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IMPACT OF CREDIT RISK ON THE PERFORMANCE OF INDIAN BANKS

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Abstract *Examining the impact of banks' credit risk on their financial performance helps in the survival of banks, as well as in protecting the interests of their customers. In this study, we examine the impact of credit risk on banks' performance, measured with Net Non-Performing Assets (NNPA) as an explanatory variable, and Return on Assets (ROA) and Return on Equity (ROE) as explained variables, while controlling others factors such as the size of the bank, loan advances, long-term capital, deposit, assets management, business per employee, and profit and loss per employee of banks. This study uses the data from the top 36 commercial Indian banks, in which half of the banks are from the public sector and the rest from the private sector, spanning the period 2010-2019. To assess that the results are not affected by endogeneity issues, we apply dynamic panel data techniques. The results from the study showed a negative and significant effect of NNPA on both the bank performance measures.*

Keywords: *Credit Risk, Public Sector Banks, Private Sector Banks, ROA, ROE*

INTRODUCTION

A bank is a financial institution that works as an intermediary between those who have funds and those who need funds. Banks face different types of risks such as credit risk, market risk, and liquidity risk. Banks always need to keep the liquid assets with them to reduce liquidity risk, and to enable them to pay creditors of the bank in case a need arises. Credit risk management of banks has become an important topic around the world because of different financial crises and regulatory responses related to minimising the risk in banks as per the Basel norms. Credit risk management has become an important issue among policymakers, researchers, and academicians around the globe.

Banks in India have a huge role to play in the Indian economy, just like other developing and developed countries, and the asset quality of Indian banks have an importance in the Indian finance system. The banks' health can be ascertained from the non-performing assets in their account. Hence, in banks, credit risk management plays an important role in defining the solvency of the banks. The Reserve Bank of India (RBI) has taken different policy measures to minimise the credit risk in banks, just like other Central banks around the world.

The use of the credit system is very important for the bank; however, a bad credit system has a very serious effect on the bank (Boahene, Dasah & Agyei, 2012). The bad effects of non-performing loans (NPA) in the bank will not only affect the bank, but also has a serious effect on the customer. It becomes difficult for the bank to get new deposits and other forms of funds due to high NPAs, and the trust of the customers and investors decreases, which makes it difficult to obtain funds from the market (Bernanke, Gertler, & Gilchrist, 1999). Therefore, high NPA has serious negative implications on the bank's growth (Cucinelli, 2015; Jorda, Schularick & Taylor, 2013). In the last three decades, we have seen a lot of change in the functioning of banks, and it has become more complex due to which credit risk management has become an important subject. Different banks around the world, including in India, have failed due to mismanagement of credit risk. Basel norms are issued by the Basel Committee on Banking Supervision (BCBS) for coordinating the banking regulation across the globe and minimising the risk of banks.

In the past, different authors and researchers have examined the impact of credit risk on the profitability and performance of banks (Kithinji, 2010; Gizaw, Kebede & Selvaraj, 2015; Serwadda, 2018; and so on). These studies have found that the credit risk of banks has a significant impact on banks' profitability. India is one of the emerging economies in the world. In this study, we want to examine the impact of credit risk on Indian banking performance, as most of the studies so far have focussed on the developed economies.

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The primary objective of the study is to examine the relationship between credit risk and banks' performance by using the net non-performing assets (NNPA) as an independent variable that captures the credit risk of banks, and return on assets (ROA) and return on equity (ROE) as dependent variables that are bank performance measures. The primary focus of this study is to analyse the role of NNPA on banks' performance, to guide different groups, such as banks' management, customers of banks, investors of banks, researchers, and academicians. The empirical evidence of the study will help understand and know the association between credit risk and banks' performance, which further helps the management of banks in protecting the interests of customers and investors by applying efficient credit risk management. The study is organised into five parts. Section one discusses the topic and section two provides the review of the literature and the relevant hypotheses. The sample data and econometric models are defined in section three. Sections four and five provide empirical results and a summary of the study, respectively.

REVIEW OF LITERATURE AND HYPOTHESES

In this section, we review the relevant existing literature about credit risk and banks' financial performance. Hosna, Manzura and Juanjuan (2009) found that credit risk management of banks has a positive impact on the profitability of banks. They suggested that banks should focus on more factors of credit risk management for enhancing the profitability of banks and controlling the credit risk of banks. Tafri et al. (2009) examined the impact of financial risk in banks on their profitability in Malaysia. They found that credit risk has a significant impact on the financial indicators for conventional as well as Islamic banks. They found that interest rate risk has no significant impact on Islamic banks and has a weakly significant impact on conventional banks' return on equity. They also found that interest risk has a significant impact on the return on assets of banks and liquidity risk has a significant impact on both the financial indicators.

Kithinji (2010) found no association among profit, amount of credit, and level of non-performing loans. The author suggested that banks should focus on other factors along with credit and non-performing loans. Ramadan et al. (2011) showed the impact of characteristics of internal and external factors of the bank on their profitability in Jordan. They found that characteristics such as low credit risk, good capitalisation, high lending, and efficient cost management have a significant impact on the profitability of the bank. They suggested that banks should focus on these factors to enhance their profitability. Kargi (2011) found that credit risk management of the banks has a significant impact on the bank's profitability in Nigeria. The author suggested that banks should focus on efficient credit policies that help in controlling credit risk and improving the banks' profitability.

Poudel (2012) suggested that the banks should focus on credit risk management systems which help improve bank profitability. Boahene, Dasah and Agyei (2012) found that credit risk indicators of banks have a positive and significant impact on the profitability of banks. Their finding does not support the previous study, which concluded that credit risk of the bank has a negative effect on their profitability. The authors suggested that banks should reduce the different charges and lending rates, which will encourage the borrowers to pay their loans on time. Haneef et al. (2012) analysed the impact of risk management of banks on their non-performing loans and profitability in Pakistan. They found that risk management of banks has a significant impact on non-performing loans and profitability of banks. They suggested that the banking sector in Pakistan should focus on efficient risk management methods for controlling and managing the non-performing loans and for enhancing their profitability.

Kolapo, Ayeni and Oke (2012) found that non-performing loans have a negative effect on Nigerian banks' performance; however, total loan and advances have a positive impact on the bank's profitability. The authors suggested that Nigerian banks should enhance their credit risk management systems, and regulatory authorities should focus on compliance of relevant provisions that help minimise banks' risk. Afriyie and Akotey (2013) observed a significant positive impact of non-performing loans on the profitability of banks. The authors recommended that rural banks should focus more on effective credit risk management practices for minimising the non-performing loans to enhance their profitability.

Musyoki and Kadubo (2012) found a negative impact of credit risk management parameters, such as default rate and cost per loan asset, on the banks' performance in Kenya. They recommended that banks should design and formulate strategies for minimising the exposure of banks, which will help enhance the profitability of the bank. Riaz and Mehar (2013) examined the impact of bank-specific and macroeconomic factors on the profitability of banks in Pakistan. They found that bank-specific factors (asset size, total deposits to total assets, and credit risk) and macroeconomic factors (interest rate) have a significant effect on return on equity profitability of the bank. They also found that credit risk and interest rate have a significant impact on the return on assets. The authors suggested that policymakers identify different factors before formulating the policies for improving the profitability of banks.

Ruziqa (2013) showed that credit risk has a negative significant impact on banks' performance; however,

the liquidity ratio of a bank has a significant effect on performance. The banks' capital has a significant effect on performance indicators and net interest margin (NIM). Size of the bank has a negative significant impact on NIM. Credit risk and liquidity of the bank have no significant effect on NIM. Ogboi and Unuafe (2013) found that credit risk management and capital adequacy ratio of Nigerian banks have a positive impact on their performance, whereas loans and advances have a negative impact on the banks' performance. The author suggested that the bank should focus on sound credit management systems and should conduct proper credit appraisal before disbursement of loans.

Li and Zou (2014) showed that banks should focus on policies for controlling the non-performing loans to operate more efficiently. Ejoh, Okpa and Egbe (2014) examined the impact of credit and liquidity risk management on the profitability of banks in Nigeria. They suggested that banks should focus on efficient and effective credit risk management that help in enhancing the profitability of banks. Kurawa and Garba (2014) examined the effect of credit risk management of the bank on their profitability in Nigeria. They found that indicators of CRM have a significant effect on the profitability of banks. They recommended that banks should implement an efficient credit risk management system to minimise the non-performing loans, which will help in enhancing the profit of banks.

Gizaw, Kebede and Selvaraj (2015) found a significant impact of credit risk management measures on the profitability of the bank. Tekalagn, Anwen and Bari (2015) found a negative association between capital adequacy ratio (CAR) and non-performing loan to total loans (NPLR), with financial performance indicators of the bank such as return on assets (ROA) and return on equity (ROE); on the other hand, loan provisions have a positive impact on the financial performance of the banks in Ethiopia. Noman et al. (2015) found that non-performing loan to gross loan and loan loss reserve ratio indicators of credit risk have a significant negative effect on the profitability of banks. They also found that the capital adequacy ratio of banks has a negative effect on return on average equity. They recommended the implementation of credit risk management policies which will help enhance the profitability of banks.

Alshatti (2015) found that credit risk management indicators of Jordanian commercial banks have a significant effect on their performance. The author suggested that banks should improve their credit risk management systems, which will help in controlling the exposure related to credit risk and increase the performance of banks. Kodithuwakku (2015) found that credit risk measures, such as non-performing loans and provisions to non-performing loans have a negative effect on the profitability of Sri Lankan banks. Magali (2016) analysed rural saving and credits cooperative societies (SACCOS) in Tanzania and found that credit risk management has a major effect on the profitability of rural SACCOS in Tanzania. The author suggested that banks should focus on the credit processing and monitoring system for enhancing their profitability and reducing the credit risk. Ndoka and Islami (2016) found that the efficient credit risk management of banks has a positive impact on the profitability of banks. The authors suggested that banks should focus more on controlling and monitoring non-performing loans for enhancing profitability.

Al-Shakrchy (2017) suggested that the bank should focus on and implement good credit risk management practices to enhance the profitability of banks. Isanzu (2017) found that the non-performing loans and capital adequacy ratio of Chinese commercial banks have a significant impact on the financial performance of the banks. The author suggested that the bank should focus more on improving capital adequacy ratio and reducing non-performing loans in the bank to enhance the financial performance of the bank.

Annor and Obeng (2017) recommended that banks should implement a sound credit risk management system for reducing the exposure of credit risk and enhancing the profitability of banks. Hamza (2017) found an inverse relationship between credit risk management and the performance of Pakistani banks. The capital adequacy ratio and liquidity ratio have a negative impact on performance indicators of the bank, whereas loan loss provision ratio and non-performing loan ratio indicators are positively related to the performance of the firm. The authors suggested that banks should focus on capital adequacy ratio, loans and advances, liquidity ratio, and non-performing loans, because these indicators are related to the performance of the firms.

Serwadda (2018) found that the non-performing loans of the bank have a negative impact on banks' performance in Uganda. The author suggested that the bank should focus more on enhancing their credit risk management systems, which will help the bank earn more profits and maintain a qualitative assets portfolio by reducing the non-performing loans. Kingu et al. (2018) showed the relationship between non-performing loans and profitability of banks in Tanzania. They found that non-performing loans occurrence in banks has a negative effect on their profitability. They recommended that the banks' management should focus on credit risk management policies related to loans to minimise the non-performing loans in banks, which can help increase the profit of banks.

Singh and Sharma (2018) found that non-performing loans to total loans has a significant impact on the profitability of banks, whereas other indicators, such as loan provisions to non-performing loans and capital adequacy ratio, have

no significant impact on profitability. They recommended that the banks should implement efficient credit risk management to reduce non-performing loans, which will help in enhancing the profitability of banks. Hallunovi and Berdo (2018) showed the impact of risk management in banks on their profitability in Albania. They found that credit risk management of banks has a significant impact on the profitability of banks. They suggested that credit risk and capital adequacy are important indicators of the profitability of banks; therefore, banks should focus on credit risk management systems for managing and controlling these indicators.

Ekinci and Poyraz (2019) suggested that the banks should focus more on credit risk management systems, especially on the controlling and managing of non-performing loans. Madugu, Ibrahim and Amoah (2019) found a significant impact of the credit risk indicator non-performing loan to total assets on Ghana's domestic bank profitability indicator return on assets (ROA), compared to foreign banks, whereas the capital adequacy ratio (CAR) indicator return on equity (ROE) was negatively related to profitability for all banks in Ghana. The study suggested that different policies related to credit risk and capital adequacy ratio were needed for domestic and foreign banks. Oleiwi et al. (2019) found that credit risk measuring indicators, such as loan loss provisions ratio (LLPR) and the ratio of capital adequacy (CAR), have a positive impact on bank performance in Malaysia. The authors suggested that the bank should focus on a new management structure for credit risk management systems in the bank to enhance the profitability of the bank.

Based on the above discussion, we formulate the following hypotheses for our study:

- Net NPA has no impact on the ROA of the banks.
- Net NPA has no impact on the ROE of the banks.

SAMPLE DATA, METHODOLOGY, AND DESCRIPTIVE STATISTICS

Sample Data and Methodology

This study uses data for 36 commercial banks in India. These are further sub-divided into public and private sector banks. There are 18 public sector banks and the same number of private sector banks included in the sample. These are the top commercial banks in India, as they form a part of the BSE (Bombay Stock Exchange) and the NSE (National Stock Exchange) bank index. The data related to the variables used in this study are obtained from the Reserve Bank of India (RBI) website, Prowess Database, and annual reports of the selected banks for the period 2010-2019.

We apply the following regression model to test the relationship between credit risk and banks' performance.

$$Bank\ Performance_{i,t} = \alpha + \beta_1 Credit\ Risk_{i,t} + \sum_{j=2}^{n} \beta_j Control_{i,t} + \varepsilon_{i,t}$$

Where, bank performance is measured with the help of return on assets (ROA) and return on equity (ROE), and the credit risk is captured by using net non-performing assets (NNPA) of the banks. The definition of the variables is provided in Table 1.

Table 1: Variables' Definition and Explanation

	Variables	Description
Dependent Variable	ROA	EBIT/Total Assets
	ROE	Net Income/Net Worth
Explanatory Variable	NNPA	Net Non-Performing Assets/Total Assets
Control Variables	SIZE	Log of Total Assets
	LOAN	Loan Advances/Total Assets
	CAP (Capital)	Log of Total Capital
	DEP (Deposits)	Total Deposits/ Total Assets
	AM (Asset Management)	Operating Profit/Total Assets
	BUSIEMP	Business (deposits plus advances) per employee
	PROFITPE	Profit and Loss per employee

We estimate the regression output by using the fixed-effect and random-effect models. However, there may be some endogeneity issues present in the dataset. To handle this issue, we also undertake the dynamic panel data methodology of Arellano and Bond (1991) based on the generalised method of moments (GMM).

Descriptive Statistics

Table 2 depicts the summary statistics of all the variables used in the study. The average value of the ROA for all the banks taken together is about 37.28%. We notice that the ROA for public sector banks has a negative average value of about −4.9%. On the other hand, private sectors banks are performing well on this front, with the average value of about 75%, which is in contrast with the public sectors banks operating in the negative territory. ROE also paints the same picture, wherein the average of all the banks is .007%, with public sector banks operating with an average ROE of about −.06% and the private sector banks an average ROE

of about 7.3%. We observe that it is the private sector banks that are contributing to show the positive figures of ROA and ROE for the banking sector of India. This analysis reflects the importance of segregating the banking sector into public and private sectors, as a combined banking sector may not throw light adequately on the functions of the banking sector. At the same time, we should not lose sight of the fact that the mandate for public sector banks in India is not to generate big profits, rather it is taken as a tool to facilitate financial inclusion and provide loans and access to sectors that may not find favour among the private banks due to low profitability and higher risk.

Table 2: Descriptive Statistics

	Total			Public			Private		
Variable	**OBS**	**Mean**	**Std. Dev.**	**OBS**	**Mean**	**Std. Dev.**	**OBS**	**Mean**	**Std. Dev.**
ROA	360	0.372806	2.114526	170	−0.049	1.048175	190	0.750211	2.684645
ROE	360	0.007088	0.218769	170	−0.06687	0.261504	190	0.073262	0.142962
NNPA	360	3.168222	3.039053	170	4.763706	3.391477	190	1.740684	1.708782
SIZE	360	14.13035	1.339507	170	14.84239	0.763521	190	13.49325	1.422263
LOAN	360	0.601151	0.091524	170	0.608832	0.071108	190	0.594278	0.106252
CAP	360	8.247204	1.452987	170	9.061315	0.82687	190	7.518789	1.506388
DEP	360	0.813041	0.125564	170	0.847394	0.072168	190	0.782305	0.152575
AM	360	0.014086	0.007777	170	0.011837	0.004354	190	0.016098	0.00945
BUSIEMP	360	192.0534	943.4167	170	293.1246	1366.981	190	101.6212	47.83715
PROFITPE	360	0.983195	5.72088	170	1.289059	8.299863	190	0.709526	0.639785

Source: Authors' estimates.

The important variable in this study is NNPA; its average value is about 3.16% for the overall banking system. However, once again we find a notable difference between the public and private sector banks. The average value of NNPA for the public sector banks is 4.76%, whereas it is about 1.74% for the private sector banks. It reflects that the major portion of NPA comes from the public sector banks. It may be attributed to the fact that public sector banks lend money to many sectors to fulfil societal goals, irrespective of the recovery rate of the loan. For variables such as LOAN, CAP, DEP, and AM, we find that both the public as well as private sectors banks have similar average values. For BUSIEMP and PROFITPE, we find that it is the public sector banks which have a lead, with an average value of about 293 and 1.2, respectively. The private sector banks have an average value of 101 and 0.70, respectively, for these two variables, which is much below the value of their counterparts.

EMPIRICAL ANALYSIS

Regression Model

Table 3 provides the results of the regression model, with ROA as a dependent variable for the aggregate banking sector and its classification into public and private sector banks. We notice, from columns 1 and 2 of Table 3 that the NNPA is highly negative and significant for the aggregate banking sector, by using both the random- and fixed-effect models. This indicates that the ROA is negatively affected by the presence of NNPA. Higher the value of NNPA, lower the value of ROA. This is understandable, as the high level of NPAs puts pressure on the banking sector and reduces their profitability. The next question which arises is whether NNPAs affect the public and private sector banks in the same way. Columns 3 and 4 of Table 3 show the result of the regression model for public sector banks. We find that the NNPA has a negative association with ROA by applying both the random- and the fixed-effect panel data technique. However, we find that the NNPA is negative and significant only for the random-effect model and is insignificant for the fixed-effect model. The negative association of NNPA with ROA indicates that the ROA of the public sector banks is adversely affected by the presence of NNPAs. Next, we discuss the results of the regression model for private sector banks as depicted in columns 5 and 6 of Table 3. We find that both the random- and fixed-effect models show the same result, that is, ROA of the private sector banks is negatively associated with the NNPAs. Similar to the previous results for public sector banks, we notice that though the relationship between ROA and NNPA is negative, it is significant only for the random-effect model. This suggests that the private sector banks are also negatively affected by the presence of NNPAs in their balance sheets. These results make a point for the banking sector companies to ponder over their NPA levels and take active steps to reduce it, as it is taking a toll on their performance. The long-run survival and profitability of the banks depend on their ability to manage their NPAs effectively and efficiently.

Table 3: ROA and Credit Risk

	Total	Total	Public	Public	Private	Private
	Random	Fixed	Random	Fixed	Random	Fixed
	ROA	ROA	ROA	ROA	ROA	ROA
NNPA	−0.156***	−0.136**	−0.0795*	−0.0517	−0.277*	−0.292
	(−5.03)	(−3.25)	(−2.43)	(−1.34)	(−2.38)	(−1.98)
SIZE	−0.0533	−0.490**	−0.227*	−0.611	−0.00860	−0.206
	(−0.69)	(−2.97)	(−2.05)	(−1.53)	(−0.07)	(−1.35)
LOAN	0.224	1.924	3.114	3.387	−0.617	0.983
	(0.18)	(1.49)	(1.17)	(1.20)	(−0.45)	(0.91)
CAP	0.0154	−0.0470	−0.285	−0.395	0.0283	0.101
	(0.17)	(−0.35)	(−1.19)	(−1.11)	(0.36)	(0.68)
DEP	−0.272	−0.846	−1.666	−1.625	0.168	−0.668
	(−0.37)	(−1.21)	(−0.98)	(−0.95)	(0.23)	(−1.01)
AM	91.15***	76.88***	92.05**	94.20*	68.83**	32.17*
	(4.79)	(6.25)	(3.13)	(2.45)	(3.29)	(2.16)
BUSIEMP	−0.0000304	−0.0000291	0.00000262	−0.00000312	−0.000190	−0.00246
	(−1.62)	(−1.89)	(0.08)	(−0.11)	(−0.13)	(−1.49)
PROFITPE	0.00969	0.0153	0.0138	0.0161	0.308	0.378
	(1.11)	(1.44)	(1.58)	(2.02)	(1.48)	(1.51)
CONSTANT	0.290	6.549***	4.700	11.02	0.0637	2.687
	(0.20)	(3.87)	(1.77)	(1.71)	(0.04)	(1.42)
N	360	360	170	170	190	190
WALD TEST	4844.26***	1745.68***	8583.02***	7771.08***	51.45***	27.6***

Source: Authors' estimates. *, **, and *** represent .05, .01, and .001 significance level. The figures in parenthesis are test statistics value.

Robustness Check

We use an alternative measure of the bank's performance to check for the robustness of our results. Specifically, we use ROE to measure the bank's performance and keep the other variables the same. We provide the result of the regression models in Table 4. Columns 1 and 2 of Table 4 show the estimation output of the regression models for the aggregate banking sector with ROE as the independent variable. NNPA is negatively and significantly associated with ROE, based on both the random- and fixed-effect models for the aggregate banking sector. This result conforms to previous results depicted in Table 3. The result suggests that the ROE of the banks is reduced in the presence of NNPAs. The negative role of NNPAs is confirmed in our study regarding the banks' performance. Next, we aim to know the effect of NNPA on ROE of public and private sector banks separately. The results of the public sector banks are shown in columns 3 and 4 of Table 4. It shows that NNPA has a negative effect on ROE of the public sector banks, reflected in both the random-effect and fixed-effect models. Moreover, we notice that NNPA is significant for both the random- and fixed-effect models. This is in contrast to our earlier results using ROA, wherein we find only random-effect model depicting a significant role of the NNPA. Thus, the alternative measure of banks' performance provides an even more convincing relationship of NNPA with the public sector banks' performance. Columns 5 and 6 of Table 4 show the results of the private sector banks, with the random- and fixed-effect models, respectively. We observe that the NNPA has a negative relationship with ROE for private sector banks based on both random- and fixed-effect models. This relationship is significant concerning both the random- and fixed-effect models. Overall, we infer from the analysis that the NNPAs have a negative effect on the bank performance measures – both ROA as well as ROE.

Table 4: Robustness Check

	Total	Total	Public	Public	Private	Private
	Random	Fixed	Random	Fixed	Random	Fixed
	ROE	ROE	ROE	ROE	ROE	ROE
NNPA	−0.0397***	−0.0340***	−0.0296***	−0.0244*	−0.0371**	−0.0362*
	(−8.31)	(−5.26)	(−3.77)	(−2.23)	(−2.78)	(−2.78)
SIZE	−0.00535	−0.0633	−0.0410	−0.0638	−0.0203	−0.0380
	(−0.50)	(−1.86)	(−1.86)	(−0.54)	(−1.17)	(−1.79)
LOAN	0.143	0.518	0.581	0.690	−0.0502	0.0993
	(0.71)	(1.74)	(1.25)	(1.22)	(−0.36)	(0.56)
CAP	−0.0219	−0.0341	−0.0711*	−0.105**	−0.0104	−0.00867
	(−1.56)	(−1.37)	(−2.26)	(−2.96)	(−1.22)	(−0.92)
DEP	0.0629	−0.168	−0.227	−0.263	0.117	0.0191
	(0.48)	(−0.99)	(−0.63)	(−0.63)	(1.34)	(0.18)
AM	10.59***	16.44***	17.90**	21.71*	10.13*	11.72*
	(4.20)	(5.11)	(3.06)	(2.83)	(2.33)	(2.17)
BUSIEMP	−0.0000188***	−0.0000145***	−0.00000838	−0.00000900	0.0000130	−0.0000111
	(−5.68)	(−3.74)	(−1.12)	(−1.33)	(0.05)	(−0.04)
PROFITPE	0.00368	0.00212	0.00284	0.00131	0.0262	0.0285
	(1.75)	(0.93)	(1.39)	(0.70)	(0.59)	(0.63)
CONSTANT	0.103	0.885	0.953*	1.498	0.245	0.433
	(0.84)	(2.02)	(2.16)	(0.83)	(1.52)	(1.90)
N	360	360	170	170	190	190
WALD TEST	16543.69***	15762.29***	30547.24***	7866.21***	177.72***	31.31***

Source: Authors' estimates. *, **, and *** represent .05, .01, and .001 significance level. The figures in parenthesis are test statistics value.

Endogeneity Issues

Thus far we observed the negative association of NNPA with the ROA and ROE of the banks using random- and fixed-effect models. The main limitation of these models is that they do not address the endogeneity issues about the variables. Endogeneity arises when the error term is correlated with the explanatory variables and it confounds the results. In our study, the results that we obtained may likely be affected by endogeneity. To ensure that our results are robust against endogeneity concerns, we rerun our regression models by applying the dynamic panel data methodology of Arellano and Bond (1991). The results are provided in Table 5.

Table 5: Dynamic Panel Data Methodology

	Total	Total	Public	Public	Private	Private
	ROA	ROE	ROA	ROE	ROA	ROE
Lagged Dependent	0.0347	0.0876	0.202*	0.170	0.0394	0.173**
	(0.49)	(1.48)	(2.09)	(1.73)	(0.39)	(2.76)
NNPA	−0.217*	−0.0289***	−0.0450*	−0.0181**	−0.281	−0.0236***
	(−2.21)	(−7.33)	(−2.08)	(−3.01)	(−0.96)	(−4.57)
SIZE	0.102	−0.0135	0.0571	0.0548	0.807	−0.0149
	(0.15)	(−0.43)	(0.14)	(0.50)	(0.66)	(−0.75)
LOAN	−11.83*	0.365	5.764***	1.144*	−22.20*	0.214
	(−2.19)	(1.64)	(3.46)	(2.55)	(−2.23)	(1.43)

	Total	Total	Public	Public	Private	Private
	ROA	ROE	ROA	ROE	ROA	ROE
CAP	−0.294	−0.0541***	−0.181	−0.0423	0.228	0.00157
	(−1.00)	(−3.76)	(−1.26)	(−1.04)	(0.49)	(0.21)
DEP	7.254	−0.226	3.839	0.915	14.52*	−0.194
	(1.80)	(−1.34)	(1.38)	(1.25)	(2.09)	(−1.84)
AM	52.83	20.61***	127.9***	33.38***	−17.31	8.245***
	(1.01)	(9.32)	(5.96)	(5.63)	(−0.19)	(5.37)
BUSIEMP	−0.000124	−0.0000119	0.0000140	−0.00000351	−0.00356	−0.000232
	(−0.57)	(−1.46)	(0.42)	(−0.40)	(−0.33)	(−1.23)
PROFITPE	0.0234	0.00383*	0.00949	0.000132	0.811	0.116***
	(0.52)	(2.02)	(1.10)	(0.06)	(0.85)	(6.93)
CONSTANT	2.499	0.405	−7.424	−2.287	−9.531	0.121
	(0.30)	(0.97)	(−0.99)	(−1.15)	(−0.67)	(0.51)
N	288	288	136	136	152	152
WALD TEST	22.7***	731.77***	505.85***	449.18***	8.91	493.8***

Source: Authors' estimates. *, **, and *** represent .05, .01, and .001 significance level. The figures in parenthesis are test statistics value.

We find that the NNPA is negatively and significantly associated with ROA and ROE for the aggregate banking sectors. Dynamic panel data methodology shows that the ROA and ROE of the public sector banks are negatively affected by the NNPAs. Similarly, for the private sector banks, we observe that there is a negative association of NNPAs with ROA and ROE. However, the results are significant only for ROE. The results of this section depict that the dynamic panel data methodology does not change the outcome of the regression models. We obtain similar results to those we achieved using the random- and fixed-effect models. It makes us believe that our results are not affected by endogeneity issues. Moreover, we notice that the lagged dependent variable is insignificant for most of the models, which tells us that the current ROA and ROE are not affected to a great extent by the previous values of these variables. To sum up, we find that the NNPA plays a negative role in banks' performance and endogeneity issues do not affect our conclusion.

SUMMARY AND CONCLUSION

Banks are an essential part of the financial system of any country. In emerging economies like India, they have a pivotal role to play in creating a system of transferring the surplus funds from the saver to the users of the funds. The measurement and management of credit risk are of paramount importance for any financial institution in general, and banks in particular. This study examines the effect of credit risk on banks' performance in India by using the data from 36 commercial banks over the period 2010-2019. Results from both random- and fixed-effect models show that the credit risk factor NNPA is negatively and significantly related to the performance measured by ROA.

We find that the NNPA is negatively associated with ROA, and high NPA creates pressure on the banks' profitability. Results from both the random- and the fixed-effect panel data technique show that NNPA is negatively associated with ROA of private and public sector banks. It shows that the NNPA of banks has a negative effect on banks' profitability. We also checked the robustness of our results by using a different measure of banks' performance, that is, ROE. It also confirmed the previous results, that the NNPA is negatively and significantly related to the firm's performance. To assess that the results are not affected by endogeneity issues, we applied dynamic panel data techniques. Our results did not change and we found the negative association between NNPA and banks' performance, which further confirms the robustness of our results.

The confidence of the public and the investors in banks is essential for the growth of any economy. The above discussion shows the importance of credit risk management for banks to reduce the NPA level, which will help increase the profitability of banks and help in the long-term survival of banks. The management of the banks should have efficient credit risk management and provisions against banks' loan default, to minimise the NPA in banks. The Government of India is also working to rescue the public sectors banks and had provided the funds for the recapitalisation of public sector banks. The Reserve Bank of India has also provided different regulatory measures to reduce the banks' NPA.

The commercial banks should change existing practices of granting loans to borrowers and apply robust practices that will help in minimising the default of banks' loans to reduce NPA. The general investors and customers need to keep track of the level of NPAs of the banks, as we find that high NPA can dent the performance of the banks. Banks should make the effort to have a well-designed credit risk assessment system in place before lending funds to the borrowers, to increase the probability of loan repayment and reduce the NPA levels.

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