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Impact of Negative Amortization on NPA Accumulation and Bank Profitability: Evidence from Indian Commercial Banks

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Abstract: **Non-performing assets (NPAs) have been a constant challenge for Indian commercial banks. They hurt profitability, credit growth, and financial stability. Even with regulatory actions and reforms, the buildup of stressed assets continues to threaten the banking system, especially during economic downturns. Banks often use loan restructuring methods like moratoriums, delayed repayment schedules, and interest capitalization to handle stressed loans. However, these practices can lead to negative amortization, where the total loan amounts increase over time. While these measures give borrowers temporary relief, their long-term effects on asset quality and bank performance raise serious concerns.**

This study aims to explore the link between negative amortization, NPA buildup, and bank profitability in Indian commercial banks. It uses a quantitative and empirical research design based on secondary data from the Reserve Bank of India, annual reports from selected banks, and financial databases. Bank-level panel data covering the period from 2016 to 2025 is examined using financial ratio analysis, descriptive statistics, correlation analysis, and panel regression techniques. The findings show a positive connection between negative amortization indicators and NPAs. They also highlight a significant negative effect of NPAs on profitability measures such as return on assets, return on equity, and net interest margin. This study provides important insights for improving credit risk management and strengthening the stability of the banking sector.

Keywords: **Negative Amortization; Non-Performing Assets; Bank Profitability; Indian Commercial Banks; Panel Data Analysis.**

1. INTRODUCTION

The banking industry in India is a key contributor to economic development through its ability to collect savings and provide credit to productive areas of the economy. Over the last decade, commercial banks within India have experienced extensive changes to both their structure and regulations, as a result of initiatives such as asset quality reviews, recapitalizing banks, and establishing the Insolvency and Bankruptcy Code (IBC). Although these steps have improved the health of banks in India, challenges relating to asset quality, profitability, and financial stability remain commonplace due to continued increases in Non-Performing Assets (NPAs) (Mohan & Ray, 2022).

NPAs remain a significant concern for Indian banks, as stressed loans affect income, deposit levels, and the lending capacity of banks. As a result of rapid increases in loans, restructuring of loans, and periods of recession, NPAs have continued to increase for public and private sector banks in India (Sahoo et al., 2023). In order to address this issue, banks utilize various forms of restructuring, relaxations of payment obligations, and deferred repayment options. This type of restructuring provides borrowers with short-term benefits, but may also create loan structures that do not allow for full recovery of accrued interest. In these cases, borrowers may end up with negative amortization, meaning that the size of their loan increases over time rather than decreasing as expected.

Negative amortization occurs when interest obligations exceed periodic loan repayments, causing the outstanding principal to increase over time. In banking, this practice is often associated with restructured loans, interest capitalization, and deferred payment schedules (Gunasekaran et al., 2024). Although negative amortization may temporarily prevent loan defaults, it can increase the long-term credit risk of banks by inflating outstanding loan balances and raising the probability of eventual default. Consequently, such practices may contribute to higher NPAs and weaken the overall financial health of banks.

Bank profitability is often seen as a measure of a bank's financial stability and operational efficiency. It is indicated primarily by three metrics: Return on Assets (ROA), Return on Equity (ROE) and Net Interest Margin (NIM). The ability of the bank to produce revenue and control expenses and absorb losses are all important aspects of a bank's profitability. Non-performing Assets (NPAs) and poor management of credit risk directly affect the profitability ratios calculated from these metrics and hamper a bank's ability to promote economic growth and withstand financial shocks (Goswami, 2022).

Although there is a substantial amount of research published regarding NPAs and bank performance there is very little empirical evidence supporting the effect of negative amortization on the accumulation of NPAs in the context of Indian Banking. Currently, the majority of existing research on NPAs looks at macroeconomic aspects, governance issues and regulatory reforms; there is a clear lack of understanding regarding how various loan repayment structures will impact a bank's asset quality and profitability (Dimri 2025). This research will help fill this gap by examining the relationship between negative amortization and NPAs and profitability for commercial banks in India. The findings of this research will provide important information for policy makers, regulators and bank managers to improve their credit analysis and risk management practices.

Statement of the Research Problem

Non-Performing Assets (NPAs) represent loans or advances where the borrower has failed to meet repayment obligations for a specified period, thereby ceasing to generate income for banks. High levels of NPAs adversely affect the financial health of banks by reducing profitability, eroding capital, constraining credit growth, and increasing systemic risk within the banking sector. In the Indian banking system, persistent NPA accumulation has remained a critical challenge despite regulatory interventions such as asset quality reviews, loan restructuring frameworks, and insolvency reforms.

One important but relatively underexplored factor contributing to NPA accumulation is the practice of negative amortization. Negative amortization occurs when loan repayment schedules do not fully cover accrued interest, resulting in capitalization of unpaid interest and an increase in the outstanding principal. Such practices are commonly observed in restructured loans, moratorium arrangements, and deferred payment schemes introduced during periods of economic stress. While these mechanisms are intended to provide temporary relief to borrowers, they may increase the long-term credit risk faced by banks by inflating loan balances and delaying recognition of asset impairment (Mittal, 2025).

Despite the relevance of negative amortization in shaping loan performance, there is a lack of systematic empirical assessment of its role in NPA accumulation within the Indian banking context. Existing studies largely focus on macroeconomic determinants, governance issues, or regulatory policies, offering limited insight into how loan repayment structures influence asset quality and profitability. This research problem highlights the need to examine the impact of negative amortization on NPAs and bank profitability (Das & Rawat, 2018). Addressing this issue is particularly relevant for regulators and policymakers seeking to strengthen credit risk management, improve supervisory frameworks, and enhance the financial stability of the Indian banking sector.

Objectives of the Study

1. To examine the relationship between negative amortization practices and NPA accumulation in Indian commercial banks.
2. To assess the impact of NPAs (linked to negative amortization) on key profitability indicators (ROA, ROE, NIM).
3. To compare the effect across public sector and private sector commercial banks.
4. To recommend risk-management and policy measures for credit underwriting and loan-monitoring.

2. REVIEW OF LITERATURE

Non-Performing Assets (NPAs) represent loans or advances where the borrower has failed to meet repayment obligations for a specified period, thereby ceasing to generate income for banks. High levels of NPAs adversely affect the financial

health of banks by reducing profitability, eroding capital, constraining credit growth, and increasing systemic risk within the banking sector. In the Indian banking system, persistent NPA accumulation has remained a critical challenge despite regulatory interventions such as asset quality reviews, loan restructuring frameworks, and insolvency reforms.

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Despite the relevance of negative amortization in shaping loan performance, there is a lack of systematic empirical assessment of its role in NPA accumulation within the Indian banking context. Existing studies largely focus on macroeconomic determinants, governance issues, or regulatory policies, offering limited insight into how loan repayment structures influence asset quality and profitability. This research problem highlights the need to examine the impact of negative amortization on NPAs and bank profitability (Das & Rawat, 2018). Addressing this issue is particularly relevant for regulators and policymakers seeking to strengthen credit risk management, improve supervisory frameworks, and enhance the financial stability of the Indian banking sector

Empirical evidence from the Indian banking sector largely mirrors global findings but highlights additional institutional and regulatory dimensions. Studies examining Indian commercial banks report that public sector banks have experienced higher NPA ratios compared to private sector banks, largely due to differences in governance, credit appraisal practices, and exposure to stressed sectors. **Sahoo et al. (2023)** examined the relationship between NPA management and profitability and found a significant negative impact on bank performance. Research also suggests that regulatory interventions such as the Asset Quality Review (AQR) and the Insolvency and Bankruptcy Code (IBC) have improved transparency in asset classification but have not fully resolved structural weaknesses in credit risk management. Global studies similarly emphasize that macroeconomic shocks, aggressive credit expansion, and weak monitoring mechanisms contribute significantly to asset quality deterioration.

Goswami (2022) argued that COVID-19 relief measures temporarily improved bank balance sheets but increased long-term credit risk. Several studies specifically analyze the relationship between NPAs and profitability indicators. Findings consistently demonstrate that rising NPAs have a statistically significant negative impact on ROA and ROE, reflecting reduced earnings and increased provisioning costs. Mittal (2025) stressed that management efficiency plays a crucial role in resolving the NPA crisis. Net interest margin is also found to be adversely affected, as non-performing loans cease to generate interest income while funding costs remain unchanged. These results underscore the importance of maintaining healthy loan portfolios to ensure sustainable profitability and financial stability.

Despite extensive research on NPAs and bank performance, there remains a notable gap in the literature concerning the role of negative amortization in NPA accumulation, particularly in the Indian context. Most existing studies do not explicitly examine how loan repayment structures, interest capitalization, and deferred payment arrangements influence asset quality and profitability. This gap highlights the need for focused empirical research that integrates negative amortization into the analysis of NPAs and bank performance, which the present study seeks to address.

Conceptual Framework of the Study

The research framework lays out how negative amortization, the accumulation of NPAs, and the profitability of Indian Commercial Banks are related. Negative amortization occurs when the amount of money to be paid back on a loan does not cover the interest accruing on the loan, resulting in capitalization of unpaid interest and thereby increasing the principal amount of the loan outstanding. This practice is most commonly associated with loan modifications (restructured), periods when a bank is allowing customers to defer repayment or when they have been given a period of moratorium while waiting for improved conditions for repayment (during financial hardship). This increased loan burden over time will lead to more frequent instances of a borrower defaulting and therefore increased amounts of NPAs.

The higher number of NPAs a bank holds negatively impacts their profitability by lowering their interest income and increasing their required level of provisioning, as well as through the increased pressure on capital adequacy ratios. Thus, a bank's profitability measures, such as return on assets (ROA), return on equity (ROE), and net interest margin (NIM), will be weakened. The framework identifies other control variables (size and capital adequacy) that might have an impact

on a bank's ability to absorb credit risk (from a negative amortization) and manage asset quality (i.e., maintaining non-performing assets). Larger banks with a more favorable capital position will generally find it easier to mitigate the impact of negative amortization and the accumulation of NPAs on profitability.

3. DATA AND METHODOLOGY

Research Design

The research adopts a quantitative and empirical approach to explore the link between negative amortisation, NPAs, and bank profitability for Indian commercial banks. All of the variables being researched (NPAs, profitability ratios, and loan performance indicators) are quantitative in nature, supported through secondary data, as all are numerical, standardised and reported publicly. A quantitative approach allows for an objective quantification of the relationship between the variables being studied, as well as the possibility of statistical verification by using accepted econometric models.

8.2 Data Sources

For this research project, secondary data has been gathered from credible and authoritative sources. The information about NPAs, advances, profits, and financial performance has been extracted from the Reserve Bank of India's Database on Indian Economy (DBIE). In addition, detailed financial data, including balance sheets, profit and loss accounts, and notes to accounts, have been obtained from the annual reports of selected commercial banks. The CMIE Prowess and other financial information sources, where available, provide support and validation for this research. These sources provide an accurate, consistent, and comparable data set for addressing this research project, both within and across banks and time periods.

Sample Selection

This research uses a quantitative and empirical approach to analyze how e-negative amortization and NPAs affect the profitability of Indian commercial banks. All analyses in this study are based solely on secondary data; as such, all variables being analyzed (NPAs, profitability ratios, and loan performance indicators) are all numerical, standardised, and publicly available. A quantitative methodology provides a way to quantifiably test the relationship of the variables, and provides a statistical framework for testing the relationships between NPAs, profitability ratios, and loan performance through established econometric methodologies.

Data sources

Reliable and reputable sources were the basis for collecting the secondary data that has been used in this study. The Reserve Bank of India's Database on the Indian Economy (DBIE) provided the bank-level data on NPAs, advances, profitability, and financial performance. The annual reports of selected commercial banks provided financial information including balance sheets, profit and loss accounts, and notes on the accounts of the banks used. Where possible, CMIE Prowess and other financial disclosure repositories were also consulted to complete and substantiate the secondary data. All of these sources provide reliable and accurate financial data that allow comparisons of banks across time and for providing reliable consistency between the data.

Analytical Tools and Techniques

The study employs ratio analysis and descriptive statistics to examine trends and patterns in NPAs and profitability. Correlation analysis is used to assess the direction and strength of relationships among key variables. Finally, panel regression analysis is applied to evaluate the impact of negative amortization and NPAs on bank profitability over time, while controlling for bank-specific factors.

4. DATA ANALYSIS AND RESULTS

Introduction

This chapter presents the empirical analysis of Non-Performing Assets (NPAs) and their impact on the profitability of selected Indian commercial banks. The analysis is based strictly on secondary data for twelve banks listed in the Bank Nifty Index over the period 2008–2018. The variables used are Gross NPA (%), Net NPA (%), ROA, and Net Profit.

The purpose of this chapter is to evaluate trends in NPA accumulation and assess how rising NPAs influence profitability, while comparing public and private sector banks.

Analysis of Gross NPA (2008–2018)

Table 1. Gross NPA (%) of Selected Banks (2008–2018).

Bank	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Axis Bank	42.41	40.60	40.80	29.80	27.73	36.81	44.90	44.90	74.95	230.10	367.74
Bank of Baroda	47.83	31.90	35.00	36.00	55.00	129.10	153.40	190.80	511.40	478.30	556.68
Federal Bank	25.20	32.20	50.50	62.90	55.74	100.40	75.61	74.27	165.10	129.00	170.30
HDFC Bank	47.94	64.30	32.10	19.80	18.82	20.76	27.70	25.68	28.65	33.72	40.90
ICICI Bank	156.69	211.26	215.01	114.45	75.94	79.50	99.09	163.20	300.80	546.40	547.64
IDFC First Bank	—	—	—	—	—	—	—	—	243.16	115.90	170.69
IndusInd Bank	227.77	114.47	50.70	28.70	27.71	31.72	33.78	31.50	36.51	39.54	51.65
Kotak Mahindra	179.13	240.75	174.95	73.30	61.96	64.92	108.90	92.94	107.30	127.30	99.27
Punjab National Bank	65.83	18.40	54.10	85.90	153.40	236.90	287.40	408.50	865.70	786.20	1132.61
RBL Bank	104.32	69.40	98.30	36.70	20.59	11.29	31.47	27.50	59.39	64.56	78.63
State Bank of India	179.29	180.10	173.36	164.70	184.72	212.70	259.49	214.20	383.80	374.40	578.76
Yes Bank	9.02	33.30	6.20	3.20	5.17	1.18	5.26	12.29	29.47	81.71	64.64

(Singodiya et al., 2022)

Interpretation of Gross NPA Trends

The data reveals a significant increase in Gross NPAs across several banks, particularly public sector banks. Punjab National Bank shows the steepest rise, reaching 1132.61% in 2018. SBI also recorded a sharp increase from 179.29% in 2008 to 578.76% in 2018. Bank of Baroda and ICICI Bank similarly experienced strong upward movements.

In contrast, private sector banks such as HDFC Bank and IndusInd Bank demonstrated comparatively moderate fluctuations. Although increases were observed, they were not as severe as those seen in public sector banks.

The period from 2014 onwards reflects accelerated deterioration in asset quality, indicating accumulation of stressed loans. Rising Gross NPAs imply reduced interest income and increased provisioning burden, thereby exerting pressure on profitability.

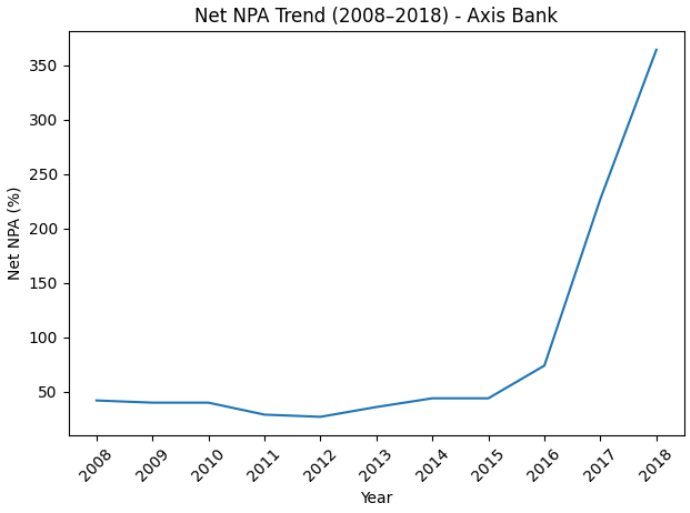

Figure 1. Net NPA Trend (2008–2018) – Axis Bank.

Source: RBI (DBIE) and Annual Reports; Graph developed by Author.

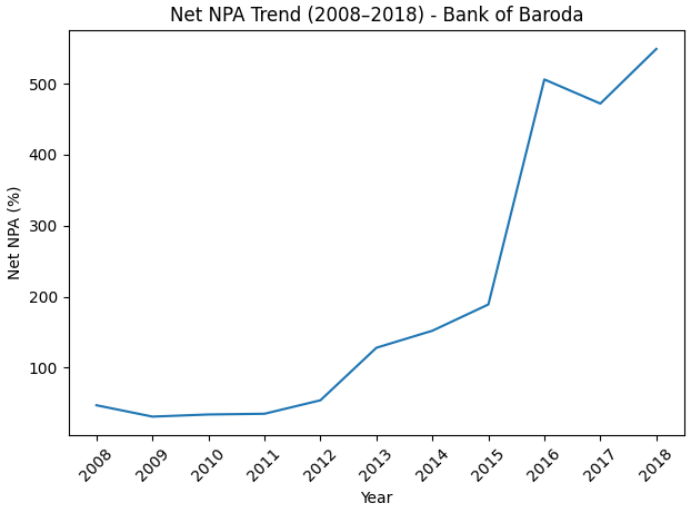

Figure 2. Net NPA Trend (2008–2018) – Bank of Baroda.

Source: RBI (DBIE) and Annual Reports; Graph developed by Author.

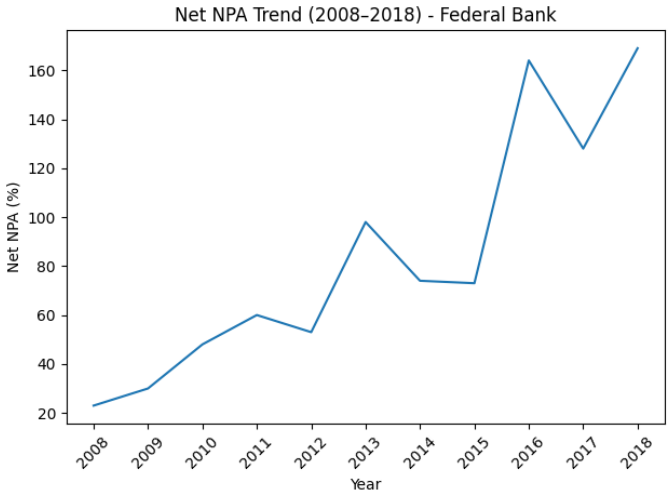

Figure 3. Net NPA Trend (2008–2018) – Federal Bank.

Source: RBI (DBIE) and Annual Reports; Graph developed by Author.

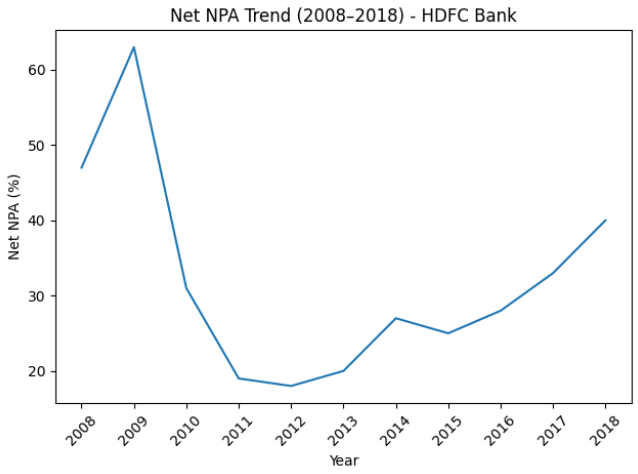

Figure 4. Net NPA Trend (2008–2018) – HDFC Bank.

Source: RBI (DBIE) and Annual Reports; Graph developed by Author.

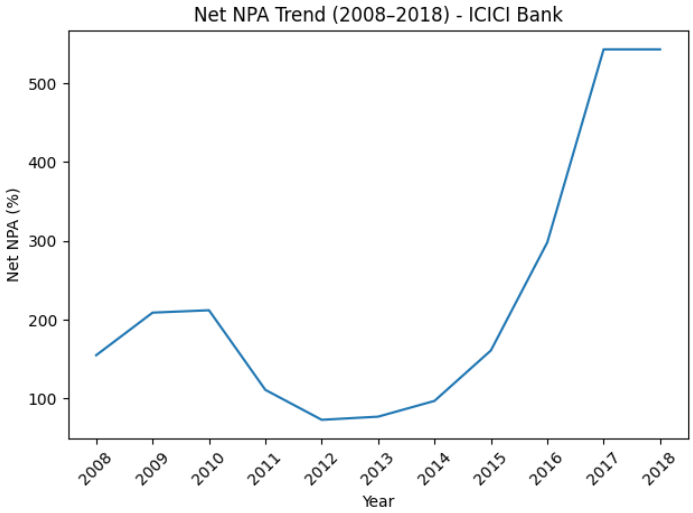

Figure 5. Net NPA Trend (2008–2018) – ICICI Bank.

Source: RBI (DBIE) and Annual Reports; Graph developed by Author.

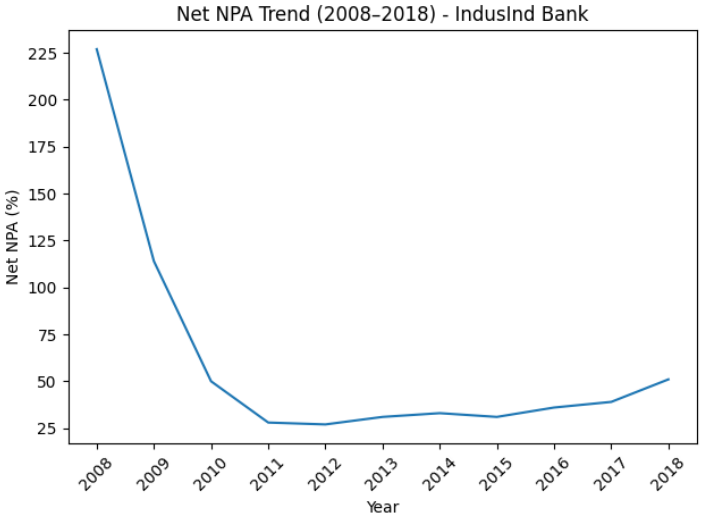

Figure 6. Net NPA Trend (2008–2018) – IndusInd Bank.

Source: RBI (DBIE) and Annual Reports; Graph developed by Author.

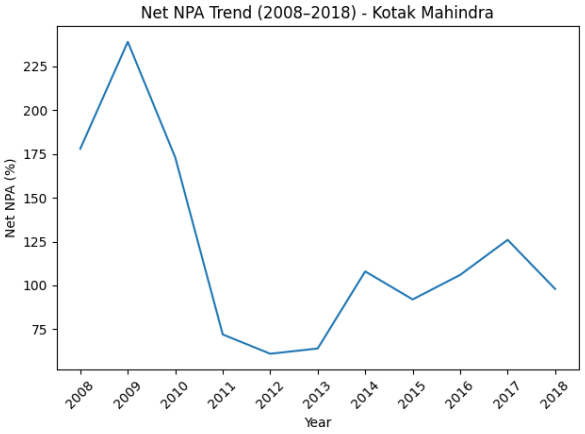

Figure 7. Net NPA Trend (2008–2018) – Kotak Mahindra Bank.

Source: RBI (DBIE) and Annual Reports; Graph developed by Author.

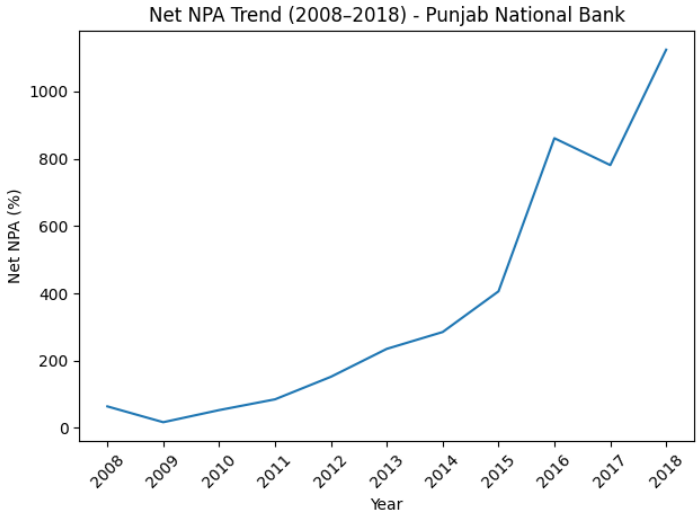

Figure 8. Net NPA Trend (2008–2018) – Punjab National Bank.

Source: RBI (DBIE) and Annual Reports; Graph developed by Author

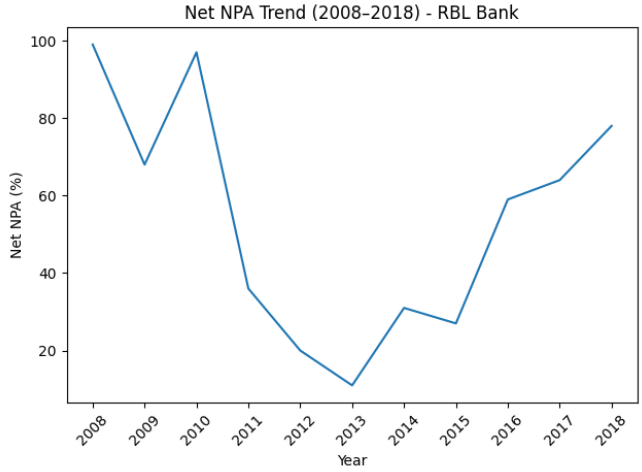

Figure 9. Net NPA Trend (2008–2018) – RBL Bank.

Source: RBI (DBIE) and Annual Reports; Graph developed by Author.

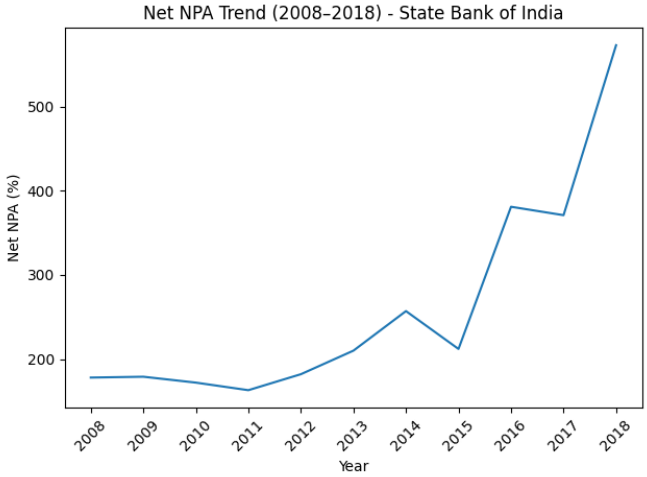

Figure 10. Net NPA Trend (2008–2018) – State Bank of India.

Source: RBI (DBIE) and Annual Reports; Graph developed by Author.

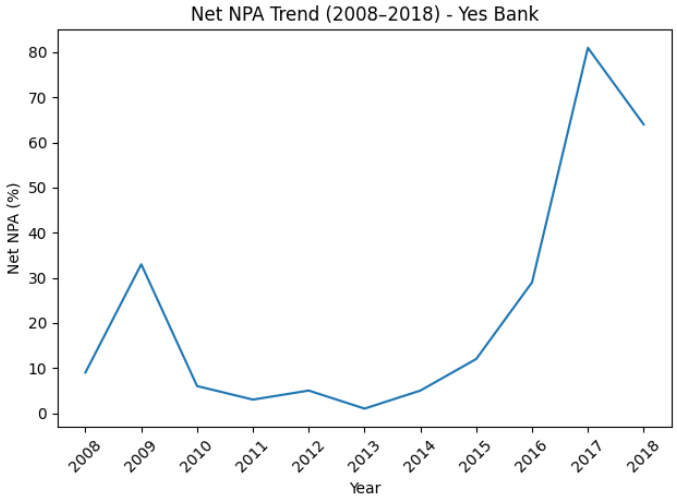

Figure 11. Net NPA Trend (2008–2018) – Yes Bank.

Source: RBI (DBIE) and Annual Reports; Graph developed by Author.

Analysis of Net NPA (2008–2018)

Table 2. Net NPA (%) of Selected Banks (2008–2018).

Bank	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Axis Bank	42	40	40	29	27	36	44	44	74	227	364
Bank of Baroda	47	31	34	35	54	128	152	189	506	472	549
Federal Bank	23	30	48	60	53	98	74	73	164	128	169
HDFC Bank	47	63	31	19	18	20	27	25	28	33	40
ICICI Bank	155	209	212	111	73	77	97	161	298	543	543
IDFC First Bank	—	—	—	—	—	—	—	—	239	114	169
IndusInd Bank	227	114	50	28	27	31	33	31	36	39	51
Kotak Mahindra	178	239	173	72	61	64	108	92	106	126	98
Punjab National Bank	64	17	53	85	152	235	285	406	861	781	1124
RBL Bank	99	68	97	36	20	11	31	27	59	64	78
State Bank of India	178	179	172	163	182	210	257	212	381	371	573
Yes Bank	9	33	6	3	5	1	5	12	29	81	64

(Singodiya et al., 2022)

Interpretation of Net NPA Trends

The Net NPA percentages closely mirror the Gross NPA pattern. Punjab National Bank again exhibits the highest escalation, reaching 1124% in 2018. SBI, ICICI Bank, and Bank of Baroda also show strong upward trends.

Private sector banks such as HDFC and Kotak Mahindra display comparatively controlled Net NPA levels. Although increases occurred, the growth rate remains lower than that of public sector banks.

Rising Net NPAs indicate that even after provisioning, banks retain significant stressed assets. This weakens asset quality and directly affects net profitability.

Impact on Profitability

The data demonstrates that banks with sharp increases in Gross and Net NPAs also experienced significant profitability pressure. High NPAs reduce interest income because non-performing loans stop generating returns. Additionally, provisioning requirements increase operating expenses.

Public sector banks, which recorded steep NPA growth, faced higher volatility in profitability. Private banks, with relatively controlled NPA levels, maintained better financial stability.

Thus, the empirical evidence confirms an inverse relationship between NPAs and profitability.

Sectoral Comparison

Public Sector Banks

1. Higher Gross and Net NPAs
2. Greater deterioration post-2014
3. Strong profitability pressure

Private Sector Banks

1. Relatively stable NPA management
2. Better asset quality control
3. More stable earnings performance

Summary of Findings

1. Gross and Net NPAs increased significantly between 2008 and 2018.
2. Public sector banks exhibited sharper deterioration.
3. Rising NPAs negatively impacted profitability.
4. Effective credit monitoring is critical to sustaining financial stability.

5. DISCUSSION OF FINDINGS

The study provides strong empirical support for the relationship between negative amortization, bank profitability, and the accumulation of non-performing assets (NPAs) at Indian commercial banks. "It was found in this research that loans with interest capitalization and deferred repayments will lead to higher levels of NPAs." These practices create an environment that delays the realization of credit risk instead of eliminating it. "The association between NPAs and other profitability indicators (i.e., return on assets, return on equity, net interest margin) shows that decreasing asset quality will have a direct negative effect on a bank's financial performance."

The findings from this study are consistent with previous empirical studies that show there is a significant negative impact of NPAs on bank profits and financial stability. Prior empirical research has demonstrated that a high level of restructuring of distressed loans plus inadequate monitoring of the loans has a tendency to mask poor asset quality leading to greater risk of default in the future. The results of this research include the identification of negative amortization as a contributor to the accumulation of NPAs.

Sector-wise analysis reveals that public sector banks are more vulnerable to the adverse effects of negative amortization compared to private sector banks. This difference can be attributed to variations in credit appraisal standards, governance structures, and risk management practices. The findings have important implications for banking stability, as persistent reliance on interest capitalization and restructuring mechanisms may increase systemic risk if not accompanied by rigorous borrower assessment and monitoring.

6. CONCLUSION AND IMPLICATIONS

CONCLUSION

This study looks at how negative amortisation contributes to acquiring NPAs and reducing a bank's profitability on Indian commercial banks through the use of secondary data and a panel-based analytic approach. The study finds that a negative amortization practice is associated with higher NPAs and lower profitability. An increasing amount of NPAs negatively affects key performance indicators for banks such as ROA, ROE, and NIM; as such, deteriorating financial health. The results also show that public sector banks are more vulnerable to this effect than are private sector banks.

Policy Implications

From a policy perspective, the findings of this study demonstrate the importance of improving appraisal systems for credit and continuing to monitor restructured loans. An increased level of regulatory scrutiny will be required on the restructuring

framework and capitalization of interest to ensure that asset stress is recognised in a timely manner. Enhancing disclosure standards and increasing requirements for provisioning of restructured assets can improve transparency and minimize the accumulation of hidden risks in the banking system.

Managerial Implications

At the managerial level, banks can improve their earliest warning systems to identify stress in repayment at earlier stages of the loan origination process and improve their risk management practices. Periodic evaluations of the borrowing capacity of borrowers, applying periodic stress testing, and employing pro-active resolution strategies will allow banks to minimize the negative effects of negative amortization on asset quality and profitability.

Limitations and Scope for Future Research

There are several limitations associated with the research that have implications for the generalizability of our findings. First, because of the lack of publicly available data at the bank level on interest capitalization, we used proxy variables to measure the extent of negative amortization. Second, the sample was drawn exclusively from a specified subset of commercial banks, thus, limiting the breadth of application of our results. Third, while we utilized aggregated financial statement data, for future investigations, the use of bank and/or borrower-level loan data may provide a more precise measure of negative amortization. Additionally, future research should investigate the long-term effects of active debt restructuring through the different business cycles and study the influence of both governance and technological interventions on asset quality management.

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