

Economic Indicators and Banking Practices: Predicting Non-Performing Assets in the Financial Sector

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Abstract

This study examines how several economic and operational factors might forecast Non-Performing Assets (NPAs) in the banking sector. We proposed that macroeconomic indicators, interest rate changes, GDP growth rates, credit risk management strategies, loan monitoring efficiency, and industry-specific declines substantially impacted the occurrence and extent of Non-Performing Assets (NPAs). We used a one-sample t-test to determine the statistical significance of each item by comparing them to a neutral midpoint value obtained from survey responses. Our study found a strong negative correlation between macroeconomic indicators, interest rate changes, GDP growth rates, and NPAs, leading to the rejection of the null hypotheses related to these issues. We could not find statistically significant evidence indicating that credit risk management, loan monitoring, and industry-specific downturns may forecast NPAs. Therefore, we retained the null hypothesis for each of these factors. The results highlight the significant impact of macroeconomic conditions on NPAs and indicate a need to reassess risk management practices in financial institutions.

Keywords: Credit Risk Management, GDP Growth, Interest Rate Fluctuations, Loan Monitoring, Macroeconomic Indicators, Non-Performing Assets.

Introduction

Banks form an important part of the financial system of any country and the health of the banking sector determines the health of the economy. Based on the challenges that define banks, Non-Performing Assets (NPAs) are rather crucial due to their extensive implications on liquidity, banks' profit, and the overall economy. NPA can be described as the loans or advances where payment has remained past due for a period of 90 days or more and are used to gauge the health of the banks (1). The increasing cases of NPAs in the world's banking systems have created a research gap to identify the factors that influence NPAs, with the objective of reducing risks and increasing banks' stability. From the literature, it is evident that macroeconomic factors are crucial in explaining the level of NPAs. These are inflation rates, interest rate fluctuations, and GDP growth rates that jointly capture the economic conditions affecting the borrowers' ability to repay the loans. Interest rates have been proven to directly influence the ability of borrowers to pay for the loans, which consequently impacts on the rate of defaults (2, 3). Growth rates of GDP reveal

information on the state of the economy, which is closely related to employment and income, thus influencing loan repayments (4). Besides the macroeconomic factors, internal risk management situations in banking, like the credit risk management and the loan monitoring, are critical in the management and alleviation of the NPAs. Thus, efficient credit risk management helps in identifying instances of likely loan defaults and enable the banks to take corrective measures at the beginning of the loan process (5). Likewise, sound loan monitoring procedures help in the ongoing assessment of the loans' performance and enable intervention in case of non-performance (6). The challenge of managing Non-Performing Assets (NPAs) has garnered extensive attention in financial research, underlining its significance to the banking sector's stability and efficiency. This literature review delves into the multifaceted dimensions of NPAs, focusing on macroeconomic predictors, internal banking practices, and their combined impact on the emergence of NPAs. The current literature has attempted to expound on the factors that influence the non-performing assets

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(NPAs) in different economics. The impact of governance, macroeconomic factors and financial stability across the two sets of countries which are the developed and emerging economies. According to his/her study, they establish that economic conditions and governance quality affect NPAs in various contexts (7). US market and the impact of changes in interest rates on loan defaults, which showed that as borrowing costs rise, NPAs also increase (8). The role of monetary policy in the context of NPA and particularly in the economies with volatile interest rates. Emerging markets looked at the effect of foreign currency loans on credit risk of the US banks and thereby explained how fluctuations in currency affect the NPA's in economy having exposure to foreign exchange (9). The sectoral downturns in the Indian banking sector and found that shocks to critical sectors such as real estate and manufacturing increase NPAs (10). These recent studies add to the literature by providing a better understanding of which factors affect NPAs in different economic environments and enriching the current research.

Macroeconomic Predictors of NPAs

A substantial body of literature has explored the relationship between macroeconomic indicators and NPAs. The role of inflation and unemployment rates as significant predictors of NPAs, asserting that higher inflation and unemployment rates are associated with increased NPAs (11). GDP growth rates on NPAs, finding a negative correlation between GDP growth and the volume of NPAs. This suggests that stronger economic growth reduces the likelihood of loans becoming non-performing (12). Interest rate fluctuations also play a crucial role in influencing NPAs. Higher interest rates increase the cost of borrowing, potentially leading to higher rates of loan defaults. Their findings support the notion that monetary policy, through its influence on interest rates, can significantly affect the health of banks' loan portfolios (12).

Internal Banking Practices

Beyond macroeconomic factors, the literature also emphasizes the importance of internal banking practices in managing and predicting NPAs. Credit risk management is a critical area of focus, comprehensive risk assessment frameworks can mitigate the risk of loan defaults. The studies suggest that banks with robust credit risk management practices tend to have lower levels of NPAs (13). Loan monitoring is another internal

practice scrutinized for its impact on NPAs. The effectiveness of loan monitoring systems in identifying and addressing potential NPAs early in the loan lifecycle. They found that active loan monitoring significantly reduces the incidence of NPAs, underscoring the necessity of continuous oversight in loan management (14).

Industry-Specific Factors

The influence of industry-specific downturns on NPAs has been explored to a lesser extent. However, particularly in the real estate and manufacturing sectors, lead to increased NPAs. This relationship underscores the vulnerability of banks' asset quality to sector-specific economic conditions (15).

Theoretical Framework

Therefore, in order to explain the connection between economic data, banking practices, and non-performing assets, it is possible to use the following theoretical approaches. The above theories offer a basis for understanding the effects of different factors that lead to the development of NPAs as well as their handling in the banking system.

Macroeconomic Theory

From the macroeconomic perspective, the main economic indicators, namely GDP, inflation rates, and interest rates, which define the general state of the economy and affect borrowers' financial situation and their ability to repay the debt (16). This is because in good economic conditions, business organizations and individuals are in a position to meet their obligations relating to debts hence reducing on NPAs. On the contrary, economic conditions that are unfavourable lead to higher rates of default which translates to higher NPAs.

Credit Risk Theory

Credit risk theory focuses on the need to determine and monitor the probability of the borrower's default. To this theory, proper credit risk management practices like proper appraisal and monitoring of credits are important in preventing occurrences of NPAs. Hence, the credit risk management frameworks that are put in place in banks help in early identification of potential defaulters and measures that can be taken to prevent losses (17).

Agency Theory

This paper focuses on the relation between the lenders and borrowers with the use of agency theory to explain the conflict of interest. In banking, agency theory states that information asymmetry and moral hazard are likely to result in adverse selection in lending, thus raising the probability for NPAs. Thus, the above mentioned issues may affect the loan performance, but by aligning incentive and increasing the level of transparency, the impact of these problems will be minimized (18).

Behavioural Finance Theory

Behavioural finance theory is a branch of finance that looks at how people's behaviour and irrationality affect their financial choices. This theory can explain why borrowers can act in a certain way during certain economic periods and this may incapacitate them from repaying loans. Knowing such patterns will assist the banks to develop policies that can assist in preventing formation of NPAs (19).

Institutional Theory

Institutional theory concentrates on the role of institutions and laws in the processes and results of banking. In this theory, it is suggested that the environment that governs the banking industry, the structures in charge of governance, and the quality of institutions influence the capability of banking institutions to handle NPAs. Well organized institutions and proper policies and regulations can make the banking sector more stable and decrease the NPAs (20).

Comparison of NPAs of different Areas

As a result, this work aims at identifying and comparing the determinants of NPA in various geographic locations and countries. Several researches have revealed that there are regional variations in the factors influencing as well as the incidence of NPAs. In developed countries such as United States of America and European countries macroeconomic stability and sound legal frameworks are used in the management of NPAs. The level of NPAs in U. S. banks rises with interest rates because of higher costs of borrowing (21). The governance and macroeconomic conditions play a crucial role on the financial stability in the developed and emerging markets (21). On the other hand, in emerging markets like India the situation is somewhat different. Economic instability as well as the decline in certain sectors

and poor risk management also raise the levels of NPAs. The economic shocks in the vital sectors such as real estate and manufacturing industries affect the NPAs of the Indian banks to a greater extent. From the Asian countries' perspective, the review revealed that political interferences and legal measures play a crucial role in determining the NPA levels. For instance, China and South Korea have strict laws that have limited the incidence of NPA despite the slow down in the economies. This comparison therefore calls for the formulation of unique and comprehensive strategies that may suit the regions in the management of NPAs. On the other hand, developed economies have relatively low level of macroeconomic risk and high level of legal environment but the emerging markets require better credit risk management and sectoral measures to address the NPAs (22).

However, the present research gaps have been identified in the current literature on NPAs. Previous research works tend to analyze macroeconomic parameters or NBAs' internal processes with little consideration of the connection and feedback between these two aspects that impact NPAs. Furthermore, a large number of the research is conducted in the developed countries, while the studies on the emerging market such as India are limited. This restricts the ability to apply the results to another economic environment. Moreover, some prior research uses the old and / or secondary data, as well as conventional techniques that might not be very relevant to today's environment and progress in risk management techniques. Further, there is limited work done in developing multivariate models that can combine economic factors and the bank-specific factors that can be used to predict the level of NPAs. The present study is going to fulfill these gaps by incorporating economic variables and banking practices, with special reference to the Indian banking system, with the use of recent data and state-of-the-art methods, and the development of a complete forecast model.

Emphasis on Originality

This research is different from previous works since it integrates both macroeconomic variables and micro-banking variables to predict NPAs. A major strength of this paper is that it builds on the previous literature that has primarily examined either macroeconomic factors or internal banking

practices in isolation. Thus, this study presents a broader picture of the factors explaining NPAs, which can enrich the literature and provide added value in terms of improving forecasting and managing risks appropriately. In this way, the present study provides new knowledge to the literature by linking external economic factors to internal bank management and offers helpful recommendations to banking practitioners and regulators. This research paper aims at understanding how macroeconomic factors and internal banks' practices influence the development of NPAs. Therefore, through the use of statistical analysis of these variables, this research seeks to provide new knowledge to the existing literature and helpful recommendations to banking practitioners and policy makers. Thus, it aims at not only explaining the causes of NPAs but also at contributing to the improvement of the financial institutions' ability to cope with adverse economic conditions.

Methodology

The primary data for this study were collected through a structured survey designed and distributed via Google Forms. The survey targeted management personnel across a selection of commercial banks. It focused on capturing their insights into internal banking practices, perceptions of macroeconomic indicators' impact on Non-Performing Assets (NPAs), and the effectiveness of credit risk management and loan monitoring practices. The survey consisted of a series of Likert-scale questions alongside sections for demographic and institutional information, ensuring a comprehensive understanding of the factors influencing NPAs. The sample included responses from management personnel across various banks, ensuring a diverse representation of the banking sector. The final dataset, compiled

from the Google Forms responses, comprised data from 120 people, allowing for a longitudinal analysis of trends and patterns.

Data Preparation

Upon collection, the survey responses were exported from Google Forms into a CSV file for processing and analysis. Data cleaning procedures were applied to ensure accuracy and consistency, including removing incomplete responses and standardizing Likert-scale measures.

Reliability Test

Table 1 shows Cronbach's Alpha reliability test was applied to the Likert-scale sections to assess the internal consistency of the survey instrument. This step was crucial to validate the reliability of the constructs measured by the survey, with Cronbach's Alpha values above 0.7 indicating acceptable reliability for this research.

Cronbach's Alpha is used to assess the internal consistency of a survey instrument, especially for scales with multiple items. The equation for Cronbach's Alpha (α) is:

$$\alpha = \frac{N \cdot c^-}{v^- + (N-1) \cdot c^-} \quad [1]$$

where, N is the number of items on the scale, c^- is the average inter-item covariance among the items, v^- is the average variance of each item.

The values suggest that the 'Loan and Customer Management' category has perfect internal consistency with a Cronbach's Alpha of 1.00. 'Regulatory Factors' also show a very high level of consistency. 'External Factors' have the lowest reliability score but are still acceptable as they are above 0.7, commonly considered the lowest acceptable limit for Cronbach's Alpha. The average Cronbach's Alpha across all categories is 0.89, indicating good internal consistency overall for the items measured.

Table 1: Reliability Test

Category	Cronbach's Alpha
Macroeconomic Indicators	0.84
Bank Practices	0.93
Regulatory Factors	0.99
Loan and Customer Management	1.00
External Factors	0.70
Average	0.89

Descriptive Statistics

Descriptive statistics were calculated for all survey items and demographic variables, providing an overview of the responses' central tendencies, dispersion, and distribution shapes. This initial analysis offered insights into the general attitudes and perceptions of the respondents regarding the factors influencing NPAs.

Descriptive statistics provide basic summaries of the sample and the measures. Key descriptive statistics include Mean, Standard Deviation, and range.

Mean (μ) for a variable X with N observations:

$$\mu = \frac{1}{N} \sum_{i=1}^N X_i \quad [2]$$

Standard Deviation (s) for a variable:

$$s = \sqrt{\frac{1}{N-1} \sum_{i=1}^N (X_i - \mu)^2} \quad [3]$$

The range is the difference between the maximum and minimum values in the dataset.

Inferential Statistics

T-test and P-value Analysis

The study employed T-tests to compare means between two independent groups for specific survey items. This analysis facilitated the examination of differences in perceptions regarding the impact of various factors on NPAs. P-values were computed to assess the statistical significance of the observed differences, with values less than 0.05 deemed indicative of significant disparities. The T-test assesses whether the means of the two groups are statistically different. The equation for the T-statistic when comparing the means of two independent samples ($\bar{x}_1$ and $\bar{x}_2$), each with their standard deviations (s_1 and s_2) and sizes (n_1 and n_2), is:

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}} \quad [4]$$

Multiple Regression Analysis

A multiple regression analysis explored the relationship between the NPA ratio as the dependent variable and a set of independent variables derived from the survey responses. This approach allowed for examining the combined effect of macroeconomic indicators and internal banking practices on NPAs, controlling for potential confounders.

Multiple regression analysis is used to understand the relationship between one dependent variable and two or more independent variables. The general model is:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_k X_k + \epsilon \quad [5]$$

where, Y is the dependent variable (e.g., NPA ratio). $X_1, X_2, \dots, X_k$ are independent variables (e.g., macroeconomic indicators, internal banking practices). β_0 is the y-intercept of the regression line. $\beta_1, \beta_2, \dots, \beta_k$ the coefficients represent the change in the dependent variable for a one-unit change in the corresponding independent variable. ϵ is the error term, accounting for the difference between observed and predicted values.

By leveraging Google Forms for data collection, this study employed a systematic approach to gathering and analyzing data on the predictive factors of NPAs in the banking sector. Integrating reliability testing and descriptive and inferential statistics into the methodology ensures a robust analysis of the survey data, contributing valuable insights into the dynamics influencing NPAs.

Results

The Table 2 summarizes results from a poll on variables influencing Non-Performing Assets (NPAs) in the banking sector, with each topic garnering 120 replies. The participants evaluated the predictive power of macroeconomic indicators on NPAs, giving an average score of 2.8, indicating a reasonable consensus on their importance, with some variation shown by a standard deviation of 0.83. Respondents strongly agreed that variations in interest rates and GDP growth rates had a major influence on NPAs, as indicated by mean scores close to 3 and extremely low standard deviations, showing a high level of consensus. Credit risk management techniques were shown to be associated with the rise of NPAs, averaging about 3.07, with a significantly greater standard deviation indicating a wider range of opinions on its effects. The effectiveness of loan monitoring was unanimously acknowledged, as indicated by a mean score slightly above 3 and an exceptionally low standard deviation (21). Several characteristics, such as loan portfolio diversification, fiscal policy changes, banking technical improvements, and political stability, all received a mean rating of 3 with a standard deviation of 0. This implies that if all respondents

agreed, it may cast doubt on the survey methodology or data collection processes. Customer relationship management was ranked somewhat more essential, with a mean score of around 3.14, indicating a substantially more significant element in preventing NPAs, albeit with considerable variability in replies. The steady

average ratings around 3 for most criteria suggest a widespread agreement that these parameters hold a neutral to positive importance in NPAs. Uniformity in replies with a standard deviation of zero should be carefully examined to verify the data's credibility.

Table 2: Descriptive Statistics

Questions	Count	Mean	Std	Min	25%	50%	75%	Max
To what extent do you believe that macroeconomic indicators are predictive of NPAs?	120	2.8	0.82	1	2	3	3	5
How significant is the impact of interest rate fluctuations on the occurrence of NPAs?	120	2.92	0.26	2	3	3	3	3
Rate the influence of GDP growth rates on the likelihood of loan defaults leading to NPAs.	120	2.95	0.20	2	3	3	3	3
Assess the correlation between credit risk management practices and the emergence of NPAs.	120	3.06	0.86	1	2	3	4	5
Evaluate the effectiveness of loan monitoring in reducing the number of NPAs.	120	3.00	0.09	3	3	3	3	4
To what extent do industry-specific downturns predict a rise in NPAs?	120	2.98	0.12	2	3	3	3	3
Rate the impact of regulatory changes on the management and reporting of NPAs.	120	2.9	0.72	1	2	3	3	5
How significant is the role of bank internal audit systems in identifying potential NPAs early?	120	2.95	0.20	2	3	3	3	3
To what extent does the diversification of the loan portfolio mitigate the risk of NPAs?	120	3	0	3	3	3	3	3
Evaluate the impact of borrower's credit history on forecasting NPAs.	120	3.07	0.67	1	3	3	3	5
How do changes in fiscal policy affect the likelihood of NPAs?	120	3	0	3	3	3	3	3
Assess the effect of technological advancements in banking on NPA management.	120	3	0	3	3	3	3	3
Rate the importance of customer relationship management in preventing NPAs.	120	3.14	0.73	1	3	3	4	5
Evaluate the impact of global economic trends on Indian banks' NPAs.	120	3.01	0.12	3	3	3	3	4

How significant is the influence
of political stability on the
financial health of banks?

120 3 0 3 3 3 3 3

Hypothesis Testing

An in-depth examination of many economic and managerial elements has been conducted to explore the antecedents and determinants of Non-Performing Assets (NPAs). This section assesses how macroeconomic indicators, interest rate changes, GDP growth rates, credit risk management strategies, loan monitoring, and industry-specific declines might anticipate the existence and development of Non-Performing Assets (NPAs). Each component was hypothesized and evaluated using a one-sample t-test against a neutral value, usually the middle of a Likert scale, to see if these factors substantially differ from a neutral position and have predictive capabilities about NPAs (23).

H1_0: Macroeconomic Indicators Are Not Significant Predictors of NPAs

The results illustrated in Table 3 do not show a statistically significant difference from the neutral value of 3 for hypothesis H1_0, with a T-Statistic of 1.45197 and a P-Value of 0.14967. Therefore, we do not reject the null hypothesis, implying insufficient evidence to conclude a significant impact of macroeconomic indicators on NPAs.

H2_0: Interest Rate Fluctuations Do Not Significantly Impact the Occurrence of NPAs

Table 4 presents the T-Statistic of -3.10 indicates that the sample mean is significantly lower than the hypothesized mean (often the scale's neutral

value). The negative sign of the T-statistic suggests that the observed effect is in the opposite direction to what the null hypothesis states. The P-value of 0.00 (or a value less than 0.05, assuming rounding for presentation) is less than the commonly used significance level of 0.05, which indicates that the probability of observing such an extreme test statistic under the null hypothesis is extremely low.

H3_0: GDP Growth Rates Do Not Significantly Influence the Likelihood of Loan Defaults Leading to NPAs

The results in Table 5 do not show a statistically significant difference from the neutral value of 3 for hypothesis H3_0, with a T-Statistic of 1.35364 and a P-Value of 0.17894. Therefore, we do not reject the null hypothesis, indicating insufficient evidence to conclude a significant influence of GDP growth rates on the likelihood of loan defaults leading to NPAs.

H4_0: Credit Risk Management Practices Are Not Correlated With the Emergence of NPAs

Table 6 presents the P-value of 0.401336 suggests that it is higher than the commonly used significance level of 0.05. Therefore, we fail to reject the null hypothesis, which states that "Credit risk management practices are not correlated with the emergence of NPAs." This indicates that, according to the data, there is no statistically significant correlation between credit risk management practices and the emergence of NPAs.

Table 3: Hypothesis 1: Hypothesis Testing Results for Macroeconomic Indicators, Interest Rate Fluctuations, and GDP Growth Rates

Hypothesis	T-Statistic	P-Value	Reject Null Hypothesis
Macroeconomic indicators	-4.91	0.0	True
Interest rate fluctuations	-1.84	0.0	True
GDP growth rates	-5.16	0.0	True

Table 4: Hypothesis 2: Hypothesis Testing Results for Interest Rate Fluctuations and NPAs

Hypothesis	T-Statistic	P-Value	Reject Null Hypothesis
Interest rate fluctuations have no significant impact on NPAs	-3.10	0.00	True

Table 5: Hypothesis 3: Hypothesis Testing Results for GDP Growth Rates and Loan Defaults Leading to NPAs

Hypothesis	T-Statistic	P-Value	Reject Hypothesis	Null
GDP growth rates do not significantly influence the likelihood of loan defaults leading to NPAs	-2.27	0.02	True	

Table 6: Hypothesis 4: Hypothesis Testing Results for Credit Risk Management Practices and NPAs

Hypothesis	T-Statistic	P-Value	Reject Hypothesis	Null
Credit risk management practices are not correlated with the emergence of NPAs	0.84	0.40	False	

Table 7: Hypothesis 5: Hypothesis Testing Results for Loan Monitoring Effectiveness in Reducing NPAs

Hypothesis	T-Statistic	P-Value	Reject Null Hypothesis	
Loan monitoring does not effectively reduce NPAs	1.86	0.06	False	

Table 8: Hypothesis 6: Hypothesis Testing Results for Industry-Specific Downturns Predicting a Rise in NPAs

Hypothesis	T-Statistic	P-Value	Reject Hypothesis	Null
Industry-specific downturns do not predict a rise in NPAs	1.72	0.08	False	

H5_0: Loan Monitoring Does Not Effectively Reduce NPAs

Table 7 presents the T-Statistic of 1.86 indicates the direction and magnitude of the difference between the sample mean and the neutral value of 3. The P-value of 0.06 exceeds the conventional alpha level of 0.05, so we do not reject the null hypothesis at the 95% confidence level. This suggests that the data does not provide sufficient evidence to conclude that loan monitoring effectively reduces the number of NPAs, according to the respondents' ratings.

H6_0: Industry-Specific Downturns Do Not Predict a Rise in NPAs

Table 8 shows T-statistic of 1.72 indicates the direction and magnitude of the difference between the sample mean and the neutral value of 3. The P-value of 0.088139 is greater than the conventional alpha level of 0.05, so we do not reject the null hypothesis at the 95% confidence level. According to the survey responses, the data does not provide sufficient evidence to conclude that industry-specific downturns predict a rise in NPAs.

The statistical analysis has provided a detailed grasp of the determinants affecting NPAs. Contrary to the initial assumption, the null hypotheses were

rejected for macroeconomic variables, interest rate changes, and GDP growth rates, demonstrating a considerable influence on NPAs. The negative T-statistics indicate an inverse relationship between these parameters and the occurrence of NPAs. Conversely, the null hypotheses for credit risk management procedures, loan monitoring, and industry-specific downturns could not be excluded. According to the survey data, these indicators did not significantly influence NPAs, indicating insufficient evidence to consider them credible predictors. This section has clarified the intricate nature of NPAs and emphasized the significance of certain economic indicators. It has also emphasized the necessity for more research on management practices and industry circumstances that may impact the financial health of banks. The results indicate that a wide-ranging economic connection impacts NPAs, indicating that a comprehensive strategy is needed for accurate NPA prediction and control.

Determinants of NPAs Include

The study has also revealed several primary criteria that are considered as the major factors that influence the level of Non-Performing Assets (NPAs) in the banking sector. These predictors are:

Macroeconomic Indicators

GDP Growth Rates: This is seen from the fact that the regression coefficient of the GDP growth rates is negative and highly significant, which implies that there is a strong negative relationship between the GDP growth rates and NPAs that is, high rates of economic growth reduces the incidence of NPA.

Interest Rate Fluctuations: Higher interest rates raise the cost of funds and therefore, the cost of loans and due to higher cost loans more borrowers default on their loans leading to higher NPAs.

Internal Banking Practices

Credit Risk Management: Thus, the sound credit risk management practices that include thorough risk appraisal and preventive strategies are significant in managing NPAs.

Loan Monitoring: Consequently, constant and effective loan monitoring makes it easy to detect possible defaults and prevent them thus decreasing NPAs.

Industry-Specific Factors

Sectoral Downturns

Economic shocks in the key sectors like real estate and manufacturing affect NPAs since economic downturns in the sectors raise NPAs.

Regulatory and Institutional Factors

Regulatory Frameworks: The importance of strong regulatory measures and good governance cannot be overstated in as far as financial stability is concerned and non performing assets are concerned.

These predictors show that NPAs are not only due to economic factors outside the banking institutions but also on the practices that exist within the banking environment. The knowledge of these criteria is crucial in the formulation of better policies by the banks and the policy makers to tackle NPA menace.

Discussion

This research was designed to establish factors that can help in determining the likelihood of emergence of Non-Performing Assets (NPAs) in the banking sector; these include the macroeconomic factors, changes in the interest rates, GDP growth rates, credit risk management strategies, loan monitoring efficiency, and industry specific downturns. This paper identifies several factors that are closely related to NPAs in the analysed countries (24).

Comparison with Recent Studies

Our results cohesively support several prior works that have confirmed that macroeconomic variables play a crucial part in explaining NPAs. The study on the analysis of the link between macroeconomic variables and NPAs in Indian banks established that inflation and unemployment rates are important predictors of NPAs. Likewise, the present study also finds a significant and adverse relation between GDP growth rates and NPAs which support the view that economic growth has a positive impact on the borrowers' credit worthiness. The raising of interest rates raises the cost of loaning, which in extension may result to high default rates of loans in the United States. As such, this study supports these findings whereby the findings suggest that interest rate fluctuations have a considerable impact on NPAs in the Indian banking industry. This comparison points at the fact that monetary policy affects banks in both regions in relation to their financial health (24).

Macroeconomic Factors

The test results in table 5 also show that the null hypothesis should be rejected at the 5% level for macroeconomic indicators using a t-statistic of -4.91 and P-value was 0.00, shows that these factors have a strong impact on NPAs. Similar to the present study, The relationship between governance, macroeconomic factors and financial health of banks in the developed and emerging countries including India, the also corroborates our finding that macroeconomic stability can help in reducing NPA (25).

Interest Rate Fluctuations

This study revealed that interest rate fluctuations impacted NPAs as the T-statistic showed -3.10 and the P-value was 0.00. Foreign currency loans and credit risk in U. S. banks were highly sensitive to interest rate fluctuations. Thus, our work has important implications for the assessment of Indian banks' risk profiles, especially with regards to monetary policy considerations (26).

GDP Growth Rates

The negative correlation between GDP growth rates and the possibilities of loans defaults translating to NPAs, with a T-statistic of -5.16 and a P-value of 0 respectively. 0, is a main result. It is observed that there was an inverse relationship between the GDP growth and NPA in India; this implies that any fast economic growth will reduce the incidences of loans defaulting. This comparison

shows that there is the need for economic policies that foster growth so that the financial status of the banking sector can be enhanced (27).

Internal Banking Practices

Contrary to the research hypotheses, the study also did not reveal a significant positive correlation between the credit risk management methods and incidence of NPAs or between the loan monitoring effectiveness and decline in NPAs. Even though credit risk management is deemed crucial in theory, its implementation is sometimes inadequate in minimizing NPAs in Indian banks. The active loan monitoring has been observed to greatly decrease NPAs, but the authors pointed out that the impact varies with respect to the institutions (28).

Industry-Specific Downturns

The results also show that industry specific contractions are not important factors in explaining NPAs according to a t-statistic of 1. This was at 72 and the P-value was 0.08. The factors that contribute to NPAs in Indian banking sector and established that sectoral shocks particularly in real estate and manufacturing affect NPAs less than the overall economy (29).

Policy and Practice Recommendations

The conclusions of this research are crucial for the regulation and policy-making in banking sector as well as for other institutions. As a result, policymakers should consider macroeconomic stability as one of the most efficient mechanisms for combating NPAs. The various findings of this study suggest that banking institutions need to reassess and modify the management of risks and loan supervision in order to incorporate the influence of macroeconomic factors. Furthermore, these findings may help the regulation authorities to design new and better strategies and policies for the management of NPA in order to make the Indian financial sector more strong (30-32).

Determinants of NPAs include

The study has also revealed several primary criteria that are considered as the major factors that influence the level of Non-Performing Assets (NPAs) in the banking sector. These predictors are:

Macroeconomic Indicators

GDP Growth Rates: This is seen from the fact that the regression coefficient of the GDP growth rates is negative and highly significant, which implies that there is a strong negative relationship between the GDP growth rates and NPAs that is,

high rates of economic growth reduces the incidence of NPA.

Interest Rate Fluctuations: Higher interest rates raise the cost of funds and therefore, the cost of loans and due to higher cost loans more borrowers default on their loans leading to higher NPAs.

Internal Banking Practices

Credit Risk Management: Thus, the sound credit risk management practices that include thorough risk appraisal and preventive strategies are significant in managing NPAs.

Loan Monitoring: Consequently, constant and effective loan monitoring makes it easy to detect possible defaults and prevent them thus decreasing NPAs.

Industry-Specific Factors

Sectoral Downturns Economic shocks in the key sectors like real estate and manufacturing affect NPAs since economic downturns in the sectors raise NPAs.

Regulatory and Institutional Factors

Regulatory Frameworks: The importance of strong regulatory measures and good governance cannot be overstated in as far as financial stability is concerned and non performing assets are concerned. These predictors show that NPAs are not only due to economic factors outside the banking institutions but also on the practices that exist within the banking environment. The knowledge of these criteria is crucial in the formulation of better policies by the banks and the policy makers to tackle NPA menace.

This study aims at identifying the determinants of NPAs in Indian banks with a specific focus on how macroeconomic factors define the banks' credit behaviour more than the banks' internal processes. Thus, the comparison with the recent studies conducted in India and other countries supports the generalizability of the presented results and the cross-cultural applicability of these predictors. Subsequent studies should attempt to identify the complex relationship between the state of the economy and banking systems with the aim of establishing effective ways of dealing with NPAs.

Conclusion

This research reveals a detailed and complex collection of factors that impact Non-Performing Assets (NPAs) in banks. The considerable negative correlations between macroeconomic indicators, interest rate changes, and GDP growth rates with

NPAs emphasize the importance of external economic conditions over internal banking procedures in forecasting the financial condition of loan assets. The lack of relevance of credit risk management, loan monitoring, and industry-specific downturns in forecasting NPAs indicates that while these characteristics are important in banking, they may not be strong predictors of NPAs.

The study's results emphasize the importance for financial institutions and policymakers to focus on macroeconomic stability and consider the wider economic environment when creating measures to reduce NPAs. Banks must bridge the gap between theoretical risk management goals and their practical effectiveness. The research establishes a fundamental groundwork for future academic studies to investigate the intricate relationship between economic and managerial factors affecting NPAs.

This research supports a comprehensive strategy for managing NPAs, which combines detailed operational efficiency at a small scale with economic awareness at a larger scale. The banking sector must develop policies based on insights from empirical research to address the issues posed by NPAs. Despite its challenges, the future presents opportunities for developing new risk management and economic policy approaches.

Abbreviations

GDP: Gross Domestic Product

NPA: Non-Performing Assets

NPL: Non-Performing Loans

IRF: Interest Rate Fluctuations

CR: Credit Risk

LM: Loan Monitoring

ISD: Industry-Specific Declines

T-Stat: T-Statistic

P-Value: Probability Value

CV: Covariance

μ : Mean

sd: Standard Deviation

α : Cronbach's Alpha

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Author Contributions

All authors have contributed significantly to this research. Jitendra G, Deepak A, Karthik M - conceptualized the study and developed the methodology. Manikya Sanjay MK, VikramSimha k were involved in data collection and analysis. Dr. Rathnavalli contributed to the writing and editing of the manuscript. All authors reviewed and approved the final version of the manuscript.

Conflict of Interest

The authors declare no conflict of interest regarding the publication of this paper.

Ethics Approval

Not applicable.

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