UNVEILING THE NEXUS: EXPLORING THE RELATIONSHIP BETWEEN CREDIT RISK MANAGEMENT AND PROFITABILITY IN INDIAN PUBLIC SECTOR BANKS

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ABSTRACT

In the ever-evolving landscape of the banking sector, the nexus between credit risk management and financial performance holds profound implications for the survival and growth of Indian public sector banks. This article explores this critical relationship over a span of a decade, from FY2009 to FY2019, focusing on fifteen prominent banks. Through the lens of null hypotheses, we investigate whether there is a significant link between credit risk management and return on assets (ROA) as well as return on equity (ROE). Drawing on data from the Reserve Bank of India and official bank websites, our analysis unveils intriguing patterns in the correlations between key credit risk management measures—capital adequacy ratio (CAR), non-performing assets ratio (NPA), and leverage ratio (LR)—and banks' profitability. The findings not only shed light on the impact of credit risk on financial performance but also underscore the imperative for banks to fortify their risk management strategies in navigating a dynamic financial landscape. As we reflect on a decade of financial evolution, this exploration contributes valuable insights for shaping resilient banking strategies in the face of uncertainty.As we reflect on this journey, our exploration contributes more than statistical revelations; it provides a compass for shaping resilient banking strategies in the face of an ever-shifting financial landscape. Beyond the data points lies a narrative that beckons institutions to draw upon the lessons of the past, fortify their foundations, and navigate future uncertainties with strategic acumen. In the unfolding chapters of banking evolution, the insights gleaned here stand as beacons guiding institutions towards a future of financial robustness and adaptability.

Keywords: Credit risk management, financial performance, Indian public sector banks, ROA, ROE, CAR, NPA, LR, etc.

I. INTRODUCTION

In the ever-evolving landscape of the banking sector, where the delicate dance between risk management and financial performance dictates the fate of institutions, this article embarks on a comprehensive exploration. Spanning a decade from FY2009 to FY2019 and centering

its focus on fifteen Indian public sector banks, the study endeavours to unravel the intricate dynamics underpinning credit risk management and its profound impact on the bottom line.

Against the backdrop of a post-Global Economic Crisis era, our investigation employs the rigor of null hypotheses to challenge preconceptions regarding the purported absence of significant relationships between credit risk management and two pivotal indicators of financial health—return on assets (ROA) and return on equity (ROE). Beyond the statistical nuances, we traverse the financial landscape armed with insights derived from capital adequacy ratio (CAR), non-performing assets ratio (NPA), and leverage ratio (LR), key measures that encapsulate the essence of risk management strategies.As this narrative unfolds, it extends beyond a mere juxtaposition of data points. It becomes a strategic compass, navigating through the complexities of an industry that has weathered global economic upheavals. Positive correlations between return on assets and return on equity with the capital adequacy ratio emerge, hinting at symbiotic relationships that merit closer scrutiny. Simultaneously, the non-performing assets ratio reveals a contrasting narrative, shedding light on potential pitfalls that underscore the criticality of effective risk mitigation.

This exploration transcends the realm of statistical analysis; it unveils strategic imperatives for banking institutions. Lessons gleaned from the past become beacons guiding the fortification of risk management strategies. Institutions are beckoned not only to navigate the intricacies of revenue growth but also to maintain a qualitative portfolio resilient to adversities.As we reflect on this journey through a decade of financial evolution, the article stands as more than an analytical exercise. It emerges as a narrative shaping resilient banking strategies in the face of an ever-shifting financial landscape. Beyond the numerical canvas, it is a call for institutions to draw upon the lessons of the past, fortify their foundations, and navigate future uncertainties with strategic acumen. In the unfolding chapters of banking evolution, the insights gleaned here stand as beacons guiding institutions towards a future of financial robustness and adaptability.

II. REVIEW OF LITERATURE

Saeed & Zahid (2016),Concentrated their assessment of the influence of credit risk on profitability specifically on five commercial banks in the United Kingdom. "The metrics used to assess profitability were return on assets and return on equity, while credit risk was evaluated via impairments and non-performing loans." The investigation collected financial data from 2007 to 2015 and concluded that there is a clear and positive correlation between credit risk and profitability. Additionally, it has been shown that banks in the United Kingdom are still engaging in practises that heighten their credit risks. This implies that these institutions have failed to learn from the financial and credit crisis of 2008-2009.

Jeslin Sheeba. J (2017) The research seeks to examine the influence of credit risk on the bank's profitability. After conducting a thorough review of the literature, several factors that affect credit risk have been identified. These include the Capital Adequacy Ratio (CAR), Nonperforming Asset Ratio (NPA), Loan to Deposit Ratio (LDR), Cost per Loan Ratio (CLR), Provision Coverage Ratio (PCR), Leverage Ratio (LR), and Nonperforming Asset to

Asset Ratio (NPAAR). The profitability statistic is known as Return on Equity (ROE). The secondary data is obtained from the Annual reports of the State Bank of India over a period of twenty years (1997-2016). Multiple regression is used to analyse the data. The findings indicate that NPAAR alone has a large adverse effect on ROE, but other credit risk indicators do not have a significant influence on ROE. However, the total credit risk has a substantial influence on the profitability of the State Bank of India. The State Bank of India is exposed to credit risk as a result of ineffective credit risk management. It is recommended to enhance credit risk management practises at the State Bank of India. The Credit risk of State Bank of India may be mitigated by implementing stringent credit rules to reduce the Nonperforming assets.

Ahmed et al. (2020) This research examines the correlation between risk management and profit efficiency by using capital adequacy ratios as a proxy for risk management in banks located in Pakistan. The first section of the study was assessing and contrasting the effectiveness of Banking sectors using the use of the Stochastic Frontier Approach. During the second stage, panel regression analysis was used to determine the relationship between risk management and efficiency scores, as well as other particular and macroeconomic characteristics of banks. A dataset was obtained from a subset of 25 commercial banks that were active in Pakistan between 2010 and 2019. The mean profitability efficiency of Pakistani banks is 57% overall and exhibits an upward trend during the research period. Similarly, while comparing profit efficiency, it is shown that big banks have the greatest rate (73%), followed by medium banks (58%) and small banks (45%). In contrast, Islamic banks exhibit lower profit efficiency (36%) compared to conventional banks (61%). Furthermore, state banks in Pakistan have the lowest level of efficiency at 50%, followed by private banks at 57% and international banks at 67%. The findings from the second phase of the study indicate that there is a positive correlation between profit efficiency and risk management. This relationship holds true for midsize, private, and traditional banks as well. Credit risk has a detrimental impact on risk management. However, in public, foreign, medium, and small banks, there is no correlation between credit risk and risk management. Conversely, in large, private, and conventional banks, a reduction in credit risk indicates an improvement in risk management. In Islamic banks, a decrease in credit risk has a positive influence on risk management. Furthermore, there is a favourable correlation between liquidity risk and risk management, particularly in private, public, and small banks. The relationship between return on assets and other variables varies across different types of banks. In the case of all banks, including medium, small, foreign, and conventional banks, return on assets is inversely correlated with capital adequacy ratio. However, in the case of big, private, and public banks, return on assets is favourably correlated with risk. These findings suggest that greater profitability is associated with improved risk management in both major commercial and state banks in Pakistan. Moreover, there exists an inverse correlation between the size of a bank and its ability to effectively manage risk. This suggests that as banks increase in size and extend their operations, the task of risk management becomes more challenging. The results would assist regulatory authorities in establishing more effective policies to enhance the efficiency, creditworthiness, and liquidity standards of banks in Pakistan. This research

may also provide valuable recommendations to bank management for maintaining an appropriate amount of bank capital.

III. OBJECTIVE OF THE STUDY

1. To evaluate the Relationship Between Credit Risk Management and Return on Assets (ROA).

2. To assess the Impact of Credit Risk on Return on Equity (ROE).

3. To provide Strategic Recommendations for Strengthening Credit Risk Management.

IV. RESEARCH METHODOLOGY

4.1 Research Design

The study adopts an empirical research design to investigate the intricate relationship between credit risk management and the profitability performance of the top fifteen public sector banks in India. The research spans an 11-year period, from 2008-09 to 2018-19, encompassing key financial indicators.

4.2 Sampling Criteria

The sample comprises the top fifteen public sector banks selected based on market capitalization, ensuring a representative analysis of the sector's major players.

4.3 Data Collection

Utilizing a secondary data approach, information is sourced from reputable and official channels, including the Reserve Bank of India (RBI) official websites and annual reports of the selected banks. This approach ensures the reliability and consistency of the dataset.

4.4 Variables

The primary focus is on two dependent variables: return on assets (ROA) and return on equity (ROE). The independent variables include credit risk management measures such as capital adequacy ratio (CAR), non-performing assets ratio (NPA), and leverage ratio (LR).

4.5 Statistical Analysis

The study employs rigorous statistical methods to analyze the relationships between credit risk management and profitability performance. Analysis of Variance (ANOVA) and Multiple Regression models are utilized to scrutinize the nuanced interactions among the variables.

4.6 Hypothesis Formulation

To validate the study's objectives, null hypotheses are formulated:

H01: There is no significant relationship between credit risk management and return on assets of Indian public sector banks.

H02: There is no significant relationship between credit risk management and return on equity of Indian public sector banks.

4.7 Software

Data analysis is conducted using IBM SPSS 19.0 version, ensuring a robust and standardized approach to statistical examination.

4.8 Ethical Considerations

The study adheres to ethical guidelines, respecting the confidentiality and integrity of the data obtained from official sources. Consent and approval procedures are followed where applicable.

4.9 Limitations

Potential limitations, such as data availability constraints and external economic influences, are acknowledged to provide a comprehensive understanding of the study's scope and constraints.

Model specification and estimation:

The panel regression model is expressed as:

$ROA = \beta 0 + \beta 1 \times CAR + \beta 2 \times NPA + \beta 3 \times LR + e1$ $ROE = \beta 0 + \beta 1 \times CAR + \beta 2 \times NPA + \beta 3 \times LR + e1$

Where;

ROA = Return on Assets of Public Sector Banks for the period of 2008-2019,

ROE = Return on equity of Public Sector Banks for the study period,

CAR = Capital Adequacy Ratio for the period of 2008-19, NPA = Non-Performing Assets Ratio for the period of 2008-19, LR = Leverage Ratio for the period of 2008-19,

β_0 = Intercept (Constant),

$\beta_1, \beta_2, \beta_3$ = The slope represents the degree with which bank's performance changes as the

independent variable changes by one unit of variable, and

$e_{i,t}$ = error component.

Variables Selection:

In the study, credit risk management used as independent variables, profitability performance used as dependent variables, a group control variable is used to be public sector banks specifically. Five different indicators used which are as under:

Variables	Variable Name	Calculating Method
Control Variable	Market Capitalization	
Dependent Variables	Return on Assets (ROA)	Earnings before Interest and tax to total assets
	Return on equity (ROE)	Net Income after tax to Total Equity
Independent Variables (Credit Risk Management)	Capital Adequacy Ratio (CAR)	Total Capital/RWAs
	Non-performing Assets ratio (NPA)	Non-Performing Assets/Total Loans
	Leverage ratio (LR)	Total debt/ total equity

V. ANALYSIS AND INTERPRETATIONS

Table 1: Descriptive Statistics of the Variables

Variable	Variables	N	Mean	SD	Minimum	Maximum
Independent	CAR	165	12.19	1.35	8.69	15.38
	NPA	165	4.06	3.47	0.17	16.69
	LR	165	17.22	4.15	-2.24	29.99
Dependent	ROA	165	0.24	1.05	-4.68	2.00
	ROE	165	3.30	19.14	-85.92	28.02

Table 1 presents the descriptive statistics for the variables under scrutiny in the study. The analysis encompasses both independent variables, including Capital Adequacy Ratio (CAR), Non-Performing Assets Ratio (NPA), and Leverage Ratio (LR), as well as dependent variables, namely Return on Assets (ROA) and Return on Equity (ROE). These statistics provide a comprehensive overview of the central tendency and variability within the dataset.

In examining the independent variables, it is observed that the Capital Adequacy Ratio (CAR) exhibits a mean of 12.19, with a standard deviation (SD) of 1.35. This suggests a relatively moderate level of variability around the mean. The minimum and maximum values, 8.69 and 15.38 respectively, signify the range within which the CAR values are distributed across the sample. Similarly, for Non-Performing Assets Ratio (NPA), the mean is 4.06, with a notable standard deviation of 3.47. The minimum value of 0.17 and the maximum of 16.69 underscore the considerable dispersion of NPA values within the dataset. Leverage Ratio (LR), with a mean of 17.22 and SD of 4.15, reveals a moderate level of variability, ranging from -2.24 to 29.99.

Turning to the dependent variables, Return on Assets (ROA) demonstrates a mean of 0.24, indicating a relatively low average return. The standard deviation of 1.05 points to a noticeable spread of ROA values. The range, from a minimum of -4.68 to a maximum of 2.00, reflects a broad distribution of ROA across the sample. In contrast, Return on Equity (ROE) displays a higher mean of 3.30, with a substantial standard deviation of 19.14. The broader range from -85.92 to 28.02 illustrates significant variability in ROE, suggesting diverse performance outcomes among the observed entities.

In summary, these descriptive statistics offer valuable insights into the central tendencies, variabilities, and distributional characteristics of the variables. They lay the foundation for a more in-depth understanding of the relationships and patterns that will be explored through subsequent inferential analyses.

Table 2: Coefficient of Correlations among variables

Variables		ROA	CAR	NPA	LR	Variables	ROE	CAR	NPA	LR
Sig. (1-tailed)	**ROA**	-				**ROE**	.			
	CAR	0.000	-			**CAR**	0.000			
	NPA	0.000	0.000	-		**NPA**	0.000	0.000		
	LR	0.438	0.023	0.029	-	**LR**	0.145	0.023	0.029	-
Pearson Correlation	**ROA**	**1.000**				ROE	**1.000**			
	CAR	**0.561**	1.000			CAR	**0.550**	1.000		
	NPA	**-0.747**	-0.532	1.000		NPA	**-0.775**	-0.532	1.000	
	LR	**0.012**	-0.156	-0.147	1.000	LR	**0.083**	-0.156	-0.147	1.000

Source: RBI official website. **Note**: Significant at 5 percent level.

Table 2 presents the coefficients of correlation among the variables under investigation, providing insights into the relationships between Return on Assets (ROA), Return on Equity (ROE), Capital Adequacy Ratio (CAR), Non-Performing Assets Ratio (NPA), and Leverage Ratio (LR). The table includes both the significance levels (Sig.) and Pearson correlation coefficients.

For the correlation between ROA and the other variables, statistically significant relationships are observed. The correlation between ROA and CAR is positive (r = 0.561, p = 0.000), indicating a moderately strong positive relationship. Similarly, the correlation between ROA and NPA is negative (r = -0.747, p = 0.000), signifying a strong inverse relationship. "However, the correlation between ROA and LR is not statistically significant (r = 0.012, p = 0.438), suggesting a lack of a clear linear relationship."

Turning to the correlation between ROE and the variables, the relationships are also statistically significant. The correlation between ROE and CAR is positive (r = 0.550, p = 0.000), indicating a moderately strong positive relationship. Like ROA, ROE has a strong negative correlation with NPA (r = -0.775, p = 0.000), highlighting a robust inverse

relationship. The correlation between ROE and LR is not statistically significant (r = 0.083, p = 0.145), suggesting a lack of a clear linear relationship.

In summary, the coefficients of correlation provide valuable insights into the direction and strength of relationships among the variables. The statistically significant correlations underscore the importance of further exploration to understand the nuanced dynamics and potential causal relationships between these key financial indicators.

Table 3: Model Summary and ANOVA results

Model	R	R-Square	Adjusted R Square	Std. Error of Estimate	ANOVA	
					F	Sign.
2	0.792	0.628	0.621	11.78	90.566	0.000
1	0.773	0.598	0.590	0.67	79.703	0.000
Predictors (Constant):LR, CAR, NPA. Dependent Variable: ROA (Model 1) and ROE (Model 2).						

Source: RBI official website. **Note:** Significant at 5 percent level.

Table 3 presents the results of two distinct models, each examining the relationship between key predictor variables—Leverage Ratio (LR), Capital Adequacy Ratio (CAR), and Non-Performing Assets Ratio (NPA)—and their impact on financial performance, measured by Return on Assets (ROA) in Model 1 and Return on Equity (ROE) in Model 2.

For Model 1, which focuses on ROA, the analysis reveals a highly significant overall fit (ANOVA: F = 79.703, p = 0.000). The collective influence of LR, CAR, and NPA explains approximately 59.8% of the variance in ROA, as denoted by the R-Square value. The adjusted R-Square, accounting for the number of predictors, remains notably high at 0.590. The standard error of the estimate, at 0.67, signifies the average deviation between observed and predicted ROA values.

Similarly, Model 2, delving into the determinants of ROE, exhibits a significant overall fit (ANOVA: F = 90.566, p = 0.000). LR, CAR, and NPA collectively elucidate around 62.8% of the variability in ROE, as indicated by the R-Square value. The adjusted R-Square, adjusting for predictors, remains robust at 0.621. The standard error of the estimate, reflecting the average distance between observed and predicted ROE values, is reported at 11.78.

In conclusion, both models underscore the substantial impact of the chosen predictor variables on financial performance metrics. The highly significant ANOVA results, coupled with elevated R-Square values, affirm the models' efficacy in explaining the variability in ROA and ROE. These findings lay a foundation for deeper exploration into the nuanced dynamics of credit risk management and its implications for the profitability of the examined entities.

Table 4: Coefficients of the Variables

Model	Coefficients t test(sign.)		Standardized beta (β)	
	ROA	ROE	ROA	ROE
LR	-0.936 (0.351)	0.299 (0.765)	-0.049	0.015
NPA	-10.446 (0.000)	-11.312 (0.000)	-0.641	-0.668
CAR	3.452 (0.001)	3.344 (0.001)	0.212	0.198
(Constant)	-1.056 (0.293)	-1.336 (0.183)	-	-

Source: RBI official website. **Note:** Significant at 5 percent level.

Table 4 provides the coefficients of the variables in the regression models for Return on Assets (ROA) and Return on Equity (ROE). The coefficients are accompanied by their respective t-test results and standardized beta values.

For the predictor variable Leverage Ratio (LR), the coefficient is -0.936 for ROA and 0.299 for ROE. The t-test results indicate that the coefficient for LR in the ROA model is not statistically significant ($p = 0.351$), while in the ROE model, it is also not statistically significant ($p = 0.765$). The standardized beta values are -0.049 for ROA and 0.015 for ROE.

Moving on to Non-Performing Assets Ratio (NPA), the coefficient is -10.446 for ROA and -11.312 for ROE. Both coefficients are highly statistically significant ($p = 0.000$), indicating a strong impact of NPA on both ROA and ROE. "The standardized beta values are -0.641 for ROA and -0.668 for ROE."

For the predictor variable Capital Adequacy Ratio (CAR), the coefficient is 3.452 for ROA and 3.344 for ROE. Both coefficients are statistically significant ($p = 0.001$), suggesting a significant influence of CAR on both ROA and ROE. The standardized beta values are 0.212 for ROA and 0.198 for ROE.

The constant term in both models has coefficients of -1.056 for ROA and -1.336 for ROE. Neither of these constants is statistically significant ($p = 0.293$ for ROA and $p = 0.183$ for ROE).

In summary, the coefficients provide insights into the direction and strength of the relationships between the predictor variables (LR, NPA, CAR) and the dependent variables (ROA, ROE). While LR appears not to have a statistically significant impact, NPA and CAR emerge as influential determinants of both financial performance metrics, shedding light on the nuanced dynamics of credit risk management in the context of the studied entities.

Hypothesis Testing:

Hypothesis	Model	Variable	Coefficient	t-test (Significance)	Decision
H0$_1$	ROA	LR	-0.936	0.351 (Not Significant)	Accepted

$H0_1$	ROA	NPA	-10.446	0.000 (Significant)	Rejected
$H0_1$	ROA	CAR	3.452	0.001 (Significant)	Rejected
$H0_2$	ROE	LR	0.299	0.765 (Not Significant)	Accepted
$H0_2$	ROE	NPA	-11.312	0.000 (Significant)	Rejected
$H0_2$	ROE	CAR	3.344	0.001 (Significant)	Rejected

In the analysis of the null hypotheses, H01 posits no significant relationship between credit risk management and Return on Assets (ROA), while H02 posits no significant relationship between credit risk management and Return on Equity (ROE). The table above summarizes the findings for each hypothesis and variable in the context of the regression models.

For $H0_1$ (ROA):

Leverage Ratio (LR) is not statistically significant ($p = 0.351$), thus the null hypothesis is accepted.

Non-Performing Assets Ratio (NPA) and Capital Adequacy Ratio (CAR) are both statistically significant ($p = 0.000$ and $p = 0.001$ respectively), leading to the rejection of the null hypothesis.

For $H0_2$ (ROE):

Leverage Ratio (LR) is not statistically significant ($p = 0.765$), leading to the acceptance of the null hypothesis.

Non-Performing Assets Ratio (NPA) and Capital Adequacy Ratio (CAR) are both statistically significant ($p = 0.000$ and $p = 0.001$ respectively), resulting in the rejection of the null hypothesis.

These results provide valuable insights into the nuanced relationships between credit risk management variablesand financial performance indicators, shedding light on the specific factors that significantly influence Return on Assets (ROA) and Return on Equity (ROE) in the context of Indian public sector banks.

VI. CONCLUSION

In conclusion, this study has undertaken a comprehensive exploration of the intricate relationship between credit risk management and the financial performance of Indian public sector banks over the period from FY2009 to FY2019. Through rigorous empirical analysis, employing models for Return on Assets (ROA) and Return on Equity (ROE), and considering key indicators such as Leverage Ratio (LR), Non-Performing Assets Ratio (NPA), and Capital Adequacy Ratio (CAR), several critical insights have emerged."The findings reveal a nuanced landscape where credit risk management plays a pivotal role in shaping the financial outcomes of these banking institutions." While Leverage Ratio (LR) appears to have a negligible impact on both ROA and ROE, Non-Performing Assets Ratio (NPA) and Capital Adequacy Ratio (CAR) emerge as significant determinants. The rejection of the null

hypotheses associated with these variables signifies the importance of effective credit risk management strategies in influencing the profitability and equity returns of Indian public sector banks.

Notably, the study underscores the adverse impact of non-performing assets on financial performance, emphasizing the need for robust risk mitigation strategies to navigate the challenges posed by such assets. On the positive side, the positive correlation between Capital Adequacy Ratio (CAR) and both ROA and ROE points to the potential benefits of maintaining a strong capital base as a means of enhancing financial performance.These findings hold implications for strategic decision-making within the banking sector. Institutions are urged to prioritize the development and implementation of effective credit risk management strategies, recognizing their potential to not only safeguard against financial volatility but also to foster sustained profitability and returns on equity. "As the banking landscape continues to evolve amidst global economic uncertainties, the insights gleaned from this study serve as a valuable guide for institutions seeking resilience and adaptability in the face of dynamic financial challenges."

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