data from 13 banks was obtained for an eight-year period (2005–2013). Two mathematical models

were built and employed in addition to regression. CRM metrics such as non-performing loans to gross loans, provision for facilities loss to net facilities and leverage ratio were employed and showed a significant impact on ROA and ROE, which are classified as profitability variables (Alshatti, 2015).

Bayyoud and Sayyad (2015) performed research in the Palestinian banking sector to determine the effect of CRM on profitability. The data was collected for a period of five years ranging from 2010 to 2014 and analyzed by deploying a regression model. ROE is taken as a proxy for profitability, whereas NPLR is considered as a proxy for credit risk. The study's findings indicated that no link exists between credit risk and the financial performance of Palestinian commercial and investment banks (Bayyoud & Sayyad, 2015).

The objective of Kodithuwakku (2015) was to explore the effect of management of credit risk on commercial bank performance in Sri Lanka. Data was gathered for eight commercial banks from primary and secondary sources and was analyzed by using a regression model through E-views software. Non-performing loans and provisions, according to the results, have an adverse influence on profitability. In order to reduce the credit risk, research suggested banks to put in place effective tools and strategies (Kodithuwakku, 2015).

The impact of credit risk on the financial performance of eighteen private commercial banks in Bangladesh was investigated by Noman, Pervin, Chowdhury, and Banna (2015) using unbalanced panel data for the years 2003 to 2013. Credit risk factors included the loan loss reserve ratio (LLRGL), loan loss reserve to non-performing loan ratio (LLRNPL), capital adequacy ratio (CAR), and non-performing loan to gross loan (NPLGL), while profitability indicators included ROAA, ROAE, and NIM. The OLS random effect model, GLS, and system GMM were used to analyze the data. NPLGL and LLRGL had a considerable negative impact on all three profitability measures, according to the study. and a significant adverse impact of CAR on ROAE (Noman et al., 2015).

Khan and Ali (2016) set out to investigate the link between commercial banks' liquidity and profitability in Pakistan. Secondary data was gathered from Habib Bank Limited's annual reports during a six-year period (2008–2014) and evaluated using correlation and regression techniques. The data revealed that banks' liquidity and profitability have a considerable positive link (Khan & Ali, 2016).

The goal of Saeed and Zahid (2016) was to investigate the effect of credit risk on the financial performance. To span the era of the financial crisis, data from five major UK commercial banks was collected over eight years, from 2007 to 2015 and was analyzed by performing multiple statistical analyses. ROA and ROE were considered as proxies of profitability, whereas non-performing loans and net charge offs (impairments) were used as credit risk variables. The findings demonstrated that credit risk factors had a favorable connection with the performance of financial institutions under investigation, as well as the size, leverage, and growth of the institutions (Saeed & Zahid, 2016).

In an empirical study, Taiwo, Ucheaga, Achugamonu, Adetiloye, and Okoye (2017) studied the quantifiable impact of CRM on the financial performance of deposit money banks and loan growth in Nigeria. The secondary data was collected for over 17 years from 1998–2014 by the World Bank and the Statistical Bulletin of the CBN. CRM, according to the data, has a minor impact on the total number of loans and advances (Taiwo et al., 2017).

Sheeba (2017) set out to explore the numerous factors that influence credit risk, and its impact on a bank's profitability. Secondary data was collected from the annual reports of State Bank of India for a 20-year period (1996–2016) and evaluated using multiple regression statistics. Credit risk shows a major negative influence on the profitability of bank, according to the study. Furthermore, it was suggested that the bank under investigation tighten its CRM methods in order to lower the associated credit risk by reducing non-performing assets and managing its leverage properly (Sheeba, 2017).

Isanzu, Akhunjonov, and Obrenovic (2017) set out to investigate the impact of credit risk on the profitability of Chinese banks by considering the data of five commercial banks from 2008 to 2014. Nonperforming loans, loan impairment charges, capital adequacy ratio, and impairment loan reserve were analyzed as credit risk measures and return on assets was used as a profitability measure. A panel data regression model was used to evaluate the data.

NPA and CAR have a considerable impact on bank profitability, according to the findings of the study. As exemplified, CRM is critical for banks' financial performance (Isanzu et al., 2017).

Rachman, Kadarusman, Anggriono, and Setiadi (2018) aimed to study the banks' specific factors in developing countries and their impact on loan default problems. The study analyzed the data of thirty-six commercial banks listed on the stock exchange of Indonesia by using a fixed effect regression model from 2008 to 2015. The results revealed that credit growth and profitability negatively impact the number of non-performing loans. Banks with better profitability have been shown to have lower NPLs because they can afford effective credit management methods and the banks with stronger credit expansion have lower nonperforming loans (NPLs) (Rachman et al., 2018).

Shetty and Yadav (2019) conducted a study to examine the relationship for an 11-year period, the association between financial risk and profitability of forty-three Indian commercial banks was studied. The proxies of profitability were return on assets (ROA) and return on equity (ROE), and the indicators of financial risk were interest rate risk (IRR) and foreign exchange risk (FER). The data was analyzed using panel data regression models with fixed and random effects. The findings concluded that the ROE was weakly related to IRR, while ROA was significantly influenced by IRR. Moreover, ROE and ROA were found to be significantly impacted by FER (Shetty & Yadav, 2019).

Mei, Nsiah, Barfi, and Bonsu (2019) intended to investigate the impact of credit risk on the profitability of listed commercial banks of Ghana Stock Exchange (GSE) by collecting secondary data over an eight-year period from 2010 to 2018. The non-performing loan ratio, cost per loan asset, capital reserve ratio, and asset growth ratio were used as indications of credit risk, whereas the cost per loan asset, asset growth ratio, non-performing loan ratio and capital reserve ratio were used as indicators of profitability. The data was then analyzed using a Classical Linear Regression Model (CLRM). Because credit risk has a negative relationship with the profitability, the findings suggest that an efficient CRM technique is required (Mei et al., 2019).

Munangi and Bongani (2020) examined the credit risk impact on the financial performance of eighteen banks of South Africa for the time period from 2008 to 2018. A panel data regression technique was deployed to analyze the data by considering non-performing loans (NPLs) as an indicator of credit risk and return on equity (ROE) and return on assets (ROA) as variables for the financial measurement of the banks under study. The findings revealed that whereas credit risk had a negative influence on financial performance, growth had a favorable impact on bank financial performance (Munangi & Bongani, 2020).

3. PROFITABILITY

Return on assets (ROA) calculates a bank's profit margin as a proportion of total assets (Singh & Sharma, 2016). Commonly, the Return on Assets (ROA) is used as a proxy for profitability in the literatures (Abiola & Olausi, 2014; Ali & Dhiman, 2019; Alshatti, 2015; Kolapo, Ayeni, & Oke, 2012) as it is a metric that compares the growth or decline in a bank's earnings with the expansion or contraction of its balance sheet.

4. CREDIT RISK INDICATORS

4.1. Credit to Deposit Ratio (CDR)

The credit to deposit ratio (CDR) indicates the amount per rupee of the deposit is going towards the credit market. The interest income generated through loans and advances strengthens the bank's performance. Thus, CDR and ROA have a positive relationship; as the credit-to-deposit ratio rises, so does the banks' return on assets (ROA) (Marshal & Onyekachi, 2014). Kolapo et al. (2012) used the ratio of total loans and advances to total deposits to measure its impact on ROA.

4.2. Net Interest Margin (NIM)

Net Interest Margin (NIM) is the difference between paid and earned interest and thus shows the ability of a bank to earn interest income. The net interest income to total assets ratio is used to calculate NIM. The 'core lending business' of the banks is represented by it. When net interest margin increases, ROA of the banks also increases (Bawa, Goyal, Mitra, & Basu, 2019).

4.3. Operating Profit (OP)

Operating profit (OP) is the profitability of a business before interest and taxes. It is calculated by deducting operating expenses from gross profit. The operating profit to total assets ratio is used to calculate operating profit. Al-Homaidi, Tabash, Farhan, and Almaqtari (2018) adopted the operating costs to interest income ratio as an indicator of efficiency of operation, claiming that the lower the ratio, the more efficient the management and the higher the bank profits. Kohlscheen, Murcia, and Contreras (2018) employed the operational expense-to-gross-revenues ratio.

4.4. Capital Adequacy Ratio (CAR)

The capital adequacy ratio (CAR) indicates a bank's available capital in terms of the risk involved with respect to its loan disbursement. Essentially, this calculates the ability of a bank to absorb the loss. It is also known as the capital to risk-weighted asset ratio (CRAR). Banks with larger capital reserve requirements are more profitable because their financial risk costs are lower. Financial risks that are lower attract more funds and banking operations, resulting in a higher profit rate. A positive relationship between bank capital and profit has been found in several researches (Ali & Dhiman, 2019; Isanzu et al., 2017; Noman et al., 2015; Poudel, 2012; Sheeba, 2017).

4.5. Provision Coverage Ratio (PCR)

Provision coverage ratio (PCR) is expressed as the percentage of the amount that a bank keeps aside for losses incurred due to bad debts. For a given level of non-performing loans, adequate loan loss reserves and hence high provision coverage ratios improve bank safety by safeguarding bank capital when losses occur (Wheeler, 2019). The ratio of provision for facility losses to net facilities has a negative impact on the profitability of the banks (Alshatti, 2015).

4.6. Net Non- Performing Assets to Net Advance Ratio (NNPA)

A net non- performing asset to the net advances ratio (NNPA) is a measure of a bank's credit quality. A "non-performing asset (NPA) is a loan or advance which: (i) remains overdue for a period of more than 90 days in respect of a term loan (ii) the account remains out of order in respect of an overdraft/ cash credit." (State Bank of India, 2021). When NPAs increase, the share of interest-earning assets declines, resulting in lower interest income and, as a result, lower ROA. It affects the profitability of banks by increasing their operating costs and resulting in a decrease in their interest margins. The relationship between NPA and ROA is negative; as NPA increases, banks' return on assets (ROA) decreases (Ali & Dhiman, 2019; Bawa et al., 2019). Ali and Dhiman (2019) have used the ratio of net NPA to net advances as a measure of asset quality.

5. RESEARCH METHODOLOGY

5.1. Data

In this study, we have selected 38 Indian scheduled commercial banks, 20 of them being public sector banks (PSBs), 18 of these being private sector banks. According to the latest statistics, these 38 banks account for about 90% of India's banking operations in asset size and nearly 95% in deposits and loan distribution. As the government is the biggest shareholder in Public Sector Banks, the government has governance authority.

Parliament has passed acts, like Banking Regulation Act of 1949, that govern PSBs. Private banks, on the other hand, are constituted under the Companies Act, 1956 and are registered under it. The majority shareholders are in charge of their management. The study spans from 2005 to 2019. This time frame is chosen since the Reserve Bank of India has established essential metrics and ratios of credit risk management and profitability in its 'guidance notes on credit risk management' issued in 2002 beside it an authentic data with uniformity is available since 2005.

Financial year-wise data of the variables used in the study were gathered from the Reserve Bank of India site database on the Indian economy having URL, <https://dbie.rbi.org.in/DBIE> time-series publication, Statistical Tables Relating to Banks in India.

5.2. Variables

The study examined the influence of CRM on the profitability of Indian Scheduled Commercial Banks. Profitability is a dependent variable that is examined using a series of banking ratios (Table 1). Return on assets (ROA) has been used as a metric for estimating profitability in previous literature. It is an efficient metric that compares the growth or decrease in a bank's earnings with the expansion or contraction of its balance sheet.

We have used the bank-related descriptive variables like credit to deposit ratio (CDR), net interest margin (NIM), operating profit to total assets (OPA), capital adequacy ratio (CAR), provision coverage ratio (PCR), net non-performing assets to net advances ratio (NNPA).

5.3. Model

To evaluate the factors of CRM that have influenced the banks' profitability in India, we used the panel data estimation approach. To examine the elements that determine profitability, the underlying operational relationship was used:

$$\text{Profitability} = \beta_0 + \beta_1 \text{ Credit to deposit ratio}_{it} + \beta_2 \text{ Net interest margin}_{it} + \beta_3 \text{ Operating profit to total assets}_{it} + \beta_4 \text{ Capital adequacy ratio}_{it} + \beta_5 \text{ Provision coverage ratio}_{it} + \beta_6 \text{ Net non-performing assets to net advances ratio}_{it} + \gamma_{it} \quad (1)$$

Where, 'i' is the number of banks, $i \rightarrow 1$ to 38, 't' represents time in years, $t \rightarrow 1$ to 15 and γ_{it} is the error component of the operational relationship.

To estimate their impact on the banks' profitability, six banking ratios are analyzed in the above equation. To analyze the panel data, Stata 17.0 version is used. The Fisher-type unit-root test based on the Augmented Dickey-Fuller test is employed to ensure that all variables are stationary. All variables are determined to be stationary. Furthermore, the descriptive statistics are also summarized, followed by a Multicollinearity test. Finally, the model is evaluated to determine whether the individual effects are fixed effects or random effects.

The impact of time-variable variables can be examined using the fixed effect (FE) model. The FE estimation also adjusts for the sample banks' time-invariant heterogeneity. As a result of the removed time-invariant properties, it is likely the sample will provide unbiased coefficient estimates (Torres-Reyna, 2007). The FE model can be formulated in its general form as below (Wooldridge, 2010).

$$Pr_{it} = c + X_{it}\beta + u_{it} + \mu_i \quad (2)$$

Equation 2 presents that, for the bank at position 'i' at time 't', the predicted variable Pr_{it} is defined by a collection of external regressors, which comprises the bank-related explanatory parameters, X_{it} , betas are the model metrics. The estimated coefficients of the predictor variables are beta values in regression. The equation denotes a variation in the predicted variable due to a unit change in the descriptive factors while the rest of the explanatory parameters remain constant. The unobserved effect of banks individually is μ_i while u_{it} is the random error. In a random-effects model, the error element is supposed to be uncorrelated with the independent variable. It has the advantage of being able to generalize the findings beyond a model's sample size (Torres-Reyna, 2007). The random-effects model may be formulated as follows in its general form (Wooldridge, 2010).

$$Pr_{it} = c + X_{it}\beta + \mu_i + u_{it} + \gamma it \quad (3)$$

γ_{it} stands for within entity error term, and u_{it} stands for the amongst entity error term in Equation 3. The random effect unique to each bank is denoted by μ_i . In the random effect model, the non-observable individual-specific effects are varied independently of the independent variables.

To analyze the factors that influence profitability, the following fixed effect model is estimated.

$$ROA_{it} = c + \beta_1 CDR_{it} + \beta_2 NIM_{it} + \beta_3 OPA_{it} + \beta_4 CAR_{it} + \beta_5 PCR_{it} + \beta_6 NNPA_{it} + u_{it} + \mu_i \quad (4)$$

ROA_{it} is shown as a predicted variable in Equation 4, which is assessed through a range of explanatory variables, which comprises bank-related descriptive parameters.

Table 1. Study variables.

Syllabary	Variable	Explanation	Expected impact
Independent variables			
CDR	Credit to deposit ratio	Ratio of Total Advances to Total Deposits (%)	Positive
NIM	Net Interest Margin	Ratio of Net Interest Income to Total Assets (%)	Positive
OPA	Operating profit to Total Assets	Ratio of Operating profit to Total Assets (%)	Positive
CAR	Capital Adequacy Ratio	Ratio of (Tier1 and Tier 2 capital) to Risk Weighted Assets (%)	Positive
PCR	Provision Coverage Ratio	Ratio of Provision for NPA to Gross NPA (%)	Negative
NNPA	Net Non- Performing Asset	Ratio of Net NPA to Net Advances (%)	Negative
Dependent variable			
ROA	Return on Assets	Ratio of Net Income to Total Assets (%)	

Table 2. Descriptive statistics.

Variable	Observations	Mean	Standard Deviation	Minimum	Maximum
ROA	570	0.64	0.97	-5.49	2.13
CDR	570	72.95	15.54	44.61	300.6
NIM	570	2.70	0.72	0.23	5.61
OPA	570	1.91	0.73	-0.67	3.92
CAR	570	13.29	3.71	2	56.41
PCR	570	0.35	0.89	-0.29	20.18
NNPA	570	2.44	2.77	0.01	16.69

6. RESULTS

A. Descriptive Statistics

Table 2 presents a descriptive analysis of the independent variables that are being used to estimate the dependent variable. The descriptive analysis quantitatively describes the features based on a set of data by combining the central tendency metric, mean, with the variability measure, standard deviation. The central tendency describes a group of data having a single value that reflects the center or middle of its distribution, in which the mean gives an average after considering all the values in the data set, while the standard deviation is a measurement of how much a group of values varies or disperses.

The results show that the return on assets (ROA) ranges from -5.49 to 2.13, with a mean of 0.64. The maximum and minimum values of predictor variables, correspondingly, vary from high to low.

B. Multicollinearity Analysis

Multicollinearity is a statistical concept where several independent variables in a model are correlated. It is a reliable statistic to measure the accuracy of regression analysis. The tolerance level and multicollinearity statistics are used to determine the variance inflation factor (VIF). Gujarati (2004) suggests that multicollinearity is supposed to occur when VIF is above 10.

Table 3. Collinearity statistics.

Independent variable	1/VIF	VIF
CDR	0.869	1.15
NIM	0.423	2.36
OPA	0.449	2.23
CAR	0.787	1.27
PCR	0.973	1.03
NNPA	0.761	1.31

The collinearity test statistic is presented in Table 3. The findings indicate that the data does not have any multicollinearity issues as the respective VIF value of all the variables is below 10.

To analyze the factors of the Indian scheduled commercial bank's profitability, we have adopted the fixed effect model (FEM). Table 4 presents the FE model's estimation result which demonstrates that the credit to deposit ratio (CDR), operating profit to total assets (OPA), and the capital adequacy ratio (CAR) are all found to be positively related to the profit rate (ROA). The inferences are determined to be statistically significant. The net interest margin (NIM) and net non-performing asset to net advance ratio (NNPA) are both found to be negatively related to the profit rate (ROA) and statistically show a significant association. The provision coverage ratio (PCR) has been determined to have a negative relationship with profitability (ROA). However, statistically, their relationship is not significant.

The Hausman test was used to come up with a suitable test between fixed effect and random effect. Table 5 presents that the 'p' value is estimated to be less than 0.05, the Hausman test results imply that the FE estimate will be appropriate for the dataset.

Table 4. The results of panel regression (FEM).

Variable (Dependent Variable: ROA)	Coefficients	Std. Error	T-Statistic	Sig. Value (p)
CDR	0.004*	0.001	2.66	0.008
NIM	-0.291***	0.066	-4.37	0.000
OPA	0.797***	0.064	12.32	0.000
CAR	0.020*	0.007	2.86	0.004
PCR	-0.032	0.023	-1.40	0.161
NNPA	-0.207***	0.008	-24.44	0.000
Constant	-0.158	0.201	-0.79	0.432
Number of observations	570			
Number of Banks	38			
R-Square	0.764			
Prob. [F Statistics]	0			

Note: *** $p < 0.001$; * $p < 0.01$.

Table 5. Hausman test.

Chi-Sq. statistics	Probability
20.78	0.002

7. DISCUSSION

The primary goal of this research is to examine the impact of CRM indicators on the profitability of Indian commercial banks. Using a set of bank-related descriptive variables; we analyzed the profitability variable of 38 Indian commercial banks. R square has a value of 0.764; this demonstrates that the independent factors under investigation jointly explain approximately 76% change in ROA. The results suggest that the credit to deposit ratio (CDR), operating profit to total assets (OPA), and the capital adequacy ratio (CAR) are all positively related to the profitability (ROA) of Indian Scheduled banks. The positive relationship between profitability (ROA) and credit to deposit ratio (CDR); profitability (ROA) and operating profit to total assets (OPA); and profitability (ROA) and

the capital adequacy ratio (CAR) are statistically significant. The results indicate that net interest margin (NIM), and net non-performing asset to net advance ratio (NNPA) both are negatively related to profitability (ROA). Their relationship has been determined to be statistically significant. Furthermore, the findings prove the provision coverage ratio (PCR) is negatively related to profitability (ROA). However, statistically, its relationship is not significant.

The results of the analysis are similar to those of Li and Zou (2014); Rachman et al. (2018); Kodithuwakku (2015); Ali and Dhiman (2019); Kolapo et al. (2012); Isanzu et al. (2017) and Kannan, Narain, and Ghosh (2001). A study by Li and Zou (2014) used the data of the 47 largest commercial banks in Europe from 2007 to 2012, found that the banks with higher non-performing assets have low profitability. Rachman et al. (2018) used data from 36 Indonesian commercial banks to conduct their research for a time period from 2008 to 2015 and found that the banks with better profitability have been shown to have fewer non-performing loans because they can afford effective credit management methods and the banks with stronger credit expansion. A study by Kodithuwakku (2015) using the data of eight commercial banks in Sri Lanka, determined that the non-performing loans and provisions have a negative impact on profitability.

A study conducted by Ali and Dhiman (2019) using the data of 10 public sector banks in India for a time period from the year 2010 to 2017, found that the capital adequacy ratio (CAR) is positively related to return on assets (ROA). A study conducted by Kolapo et al. (2012) using the data of five Nigerian commercial banks from 2000 to 2010, found that profitability increased with an increase in credit to deposit ratio (CDR).

A study by Isanzu et al. (2017) using the data of *five Chinese commercial banks over a seven-year period from 2008 to 2014, shows that NPA and CAR have a significant influence on the profitability of banks. Kannan et al. (2001) found that banks with higher NPAs had lower profit margins from 1995–96 to 1999–2000, based on data from 86 Indian banks.*

8. CONCLUSION

The variables affecting the profitability of Indian scheduled commercial banks were empirically analyzed using a set of bank-related descriptive variables. We analyzed the profitability determinants of 38 private sector and public sector banks of India. The statistical result reveals that the CRM factors have a statistically significant influence on the profitability. Specifically, the credit to deposit ratio (CDR), operating profit to total assets (OPA), and the capital adequacy ratio (CAR) are all found to be positively related to the profit rate (ROA) and are determined to be statistically significant. A positive association of credit to deposit ratio with return on assets shows that the banks are earning a good interest margin, positively affecting profitability. A positively related capital adequacy ratio states that the banks need to maintain a sufficient amount of capital funds to soak up adverse situations and remain solvent. A positively related operating profit to total assets indicates that banks are earning a positive profit on their total assets. Banks aim to sustain low operating expenses in order to increase profitability. Furthermore, net interest margin (NIM), and net non-performing asset to net advance ratio (NNPA) both are found to be negatively related to the profit rate (ROA) and statistically show a significant association. The provision coverage ratio (PCR) has been determined to be adversely correlated with profitability (ROA). However, this relationship is statistically insignificant. Since, banks depend mainly on the performance of their loans and advances as a means of revenue and profit, the growing number of non-performing assets (NPAs) is a reason for concern. NPAs not only bring severe financial stress on the banks, but also cause a remarkable reduction in the amount of funds available for further lending.

Therefore, in order to prevent loan losses, support sound banking practices and strengthen market discipline, banks need to keep the non-performing assets level low by stringent CRM policies to reduce the associated high operating costs of NPA. In addition, banks need to strictly follow the minimum capital standards, minimum capital adequacy and an internal evaluation mechanism proposed by the Basel Committee.

9. THE LIMITATIONS OF STUDY AND FUTURE RESEARCH SCOPE

The study was performed on a sample of banks that mainly includes public-sector banks and private-sector banks and spans the years 2005 to 2019. Though foreign banks and payment banks are also scheduled commercial banks, authentic data for foreign banks is not available and the required data for payment banks has been available since 2018, so these banks could not be included in the study.

Although data beyond the year 2019 is available, due to recent mergers of banks in India, it was not integrated. Several mergers within public sector banks occurred between 2020 and 2021. The number of PSBs has decreased from 20 to 12 since the merger. While including mergers in the empirical study would be interesting, one year seems to be a short time period for establishing any valid conclusions. If enough data is available, the influence of mergers in examining the impact of CRM on the profitability of Indian commercial banks can be explored.

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APPENDIX

Table 6 presents the names of the banks considered for the study.

Table 6. Banks under study.

Sr. no.	Name of bank	Sector	Sr. no.	Name of Bank	Sector
1	Allahabad Bank	Public	21	Axis Bank Limited	Private
2	Andhra Bank	Public	22	City Union Bank Limited	Private
3	Bank of Baroda	Public	23	CSB Bank Limited	Private
4	Bank of India	Public	24	DCB Bank Limited	Private
5	Bank of Maharashtra	Public	25	Federal Bank Ltd	Private
6	Canara Bank	Public	26	HDFC Bank Ltd.	Private
7	Central Bank of India	Public	27	ICICI Bank Limited	Private
8	Corporation Bank	Public	28	IDBI Bank Limited	Private
9	Dena Bank	Public	29	INDUSIND Bank Ltd	Private
10	Indian Bank	Public	30	Jammu & Kashmir Bank Ltd	Private
11	Indian Overseas Bank	Public	31	Karnataka Bank Ltd	Private
12	Oriental Bank of Commerce	Public	32	Karur Vysya Bank Ltd	Private
13	Punjab And Sind Bank	Public	33	Kotak Mahindra Bank Ltd.	Private
14	Punjab National Bank	Public	34	Lakshmi Vilas Bank Ltd	Private
15	State Bank of India & Its Associates	Public	35	RBL Bank Limited	Private
16	Syndicate Bank	Public	36	TAMILNAD Mercantile Bank Ltd	Private
17	Uco Bank	Public	37	The DHANALAKSHMI Bank Ltd	Private
18	Union Bank of India	Public	38	Yes Bank Ltd.	Private
19	United Bank of India	Public			
20	Vijaya Bank	Public			

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