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Financial Performance Sensitivity to Non-Performing Assets in Indian Public Sector Banks

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Abstract

Non-Performing Assets (NPAs) have remained a persistent and structural problem in the context of the public sector banking system of India, impacting the financial performance and stability of banks. This research aims at evaluating the sensitivity of some financial performance indicators, namely, ROA, ROE, and NIM to the changes in NPAs using Gross NPA and Net NPA as proxies for asset quality. Four Indian public sector banks, State Bank of India (SBI), Punjab National Bank (PNB), Bank of Baroda (BoB), and Canara Bank, have been selected for examination during the five years, i.e., 2020-21 to 2024-25. Secondary data, obtained from the annual reports of banks and RBI publications will be analysed by applying the methods of descriptive statistics, correlation analysis, and multiple regression.

Results show that Gross NPA has a significantly negative correlation with all three financial performance indicators, which is demonstrated by correlation coefficients of -0.867, -0.869, and -0.697 for ROA, ROE, and NIM respectively. Multiple regressions show a statistically significant effect of Gross NPA on ROA with β of -0.116 (p = 0.038) and approximately 75.4% of total variance explained, i.e., R^2 of 0.754. Despite the same pattern of relationships, Net NPA cannot serve as an independent variable in regressions due to perfect multicollinearity with Gross NPA (r = 0.966). The research demonstrates a general improvement of asset quality and financial performance indicators caused by such regulations as IBC and AQR. Interpretation of results is carried out based on the Bad Management Hypothesis, Signalling Theory, and Agency Theory.

Keywords: Non-Performing Assets (NPA), Return on Assets (ROA), Return on Equity (ROE), Net Interest Margin (NIM), Credit Risk, Indian Public Sector Banks, Banking Regulation

INTRODUCTION

Non-Performing Assets (NPAs) constitute an enduring structural problem within India's public sector banking environment, with ramifications for financial performance and stability. This research evaluates the influence of changes in asset quality on important financial performance measures: Return on Assets (ROA), Return on Equity (ROE), and Net Interest Margin (NIM). Specifically, the study investigates the degree of correlation and causality between Gross NPA and Net NPA ratio and selected financial performance variables for four leading Indian public sector banks SBI, PNB, BoB, and Canara Bank from FY2020/21 to FY2024/25. Descriptive statistics, Pearson correlation and multiple regression methods are applied to secondary data sourced from annual reports and publications of Reserve Bank of India.

Results demonstrate a robust negative correlation between Gross NPA and ROA (-0.867), ROE (-0.869), and NIM (-0.697). Regression analysis confirms the statistical significance of the association between Gross NPA and ROA (β = -0.116, p = 0.038), whereby Gross NPA explains around 75.4% of variance in ROA (R^2 = 0.754). Net NPA exhibits the same correlation with ROA but does not emerge as an independently significant predictor on account of multicollinearity with Gross NPA (r = 0.966). Overall, the findings highlight a trend of simultaneous improvement in asset quality and financial performance at Indian PSBs attributed largely to regulatory reform initiatives such as IBC and AQR. Interpretation of the findings is based on Bad Management

Hypothesis, Signalling Theory, and Agency Theory.

The banking sector acts as the engine of financial intermediation in emerging economies, mobilizing savings into investments in order to foster economic development. Public sector banks in India occupy the commanding position in terms of overall share of banking system assets, deposits, and loans. Simultaneously, PSBs play the role of tools for the implementation of socio-economic policies aimed at promoting financial inclusion via preferential credit allocation. Such twin goals financial sustainability and developmental role are mutually inconsistent, particularly when viewed from the prism of managing credit risks.

Non-Performing Assets (NPAs) pose the biggest structural problem for India's public sector banks. According to RBI, NPA refers to a loan or advance for which principal and/or interest payments are overdue for more than 90 days. NPAs result in the loss of interest income, increase in provision costs, and immobilization of capital in unproductive assets, thus restricting the bank's ability to grant credits and make profit. The gross NPA ratio is used as the measure of overall asset quality, and the net NPA ratio equals gross NPA less provision.

The Indian banking sector witnessed a dramatic NPA cycle during 2013-2018 caused by a combination of macroeconomic slowdown, troubles in the infrastructure sector, excessive loan book growth in boom years, and poor credit underwriting and monitoring practices. PSBs suffered most of all from the NPA cycle due to their higher exposure to large corporate borrowers in the infrastructure and manufacturing sectors and the need for meeting the targets for policy-driven lending. As a response, the government and RBI initiated a series of far-reaching regulatory reforms encompassing Insolvency and Bankruptcy Code (2016), Asset Quality Review (2015), and recapitalization of banks among others, that contributed significantly to an improvement in asset quality since 2019.

This time interval (2020-21 to 2024-25) will be especially critical from an analysis perspective because it captures not only the COVID-19 crisis period along with all regulatory adjustments made (moratorium on loans, emergency funding programs, one-time restructuring policy), but also a recovery stage marked by falling NPA ratios and increasing profitability. The present research seeks to shed light on the sensitivity of the financial performance of four leading PSBs (namely, SBI, PNB, BOB, and Canara Bank) to fluctuations in NPA ratio levels.

RESEARCH OBJECTIVES

The primary objective of this study is to analyse the relationship between Non-Performing Assets and the financial performance of selected Indian public sector banks over 2020–21 to 2024–25. The specific objectives are as follows:

(i) To analyse the trend of Gross NPAs and Net NPAs in selected public sector banks over the period 2020–21 to 2024–25.

(ii) To examine the trend of financial performance indicators such as ROA, ROE, and NIM during the study period.

(iii) To study the relationship between NPAs and financial performance indicators.

(iv) To compare the performance of selected banks in terms of asset quality and profitability.

(v) To assess the sensitivity of financial performance indicators to changes in NPAs.

THEORETICAL FRAMEWORK

Three interrelated theoretical frameworks inform the analytical structure of this study.

The Bad Management Hypothesis (Berger & DeYoung, 1997) posits that poor managerial quality manifested in inadequate credit appraisal, insufficient borrower monitoring, and lax recovery efforts leads to NPA accretion and consequent financial performance deterioration. This hypothesis is particularly salient for PSBs, where governance challenges, directed lending pressures, and bureaucratic credit cultures have historically contributed to elevated bad loans.

Signalling Theory holds that a bank's NPA ratio functions as a market signal regarding balance sheet health and management quality. Elevated NPA ratios signal poor asset quality and weak governance, raising the cost of capital and dampening investor confidence, thereby adversely impacting ROE. Conversely, declining NPA trajectories signal improved credit discipline, supporting equity valuations a dynamic observed in the post-2019 recovery of all four sample banks.

Agency Theory of Banking highlights the principal-agent conflicts inherent in bank lending, where managers (agents) may pursue loan volume growth at the expense of credit quality when incentive structures are misaligned. In the PSB context, the government as principal and bank management as agent have faced material agency conflicts, contributing to the accumulation of directed and priority sector NPAs. The IBC and AQR can be understood as regulatory mechanisms that realign these principal-agent incentives, thereby restoring asset quality and improving financial performance.

LITERATURE REVIEW

The relationship between NPAs and bank financial performance is well-documented in both Indian and international literature, consistently revealing an inverse association between asset quality and profitability. Das and Uppal (2021) established that higher NPA ratios significantly reduce ROA in Indian banks, attributing this to the dual mechanism of interest income foregone and mandatory provisioning charges. Bansal and Mohanty (2023) confirmed that both Gross and Net NPAs exert statistically significant negative effects on ROA and ROE, positioning asset quality as the foremost determinant of profitability. Kaur and Singh (2022) documented that banks with persistently elevated NPAs exhibit consistently lower operational efficiency, while Kumar (2020) underlined the balance sheet erosion that follows NPA accumulation.

Earlier foundational work by Rajan and Dhal (2003) identified macroeconomic variables GDP growth, credit expansion, and interest rates as significant determinants of NPA levels, establishing that bank-level stress is partly a function of the broader economic cycle. Selvarajan and Vadivalagan (2013) and Joseph and Prakash (2014) highlighted structural factors in NPA formation, including weak credit monitoring and inadequate recovery frameworks.

Comparative studies reveal that PSBs exhibit systematically higher NPA levels and lower profitability than private sector banks (Patel & Patel, 2020; Kiran & Jones, 2016), a pattern attributed to governance constraints and policy-driven lending. The impact of regulatory reforms is examined by Goyal (2021) and Kumar and Prasad (2021), who find that declining NPAs post-reform are closely associated with improved ROA and ROE, consistent

with this study's findings. Sharma (2022) specifically confirms a strong sensitivity of profitability to NPA changes during the reform period, while Agarwal (2019) and Chakrabarti (2018) emphasise the systemic risk and operational efficiency consequences of elevated NPAs.

A notable gap in the existing literature is the limited coverage of the post-pandemic period (2020–25), which is characterised by unique NPA dynamics arising from regulatory accommodations and the subsequent recovery. Additionally, most studies examine profitability using a single indicator, whereas this study simultaneously analyses ROA, ROE, and NIM within a unified framework, enabling a comparative assessment of which metric is most sensitive to NPA changes.

RESEARCH METHODOLOGY

Data and Sample

The study employs a quantitative, descriptive-analytical research design using secondary panel data. Data on Gross NPA (%), Net NPA (%), ROA (%), ROE (%), and NIM (%) for four PSBs State Bank of India, Punjab National Bank, Bank of Baroda, and Canara Bank were sourced from the audited annual reports of the respective banks and supplementary publications of the Reserve Bank of India. The study period spans five financial years from 2020–21 to 2024–25, yielding a panel dataset of 20 bank-year observations. These banks were selected based on their systemic significance, contrasting NPA profiles (enabling comparative sensitivity analysis), and consistency of data availability.

Variables

Independent Variables: Gross NPA (%) and Net NPA (%) serve as proxies for asset quality. Gross NPA captures the total stock of bad loans, while Net NPA reflects the residual burden after provisions. Dependent Variables: ROA (net profit as a percentage of total assets), measuring operational efficiency; ROE (net profit as a percentage of shareholders' equity), measuring returns to equity holders; and NIM (net interest income as a percentage of earning assets), measuring core banking efficiency.

Analytical Techniques

The analysis proceeds through four stages: (1) descriptive statistics to characterise variable distributions and identify outliers; (2) trend analysis to assess directional changes in NPAs and profitability over the study period; (3) Pearson correlation analysis to examine the strength and direction of bivariate relationships; and (4) multiple regression analysis using the Ordinary Least Squares (OLS) method, with ROA as the dependent variable and Gross NPA and Net NPA as independent variables. The regression model is specified as: $ROA = \alpha + \beta_1(\text{Gross NPA}) + \beta_2(\text{Net NPA})$

DATA ANALYSIS AND RESULTS

Financial Data of Selected Banks (2021–2025)

Table 1 presents the complete panel dataset across all four banks and five years.

Descriptive Statistics

Table 2 summarises the distributional characteristics of all study variables across the 20 bank-year observations. The mean Gross NPA of 5.664% and standard deviation of 3.259 reflect substantial cross-sectional and temporal variation in asset quality. PNB's opening Gross NPA of 14.12% represents the maximum stress observation, while SBI's 2025 figure of 1.82% denotes the minimum. The mean ROA of 0.679% and mean ROE of 12.762% indicate moderate but improving profitability, while NIM exhibits considerable stability (mean

2.998%, standard deviation 0.195), signalling consistency in core banking spreads.

Average Performance Comparison

Table 3 presents bank-wise averages over the full study period, revealing a clear performance hierarchy inversely related to average NPA levels. SBI, with the lowest average Gross NPA (3.16%), achieves the highest average ROA (0.85%) and ROE (16.70%). PNB, despite beginning the period with the most severely impaired balance sheet (Gross NPA of 14.12%), demonstrates the most dramatic improvement trajectory, ending the period with a Gross NPA of 3.95% and ROE of 19.33%.

Correlation Analysis

Table 4 presents the Pearson correlation matrix. Gross NPA exhibits a strong negative correlation with ROA (-0.867) and ROE (-0.869), and a moderate negative correlation with NIM (-0.697). Net NPA demonstrates similarly strong negative relationships with ROA (-0.825) and ROE (-0.848). The near-perfect collinearity between Gross NPA and Net NPA ($r = 0.966$) indicates that both measures largely capture the same underlying asset quality dimension, a finding with direct implications for regression specification. ROA and ROE are strongly positively correlated ($r = 0.969$), affirming that asset efficiency and equity returns move in tandem.

Regression Analysis

Table 5 reports the OLS regression results for the model ROA = $\alpha + \beta_1$(Gross NPA) + β_2(Net NPA). The model is highly significant overall ($F = 26.055$, $p = 0.0000066$), confirming that NPA ratios collectively possess strong explanatory power over ROA. The model accounts for 75.4% of the variation in ROA ($R^2 = 0.754$; Adjusted $R^2 = 0.725$).

Gross NPA is statistically significant ($p = 0.038$), with a coefficient of -0.116, indicating that a one percentage point increase in Gross NPA reduces ROA by approximately 0.116 percentage points, ceteris paribus. Net NPA, however, is not statistically significant ($p = 0.697$), attributable to the severe multicollinearity between the two regressors. The positive sign of the Net NPA coefficient is a multicollinearity artefact and should not be interpreted substantively.

DISCUSSION

The findings of this study establish a robust, statistically validated inverse relationship between asset quality and financial performance in Indian PSBs. The regression coefficient of -0.116 for Gross NPA on ROA implies that the NPA improvements observed across sample banks ranging from 3.16 percentage points for SBI to 10.17 percentage points for PNB over the study period translate into economically meaningful profitability gains. PNB's near-complete reversal of its NPA position, from 14.12% in 2021 to 3.95% in 2025, is mirrored in its ROE trajectory from 3.88% to 19.33%, illustrating the high sensitivity of equity returns to asset quality restoration.

The significance of Gross NPA relative to Net NPA is analytically important. Because provisioning policy and discretion can temporarily mask the true extent of credit stress, Gross NPA provides a cleaner, more conservative signal of underlying asset quality. The near-perfect multicollinearity between the two ($r = 0.966$) confirms they are informationally redundant in a joint regression, reinforcing the primacy of Gross NPA as the sentinel indicator for both internal monitoring and external reporting.

The stability of NIM across the study period (mean 2.998%, standard deviation 0.195) despite significant NPA

variation suggests that core banking spreads were largely insulated from credit stress during this period possibly because RBI's accommodative monetary stance and the low interest rate environment sustained net interest income even as problem loans mounted. This finding implies that the profitability impact of NPAs is transmitted primarily through provisioning charges and the opportunity cost of unproductive assets (captured in ROA and ROE) rather than through the spread compression channel (reflected in NIM).

The results align with the theoretical frameworks underpinning this study. The Bad Management Hypothesis is evidenced by the cross-sectional variation in NPA levels across banks, reflecting differential credit appraisal and monitoring quality. Agency Theory is manifest in PNB's historically elevated NPAs, consistent with well-documented governance challenges in that institution. Signalling Theory is supported by the strong ROE recovery as Gross NPAs declined, indicating that improved asset quality positively influenced market and investor perceptions. The effectiveness of the IBC and AQR in catalysing this recovery provides empirical validation for regulatory interventions designed to realign principal-agent incentives.

Hypothesis Testing

The study was framed around the following hypotheses:

H_0: There is no significant relationship between NPAs (Gross NPA and Net NPA) and financial performance indicators (ROA, ROE, NIM) of selected public sector banks.

H_1: There is a significant relationship between NPAs and financial performance indicators of selected public sector banks.

Additionally, two specific sub-hypotheses were formulated:

H_{01}: Gross NPA has no significant impact on ROA. | H_{11}: Gross NPA has a significant impact on ROA.

H_{02}: Net NPA has no significant impact on ROE. | H_{12}: Net NPA has a significant impact on ROE.

Results of Hypothesis Testing: The overall regression model is statistically significant ($F = 26.055$, $p = 0.0000066 < 0.05$), providing strong evidence against H_0. Accordingly, H_0 is rejected, and H_1 is accepted: a significant relationship exists between NPAs and financial performance indicators. With respect to the sub-hypotheses, Gross NPA is a statistically significant predictor of ROA ($p = 0.038 < 0.05$), leading to the rejection of H_{01} and acceptance of H_{11}. Conversely, Net NPA does not independently and significantly predict ROA in the presence of Gross NPA ($p = 0.697 > 0.05$); the multicollinearity with Gross NPA precludes isolation of its independent effect. Correlation analysis provides additional support for the broader hypothesis, with Gross NPA significantly correlated with all three performance measures (ROA: $r = -0.867$; ROE: $r = -0.869$; NIM: $r = -0.697$).

CONCLUSION

This study provides robust empirical evidence that Non-Performing Assets exert a significant and economically material negative impact on the financial performance of Indian public sector banks. Gross NPA emerges as the dominant asset quality predictor of profitability, explaining approximately 75% of the variation in ROA across sample banks. The study period (2020–25) documents a remarkable and broad-based improvement in both asset quality and financial performance, underpinned by regulatory reforms (IBC, AQR) and improved internal credit governance. PNB's transformation from the most stressed bank in the sample (Gross NPA of 14.12% in 2021) to near parity with

peers by 2025 exemplifies the magnitude of this recovery.

From a theoretical standpoint, findings validate the Bad Management Hypothesis, Signalling Theory, and Agency Theory as complementary explanatory frameworks for the NPA-performance nexus in the PSB context. From a managerial perspective, the results underline the imperative of proactive credit risk management—rigorous borrower appraisal, real-time loan monitoring, and early-stage stress resolution—as prerequisites for sustainable profitability. Policymakers should sustain the regulatory momentum of the IBC and AQR frameworks, and consider extending enhanced governance mechanisms to address residual principal-agent conflicts within PSBs.

Future research may extend this analysis to include private sector and foreign banks for comparative assessment, incorporate macroeconomic moderators (GDP growth, repo rate) in regression models, and deploy panel data econometric methods (fixed/random effects, GMM) to address endogeneity concerns. A longer post-IBC time series would also enable more definitive assessment of the reform's impact on NPA-performance sensitivity.

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Table 1: Financial Data of Selected Public Sector Banks (2021–2025)

Year	Bank	Gross NPA (%)	Net NPA (%)	ROA (%)	ROE (%)	NIM (%)
2021	State Bank of India	4.98	1.50	0.48	9.94	3.04
2022	State Bank of India	3.97	1.02	0.67	13.92	3.12
2023	State Bank of India	2.78	0.67	0.96	19.43	3.37
2024	State Bank of India	2.24	0.57	1.04	20.32	3.28
2025	State Bank of India	1.82	0.47	1.10	19.87	3.09
2021	Punjab National Bank	14.12	5.73	0.15	3.88	2.77
2022	Punjab National Bank	11.78	4.80	0.36	7.25	2.85
2023	Punjab National Bank	8.74	2.72	0.37	7.57	2.85
2024	Punjab National Bank	5.73	0.73	0.54	11.66	3.06
2025	Punjab National Bank	3.95	0.40	0.97	19.33	3.08
2021	Bank of Baroda	8.87	3.09	0.07	1.50	2.71
2022	Bank of Baroda	6.61	1.72	0.57	11.86	3.03
2023	Bank of Baroda	3.79	0.89	0.97	18.34	3.31
2024	Bank of Baroda	2.92	0.68	1.12	18.95	3.18
2025	Bank of Baroda	2.26	0.58	1.10	16.96	3.02
2021	Canara Bank	8.42	3.54	0.11	2.63	2.71
2022	Canara Bank	7.51	2.96	0.29	6.62	2.78
2023	Canara Bank	5.35	1.73	0.62	12.63	2.85
2024	Canara Bank	4.23	1.27	1.01	14.12	3.05
2025	Canara Bank	3.21	0.89	1.09	18.45	2.80

Table 2: Descriptive Statistics of Key Variables (n = 20)

Variable	Mean	Std. Deviation	Minimum	Maximum
Gross NPA (%)	5.664	3.259	1.82	14.12
Net NPA (%)	1.798	1.490	0.40	5.73
ROA (%)	0.679	0.361	0.07	1.12
ROE (%)	12.762	6.047	1.50	20.32
NIM (%)	2.998	0.195	2.71	3.37

Table 3: Average Performance of Selected Banks (2021–2025)

Bank	Avg. Gross NPA (%)	Avg. ROA (%)	Avg. ROE (%)
State Bank of India	3.16	0.85	16.70
Punjab National Bank	8.86	0.48	9.54
Bank of Baroda	4.89	0.77	13.92
Canara Bank	5.74	0.62	10.89

Table 4: Pearson Correlation Matrix

Variable	Gross NPA	Net NPA	ROA	ROE	NIM
Gross NPA	1.000	0.966	-0.867	-0.869	-0.697
Net NPA	0.966	1.000	-0.825	-0.848	-0.713
ROA	-0.867	-0.825	1.000	0.969	0.719
ROE	-0.869	-0.848	0.969	1.000	0.797
NIM	-0.697	-0.713	0.719	0.797	1.000

Table 5: Regression Results — Dependent Variable

Variable	Coefficient	t-Statistic	p-value	Significance
Intercept	1.254	10.67	0.000	***
Gross NPA	-0.116	-2.249	0.038	*
Net NPA	0.045	0.396	0.697	n.s.

ROA | R^2 = 0.754 | Adjusted R^2 = 0.725 | F-statistic = 26.055 | p < 0.001 | Note: *** p < 0.001; * p < 0.05; n.s. = not significant