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IMPACT OF ASSET RESTRUCTURING ON FINANCIAL STABILITY AND BANK PERFORMANCE: EVIDENCE FROM THE INDIAN BANKING SECTOR USING DYNAMIC PANEL ANALYSIS

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SUMMARY

Asset restructuring has become a key tool for banks to deal with non-performing assets (NPAs) and sustain banking sector health, especially in emerging economies like India where the quality of assets is a persistent issue. This study examines the effect of asset restructuring on financial performance and financial stability of the Indian scheduled commercial banks through a dynamic panel framework. The analysis utilizes panel data of 97 scheduled commercial banks during the time frame 2015–2025 which generates 608 observations. Endogeneity, autocorrelation and heterogeneity issues are tackled by using a two-step system Generalized Method of Moments (GMM) estimation approach. The asset quality, financial stability (measured with Z score), capital adequacy and liquidity are the four major dimensions of banking performance under consideration. The empirical results suggest that restructuring has no long-term statistically significant impact on asset quality and financial stability, which suggests that restructuring may not be an effective way to increase the fundamental credit risk profile of banks. The results, however, illustrate a strong negative effect on the capital adequacy and liquidity. The two-step system GMM estimation results indicate that asset restructuring results in around 0.5% reduction in capital adequacy and 5.9% reduction in liquidity, which shows the mechanism of the short-term NPA resolution and long-term banking resilience. Moreover, NPA provisioning and operating efficiency have a positive impact on bank stability and bank capitalization and higher profitability has positive impact on liquidity performance. The study findings suggest that restructuring assets can be a short-term solution for the management of distressed assets, but overusing restructuring might cause a decline in long-term sustainability. The results offer valuable policy insights related to the reinforcement of restructuring systems, risk management practices and the enhancement of regulatory oversight in new banking systems.

Key words: *asset restructuring, financial stability, non-performing assets, capital adequacy, liquidity, GMM, indian banking sector.*

INTRODUCTION

Credit resources play an important role in building a robust economy, whereas timely recovery of loans and advances is basic to the stability of the economy. Banks, as critical contributors to India's economic growth, account for about 6.8% of the country's GDP [4]. Consequently, financial stability has been and continues to be a major goal for financial institutions around the world, remarkably after the critical financial crisis of 2007-2008. Several structural reforms emerged in its aftermath, including the Basel III framework, mandatory stress testing and enhanced risk management strategies. Although Indian banks were able to navigate the Global Financial Crisis relatively well, the persistent deteriorating asset quality remains a significant threat to both the banking sector and the overall economy.

When bank capital is tied up in NPLs, lending capacity declines, leading to rise in interest rates, reduced investment, and adversely affecting the overall economic activity. Commercial Bank NPAs in India have increased significantly during 2016-2018 due to asset stripping, willful defaults, poor governance, and fund diversion, despite strong economic growth [5].

India's insolvency framework has been criticized for its inefficiencies and lengthy adjudication processes [6]. The weak protection of creditor rights in India has historically positioned bank debt as subordinate to borrower interests resulting in insolvency resolution taking an average of 4.3 years. In the early 2000s, Indian corporations faced mounting financial distress in meeting their debt obligations. To address the rising level of CLOs threatening the stability and balance sheet of banks, in 2002 the RBI launched an arbitrary restructuring initiative. The debt restructuring mechanism supported by tangible assets allowed banks an effective route for restructuring corporate debts above INR 100 million from different banks, syndicates or consortiums and thus reduced corporate debt exposure while avoiding the worsening of the credit market [7].

Under the RBI's restructuring norms, the only condition for referring a loan account was the borrower's commitment to repay the loan. Each distressed corporate loan needed the support of 60% of its creditors by value [8]. Initially only substandard collateralized loan obligations were to be restructured by the banks; however, the RBI widened the ambit of asset restructuring in 2003 to standard loan assets, doubtful loans and pending cases of the BIFR.

Despite these restructuring expansions, the RBI made substantial concessions on provisioning, which facilitated the return to normal asset classification for about 93.89% of restructured loans [9]. While asset restructuring was intended to minimize the exposure of banks to bad debt through setting up expeditious and viable alternatives in place of lengthy insolvency proceedings, yet there was no certainty regarding recovery in the long run [10]. Banks reclassified restructured assets as standard assets to evade higher provisioning requirements thereby distorting the actual financial health of the sector. This misrepresentation promoted over-risk-taking, prompting regulatory to curb such practices. The RBI then issued guidelines to exit restructured assets and to bring the provisions for restructured assets closer to those for NPAs by 2016.

Irrespective of these obstacles, Indian banks have remained financially stable and one factor that has enhanced their financial stability is the regulatory environment that offers enough capital buffers. The long-term economic growth of India coupled with a very high domestic demand and a huge amount of investments presents banks with growth opportunities, supported by excellent fundamentals and credit growth. However, the literature is still split on the viability of restructuring in the Indian context. Corporate loan is normally regarded as low risk in advanced economies, but India's experience is very different because the highest proportion of NPAs has been of the corporate loan category [12]. The RBI (2020) report provides evidence that NPAs on corporate loans are often higher than those on SME and other retail loans during 2015-2019, which makes this study pertinent.

Accordingly, this research aims to empirically quantify the effectiveness of corporate loan restructuring in improving key bank performance indicators, such as asset quality, financial stability, capitalization, and liquidity, for Indian SCBs.

Under the RBI's restructuring framework, banks may classify restructured assets as standard, which

requires only 2% provisioning rather than 10%. By making higher provisions for these assets, banks compromise their net income, leading to increased risk-taking [15]. In addition, many banks lowered their risk-weighted assets by obscuring how much non-performing loans had. The Basel framework for capital adequacy suggests that 1.25% of RWA should be the benchmark for calculating Tier-2 capital [16]. Consequently, banks not constrained by capital requirements will have less incentive to keep regulatory capital as higher levels of loan loss provisions. Asset Restructuring is typically viewed as a major tool to deal with distress in the financial markets and in particular to conserve bank assets through reduction of NPLs. It has been found that restructuring is most effective when it is done early, coordinated by creditors and involves large banks [17]. Nevertheless, the procedure usually entails huge compromises on the part of the lenders, which may have a negative impact on profitability and capital sufficiency. Out-of-court restructurings do not cope with the problems of institutional loans and complicated creditor structures, and thus there is significantly greater use of formal bankruptcy [18]. Regulatory frameworks and previous lending relationships are also factors that can affect economic growth and financial stability in order to bring about a successful restructuring. With the diverse performance in the various economies in view, the purpose of the current research is to investigate, whether asset restructuring will assist in creating resilience in the Indian banking sector using the following hypotheses:

H₁: Asset restructuring is an effective mechanism in banking sector to enhance asset quality.

H₂: Asset restructuring significantly contributes to enhancing financial stability.

H₃: Asset restructuring reduces ability for capital formation.

H₄: Asset restructuring moderates liquidity creation.

Research Gap and Contributions

Existing literature on the restructuring of assets among the banking systems provides conflicting evidence in regards to effectiveness in improving the quality of assets and financial stability particularly in the emerging economies like India [19]. Despite the earlier research that has revealed the association between non-performing assets (NPAs) and bank performance, a gap in empirical research that combines both bank asset restructuring and the major financial variables including capital adequacy, liquidity and stability by using dynamic panel models exists [20].

Most of the research makes use of set frameworks or limited samples of research hence do not reflect endogeneity and persistence in the performance of banks. In addition, the literature on the evaluation of the systemic impacts of restructuring mechanisms in the Indian banking sector in the long run is lacking [21].

The study fills these gaps by using a two-step system GMM model on a panel data of 97 scheduled commercial banks over the period 2015-2025.

The following are the Main Contributions of This Study:

- Offers a dynamic empirical estimation of reorganizing assets using GMM to solve endogeneity.
- Concurrently assesses four essential banking signifiers namely: asset quality, financial stability, capital adequacy and liquidity.
- Provides evidence on the trade-off between short-term NPA resolution and long-term financial stability.
- Offers policy-relevant information towards restructuring frameworks in emerging economies.

Paper Organization

This paper is organized as follows: the remainder of the paper. The literature review on asset restructuring and financial stability in the banking sector is provided in Section 2. The materials and

methods used in the study, the measurement of variables, and the model specifications are discussed in Section 3. The empirical results and discussion are provided in Section 4 for both fixed-effects and two-step GMM estimations. Finally, Section 5 offers policy implications, limitations and future research directions.

LITERATURE REVIEW

Asset restructuring has been subject to significant theoretical analysis as an important strategic tool to deal with troubled assets and improve the financial status of the banking institutions. The negative effects of non-performing assets (NPAs) have been mitigated with the help of restructuring mechanisms and credit flows are rejuvenated [22]. However, such mechanisms are not equally successful in countries and institutional frameworks.

The best association of restructuring in developed economies has been the resultant increase in financial stability in cases where it has been practiced together with strong regulatory regimes. One such instance is the experience of Japan during early 2000s which demonstrated that the process of restructuring when coordinated turned out to be effective in terms of reinstating the economic growth as well as stabilizing the banking system [23]. Similarly, the reorganization of policies in Spain and Russia contributed to decreasing the strains on loan classification and provisioning in economic crises. These photos demonstrate the significance of institutional backing and prompt action in safeguarding positive restructuring results.

Nonetheless, there are also critical opinions on the practices of restructuring in the literature. It has been argued that the idea of securitization as a method of restructuring has led to heightened systemic risk, particularly in the context of a global financial crisis, like that of 2008. Research has shown that the unregulated activities of securitization caused mispricing of risk and were one of the causes of the financial instability. These matters have been already brought up in emerging markets and Brazil has proven that securitization may in fact drive the credit risk up instead of down [24].

Among the most significant policy tools added by the Reserve Bank of India (RBI) to deal with the increasing NPAs has been asset restructuring [23]. Corporate Debt Restructuring (CDR) mechanism was developed to allow quick resolution of the bad loans and avoid the further decline in the quality of assets [14]. Although these have been undertaken, the success of the restructuring in India is still controversial. Studies have found that restructuring might lead to short-term gains in the classification of assets but no gains in the underlying credit risk.

Mixed results are found on the impact of bank restructuring on bank performance. Other researchers allege that restructuring improves profitability and lowers the provisioning needs since it helps banks to reclassify distressed assets [3]. Others claim that restructuring has the ability to delay the recognition of losses and encourages risk-taking behaviour hence undermining financial stability in the long-term. Moreover, the studies show that the high levels of NPAs are strongly correlated with poor credit appraisal systems and governance problems in banks.

The relationship between restructuring and financial stability is typically analyzed in terms of the indicators, including Z-score, which gives a chance of the bank insolvency. Studies have established that though restructuring can be effective in reducing the chances of short-term default, it is not always effective in improving the stability in the long term especially when it is coupled with poor risk management behavior. In addition, other macroeconomic factors like inflation, GDP growth and interest rates are significant determinants of the performance of the bank and effectiveness of the restructuring policies [13].

Typically, the existing body of work is inconclusive and mixed on the effectiveness of asset restructuring in boosting the performance and financial stability of banks within different economies [11]. Some studies show that it plays a significant role in mitigating the non-performing assets, whereas others affirm that it has weaknesses in addressing the long-term systemic risks. Notably, no consensus has been reached regarding emerging markets such as India, where institutional, regulatory, and economic factors vary significantly. As such, the study will add value to the literature by offering updated empirical

evidence using a dynamic panel framework to provide a more comprehensive picture of the effects of asset restructuring on the performance of the banking sector.

MATERIALS AND METHODS

The Indian banking sector currently comprises 136 banks, of which the current study focuses on 97 Scheduled Commercial Banks ($i = 1, 2, \dots, 97$) that account for around 85% of lending and deposit activity in the country. The data is taken from the RBI's database for 10 years (2015-25). The number of observations in the first dataset was 928. However, after excluding missing data, the final number of observations was 608. There is a minor difference in the number of observations reported (607 in the regression analysis) because lagged variables are used in dynamic panel estimation. In addition to information from banks, the study uses inflation and GDP growth rates as macroeconomic variables, gathered from the World Bank's WDI database. Furthermore, the aggregate repo rate for each year is calculated from the RBI's regulatory reports. To be included in the unbalanced panel dataset, banks had to be in operation for at least one year and have at least two observations. Unbalanced panels may exhibit heterogeneity in variance, making the standard error difficult to estimate. The issue is addressed using the fixed-effects model by controlling for time-invariant factors, a Hausman test to assess the model's appropriateness, and a robustness test using the GMM model to address possible endogeneity.

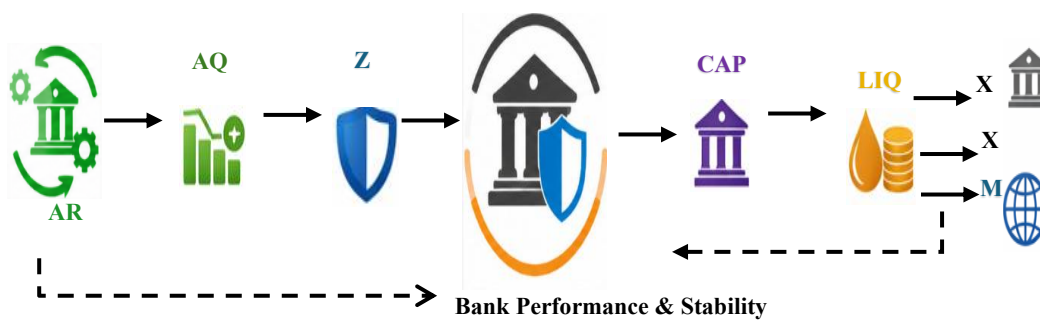


Figure 1. Conceptual framework of asset restructuring and bank performance

The figure 1 provides a conceptual relationship between asset restructuring and key bank performance indicators such as asset quality, financial stability, capital adequacy and liquidity. It also highlights the moderating roles of bank-specific and macroeconomic factors, as well as the feedback mechanism that influences future restructuring decisions.

Measurement of Variables

The model is intended to quantify the consequences of conventional restrictions on the fiscal performance of assets in the banking sector in India, with respect to asset quality, financial stability, liquidity, and capitalization. The effect of asset securitization on bank performance is measured in the study using Asset restructuring as the main variable, operationalized as a dummy variable indicating whether bank i is involved in debt restructuring in year t . According to RBI guidelines, substandard assets are defined as assets in NPA that are up to 12 months overdue (from 31st March 2005), and doubtful assets are defined as those that are in NPA for more than 12 months. Both classifications affect banks' asset quality [2], financial stability, and liquidity and capitalization [3]. Widely used this method to measure financial stability, and it is an alternative to the Altman Z-score. Both measures indicate insolvency risk; however, the Z-score used in this study serves as an inverse proxy for the probability of liquidation. Liquidation usually occurs because of poor bank performance on equity; thus, insolvency is the probability that asset returns will fall below equity. Assuming the bank's profit is distributed normally, the Z-score is evaluated as follows:

$$Z\text{-Score}_{i,t} = \frac{ROA_{i,t} + \left(\frac{Equity_{i,t}}{Assets_{i,t}}\right)}{\sigma(ROA_{i,t})} \quad (1)$$

Where:

- $Z\text{-Score}_{i,t}$ = Financial stability indicator of bank i at time t

- $ROA_{i,t}$ = Return on Assets of the bank i at time t
- $\frac{Equity_{i,t}}{Assets_{i,t}}$ = Equity-to-assets ratio of bank i at time t
- $\sigma(ROA_{i,t})$ = Standard deviation of return on assets, representing earnings volatility

The distance-to-insolvency model (DTI) for estimating banks' financial stability is given by equation (1). A higher Z-score means the banks are farther from insolvency, suggesting long-term stability. To ensure standardization, the SD of the average ROA for bank i over the preceding 3-year period is employed for time t . There is no consensus on the optimal rolling window specification.

Asset quality depends mostly on the loan portfolio and credit administration mechanisms. Considering that NPA mitigation positively impacts a bank's economic viability, liquidity, and capitalization, The study measures the ratio of NPLs to gross loans ($\Delta AQ_{i,t}$) as a substitute for asset quality. The model also incorporates bank size, as research indicates that larger banks typically have better asset quality than smaller banks. Capital adequacy ratio ($\Delta CAP_{i,t}$) serves as a crucial buffer against potential losses from lending and investments. During economic shocks, the banks that are adequately capitalized are resilient, and their capital adequacy and asset quality are negatively correlated [1].

Macroeconomic variables such as the inflation rate, repo rate, and GDP growth rate are important for analyzing banks' performance and financial stability. Inflation impacts the performance and profitability of loans, thus influencing stability. GDP growth reflects economic conditions, and, generally, higher economic growth will enhance asset quality and mitigate credit risk. Repo rate affects borrowing costs, banks' liquidity, lending rates, and profitability. In the model, these variables ($\Delta IR, \Delta GDPG, \Delta Repo$) contextualize put bank performance within the broader macroeconomic context. Macroeconomic conditions are regulated using real GDP growth and annual repo rates, which are computed as the proportionate value of repo rates for each day of the year.

Assessment of Bank Performance

The methodology adopted here is based on the analysis of the implications of bank restructuring for financial performance. The study employs dynamic panel estimation using two-step GMM to assess the effectiveness of restructuring on overall banking-sector performance. The OLS method is not used because of problems estimating models with serial correlation. The GMM system method is used as the preferred estimation method, after comparison with the FE estimation model, because the lower bound on the lagged coefficient of the bank performance indicators estimated by the GMM system method is lower than the coefficients calculated by the FE estimation model. This is significant because of the lagged coefficient which reflects the persistence of bank performance over time. The time-invariant factors are controlled for in the FE model; however, it may still yield biased estimates due to endogeneity. The GMM system method overcomes these biases by using instruments such as lagged values of endogenous variables to yield more accurate and reliable estimates.

The model evaluates the impact of asset securitization on bank performance, expressed by the following general specification:

$$\text{Bank Performance} = f(\text{Asset Restructuring}, \text{Bank-Specific Variables}, \text{Macro Variables}) \quad (2)$$

The general functional relationship between asset restructuring and bank performance indicators in equation (2).

$$Y_{i,t} = \alpha Y_{i,t-1} + \beta_1 AR_{i,t} + \beta_2 X_{i,t} + \beta_3 M_t + \varepsilon_{i,t} \quad (3)$$

The dynamic panel regression model used in estimation is defined by equation (3) and was estimated using two-step system GMM.

where $Y_{i,t}$ represents the dependent variable (asset quality, financial stability, capitalization, or liquidity)

for bank i at time t ; α_i captures explicit bank effects; λt denotes time effects; $AR_{i,t}$ is the debt restructuring dummy; $X_{i,t}$ represents the set of bank-specific control variables; M_t denotes macroeconomic variables; and $\varepsilon_{i,t}$ represents the error term.

The bank's performance is assessed based on asset quality, financial stability, liquidity, and capitalization. The Hausman test is used to determine the appropriate model linking FE and RE. In all cases, the p-value > 0.05 suggests that the RE model is biased because the individual effects are associated with the predictor variables. Therefore, the FE model is employed, as it yields more reliable and unbiased estimates by accounting for unobserved heterogeneity among banks. The research uses a two-step GMM methodology to analyze bank performance through asset restructuring, addressing potential endogeneity in which explanatory variables are affected by the dependent variable. The model also controls the possibility of reverse causality and, therefore, consider all bank-specific variables as endogenous. In the first stage, the model is assessed using an initial weighting matrix (typically an identity matrix) by minimizing an objective function that measures the discrepancy between observed data and the model predictions. In the second step, the estimates are improved using an optimal weighting matrix based on the first-step residuals, yielding more efficient and consistent parameter estimates that are less prone to heteroskedasticity and autocorrelation. Given the possibility of endogeneity in bank-specific variables, capital adequacy, liquidity, and other internal factors, the study employs lagged values of these variables as instruments for the proposed model's endogeneity. This instrumental variable method addresses the problem of bias due to simultaneity or reverse causality. The independent variables include $\Delta AQ_{i,t-1}$ for asset quality, $\Delta CAP_{i,t-1}$ for capitalization, and $\Delta Liq_{i,t-1}$ for liquidity. Additional bank-specific control variables include $\Delta ROA_{i,t-1}$ for profitability, $\Delta NPAProv_{i,t-1}$ for NPA provisions, $\Delta Size_{i,t-1}$ as the natural log of total assets, $\Delta Div_{i,t-1}$ for income diversification and $\Delta CIR_{i,t-1}$ for management efficiency. Macroeconomic variables include the first-differenced lagged inflation rate, GDP growth and repo rate.

Model Specification and Variable Definition

For clarity and consistency, the model specifications, together with all the variables employed in this paper, are presented in this section. The model seeks to assess the influence of asset reorganization on key aspects of bank performance, including asset quality, stability, capital adequacy, and liquidity.

The list of dependent variables that are included in the model is asset quality ($\Delta AQ_{i,t}$), which is determined by the non-performing assets (NPA) ratio to total gross loans, financial stability (Z-score) reflecting the probability of insolvency, capital adequacy ($\Delta CAP_{i,t}$) measured by the capital adequacy ratio, and liquidity ($\Delta Liq_{i,t}$) measured using the loans-to-deposits ratio. The primary independent variable is asset restructuring ($AR_{i,t}$), which is operationalized as a dummy variable taking the value 1 if a bank undertakes restructuring in a given year and 0 otherwise.

The financial stability indicator, Z-score, is computed as:

$$Z = \frac{ROA + \frac{Equity}{Assets}}{\sigma(ROA)} \tag{4}$$

where ROA is the return on assets and $\sigma(ROA)$ stands for the standard deviation of ROA , which measures income risk. An increasing Z-score indicates greater financial stability and a lower likelihood of insolvency in equation (4).

In order to account for the dynamic process of bank performance, the study utilizes a dynamic panel approach represented by the following equation:

$$Y_{i,t} = \alpha Y_{i,t-1} + \beta AR_{i,t} + \gamma X_{i,t} + \delta M_t + \varepsilon_{i,t} \tag{5}$$

where $Y_{i,t}$ indicates the dependent variables, i.e., asset quality, financial stability, capital adequacy, or liquidity of bank i at time t , and $Y_{i,t-1}$ is the lagged value of dependent variables due to the persistence of performance in banks. $AR_{i,t}$ denotes asset restructuring, $X_{i,t}$ represents bank-specific control

variables, and M_t includes macroeconomic variables such as inflation, GDP growth, and repo rate. $\varepsilon_{i,t}$ is the error term capturing unobserved factors in equation (5).

Bank-specific control variables comprise of profitability (ROA), NPAs provisioning, the natural logarithm of total assets (size), the income diversification, and the cost-to-income ratio (CIR). These aspects put into consideration internal efficiencies and risk management strategies. The macroeconomic factors on the other hand are the external environmental factors which influence the performance of the banking industry.

The two-stage GMM system estimator is adopted to address any issue of endogeneity, reverse causality and heterogeneity. The lagged values of the endogenous variables are used to instrument them. Moreover, all the equations are mathematically stated.

Theoretical Framework

This study is grounded in three major theoretical perspectives:

1. Financial Stability Theory

According to the theory of financial stability, banks are stable when have sufficient capital buffers and are able to cope with risks. Z-score is a very popular proxy to estimate the insolvency risk and stability.

2. Banking Risk Theory

The banking risk theory stipulates that increased exposure to bad assets enhances the credit risk and thus impacts profitability, liquidity and capital adequacy. Asset restructuring can temporarily alleviate the pressure of default but can associated with the long-term systemic risk.

3. Debt Restructuring Framework

The frameworks of debt restructuring lay stress on a coordinated intervention of creditors in the solution of distressed assets. Restructuring can also, however, postpone the loss recognition and misrepresent financial reporting.

RESULTS AND DISCUSSION

The study is based on 608 yearly observations of 97 planned commercial banks in India over a span of 10 years. Based on table 1 NPA measure, the mean value is of 3.414 and SD is relatively large 4.455, indicating that there is a significant change in the asset quality of Indian banks. The mean of the Z-Score of financial stability is 2.366 and therefore, the ROA of Indian banks would have to decrease by about 2.366 SD to induce insolvency, which means that the Indian banks are nowhere near insolvency, even though the NPA level is still above the optimal level. Empirical analysis was done using Stata 17. Two-step system GMM estimator was used where robust standard errors were used to tackle the issues of heteroskedasticity and autocorrelation.

Parameter Initialization:

- Lag structure: 1-period lag
- Instrument variables: Lagged endogenous variables
- AR (1) and AR (2) tests applied for autocorrelation
- Hansen test used for instrument validity

Table 1. Summary statistics of the study variables

Variables	Measure	Mean	Std. Dev.	Min	Max
NPA	Asset Quality	3.414	4.455	0.010	54.560
Z-Score	Financial Stability	2.366	2.659	0.011	17.555
CAR	Capitalization	19.194	17.495	1.120	277.450
Loans to Deposits	Liquidity	87.783	57.695	18.776	556.019
NPA Prov	Provision for bad assets	0.651	0.452	0.002	3.879
ROA	Profitability	0.397	1.508	-9.620	4.460
Size	Ln (Total Assets)	4.791	0.923	1.842	6.742
I Div	Non-interest income/assets	1.593	2.292	-0.288	22.478
CIR	Management ability	0.276	0.146	0.092	1.664
Repo Rate	Policy repo rate	6.026	1.129	4.260	8.000
IR	Inflation Rate	5.297	1.339	3.233	7.588
GDPG	GDP Growth Rate	5.611	4.559	-5.778	9.690

Note: N = 608 observations across 97 scheduled commercial banks (2015–2025). Source: calculations based on RBI database.

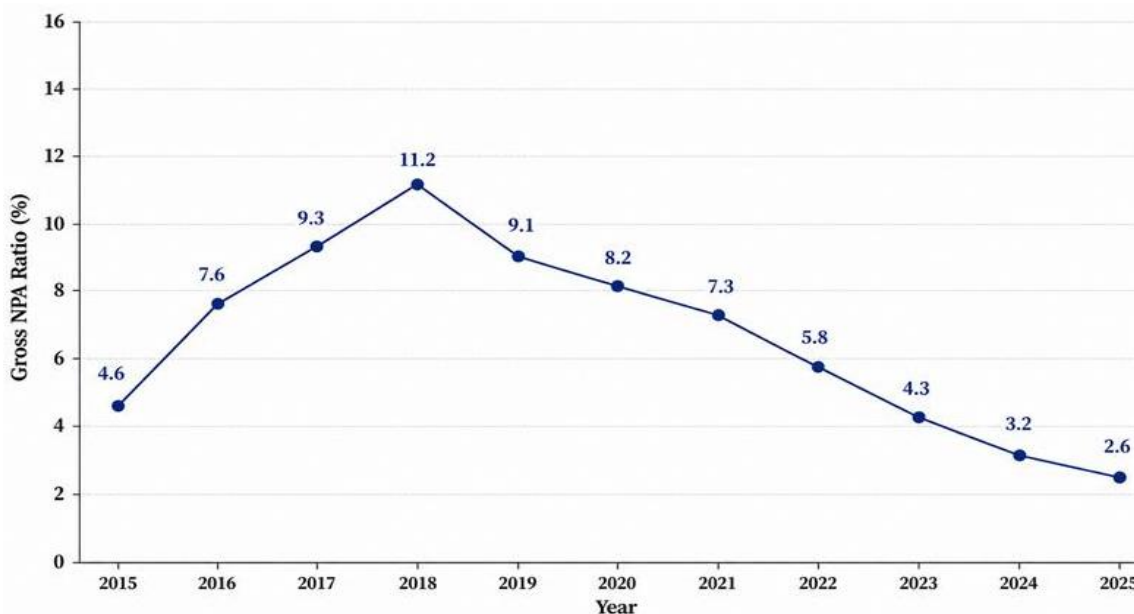


Figure 2. Trend of non-performing assets (NPA) in Indian scheduled commercial banks (2015–2025)

The figure 2 shows the change in the gross NPA ratios over the period of study, where the change is sharp in the period of 2016-2025 and then it begins to decrease gradually, suggesting that the changes in the quality of the assets and effects of regulatory and restructuring measures. The average Capital Adequacy Ratio (CAR) is 19.194, which means that there is no variation in the capitalization of the sample. The Indian Banks have a high liquidity among them and this indicates a large range of liquidity positions. The high variability of CAR and liquidity values can be attributed to the very high ratios of foreign banks. The mean of ROA is 0.397, which shows low profitability and the provision of bad assets is 0.651, which shows that provisioning is an additional practice. To reduce the effects of extraneous variables, additional control variables and macroeconomic variables are included.

The empirical analysis begins by examining the impact of asset restructuring on financial health indicators using a fixed-effects model. Table 2 shows that the negative coefficient for AR across all models, which is significant at the 5% and 10% levels, indicates that increases in asset restructuring are linked with higher levels of restructured assets, reflecting banks' increasingly relying on restructuring mechanisms as a strategy to address rising NPAs. NPA provisions are positively and significantly associated with restructured assets in later models, implying that banks with higher AR allocate more NPA provisions [6]. However, high provisioning for NPAs may not necessarily help banks mitigate their risk [19].

Table 2. Impact of AR on NPA

Variables	Model 1	Model 2	Model 3
AR	-0.539*** (0.048)	-0.241** (0.128)	-0.173** (0.107)
NPA Prov	-	-2.065** (0.548)	-2.512** (0.547)
ROA	-	-0.457** (0.214)	-0.559** (0.220)
Size	-	-0.237 (0.410)	-0.132 (0.375)
I Div	-	-0.134* (0.065)	-0.169* (0.071)
CIR	-	2.326*** (1.275)	3.580** (1.818)
Inflation Rate	-	-	0.515* (0.312)
GDP Growth	-	-	-0.415* (0.135)
Repo Rate	-	-	0.594* (0.185)
Bank FE	Y	Y	Y
Year FE	Y	Y	N
Obs	607	607	607
R ²	0.121	0.198	0.252
F-Statistic	9.111	11.501	13.985

Note: -, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.
Source: calculations.

Table 3. Impact of AR on Z-score

Variables	Model 1	Model 2	Model 3
AR	0.333* (0.068)	0.236 (0.068)	0.224 (0.085)
NPA Prov	-	0.377 (0.169)	0.296 (0.146)
ROA	-	1.310* (0.410)	1.236* (0.388)
Size	-	0.340 (0.285)	0.151 (0.290)
I Div	-	0.191* (0.136)	0.260* (0.168)
CIR	-	-0.938** (0.429)	-1.220** (0.490)
Inflation Rate	-	-	-0.120 (0.095)
GDP Growth	-	-	0.495 (0.252)
Repo Rate	-	-	-0.267* (0.142)
Bank FE	Y	Y	Y
Year FE	Y	Y	N
Obs	607	607	607
R ²	0.065	0.389	0.245
F-Statistic	3.591	8.708	10.637

Note: *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.
source: calculations.

As table 3 shows, the positive AR coefficient in Model 1 (0.333*) indicates that restructuring may contribute to an initial improvement in financial stability. However, this effect is statistically insignificant in Models 2 and 3 after the inclusion of bank-specific and macroeconomic controls, thus showing that AR does not robustly contribute to financial stability. This is consistent with propose that restructuring tends to delay the identification of losses, thereby reflecting risks underlying bank stability [12]. The positive but insignificant coefficients on NPA provisions further indicate that provisioning alone does not significantly influence financial stability in this model. The effect of asset restructuring may be to help conceal distressed assets rather than improve their quality. This negative correlation implies that asset restructuring helps banks temporarily delay recording distressed assets, without actually addressing the underlying credit risks. This might result in hidden vulnerabilities developing in the banking industry over time.

Table 4. Impact of AR on capital adequacy ratio

Variables	Model 1	Model 2	Model 3
AR	-0.392* (0.141)	-0.326 (0.163)	-0.205 (0.170)
NPA Prov	-	-1.217 (0.625)	-1.593 (0.672)
ROA	-	1.221* (0.340)	1.233* (0.372)
Size	-	-1.854 (0.672)	-1.445 (0.736)
I Div	-	0.517* (0.230)	0.562* (0.268)
CIR	-	-2.242** (1.183)	-3.213*** (1.334)
Inflation Rate	-	-	-0.158 (0.046)
GDP Growth	-	-	0.670 (0.489)
Repo Rate	-	-	-0.467 (0.361)
Bank FE	Y	Y	Y
Year FE	Y	Y	N
Obs	607	607	607
R ²	0.045	0.120	0.180
F-Statistic	3.609	6.744	7.454

Note: *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. source: calculations.

Table 5. Impact of AR on loans to deposits

Variables	Model 1	Model 2	Model 3
AR	-8.449* (2.982)	-5.676 (3.178)	-5.185 (3.248)
NPA Prov	-	-5.377 (3.253)	-5.096 (3.626)
ROA	-	2.679* (2.148)	2.534* (2.014)
Size	-	-10.506 (4.700)	-12.549 (5.725)
I Div	-	7.390* (1.851)	7.834* (1.914)
CIR	-	-6.047 (5.440)	-7.232 (6.471)
Inflation Rate	-	-	-0.165 (0.110)
GDP Growth	-	-	3.094 (1.340)
Repo Rate	-	-	-1.768 (0.933)
Bank FE	Y	Y	Y
Year FE	Y	Y	N
Obs	607	607	607
R ²	0.045	0.140	0.190
F-Statistic	9.587	14.959	17.606

Note: *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. source: calculations.

In figure 3 shows that banks undergoing asset restructuring consistently exhibit lower liquidity and capital adequacy compared to non-restructured banks. This supports the empirical findings that restructuring constrains financial flexibility. Tables 4 and 5 indicate that the AR coefficient in the initial models is negative, suggesting that banks are making efforts to maintain or enhance their capital adequacy by restructuring to comply with RBI requirements. A negative correlation between asset restructuring and capital adequacy means that asset restructuring could eventually reduce the capital position of banks. This is because of the fact that asset restructuring increases risk, which means that capital should be raised. In such a situation, although asset restructuring would enable banks to recover loans, it would also put pressure on their long-term solvency. Unlike US and European banks, which heavily used securitisation to regain liquidity, the results indicate that higher AR activities in India correlated with falling liquidity, reflecting the pressure restructuring efforts exerted on the liquid assets of banks [21]. This implies that the process of restructuring assets might affect banks' liquidity positions, as money might be locked up in recovering such assets. The effect on the liquidity position stems from the trade-off between addressing NPAs and maintaining banks' liquidity. The negative impact on liquidity underlines the trade-off that banks must deal with between managing the NPAs through restructuring that involves long recovery periods and high transaction costs and ensuring that have adequate liquidity to meet their short-term obligations [13]. Liquidity did not emerge as a significant determinant in Models 2 and 3 mainly because of the insulation of RBI's stipulated 4% CRR and 21%

SLR.

Impact of Asset Restructuring (AR) on Bank Liquidity and Capital Adequacy (2015–2025)

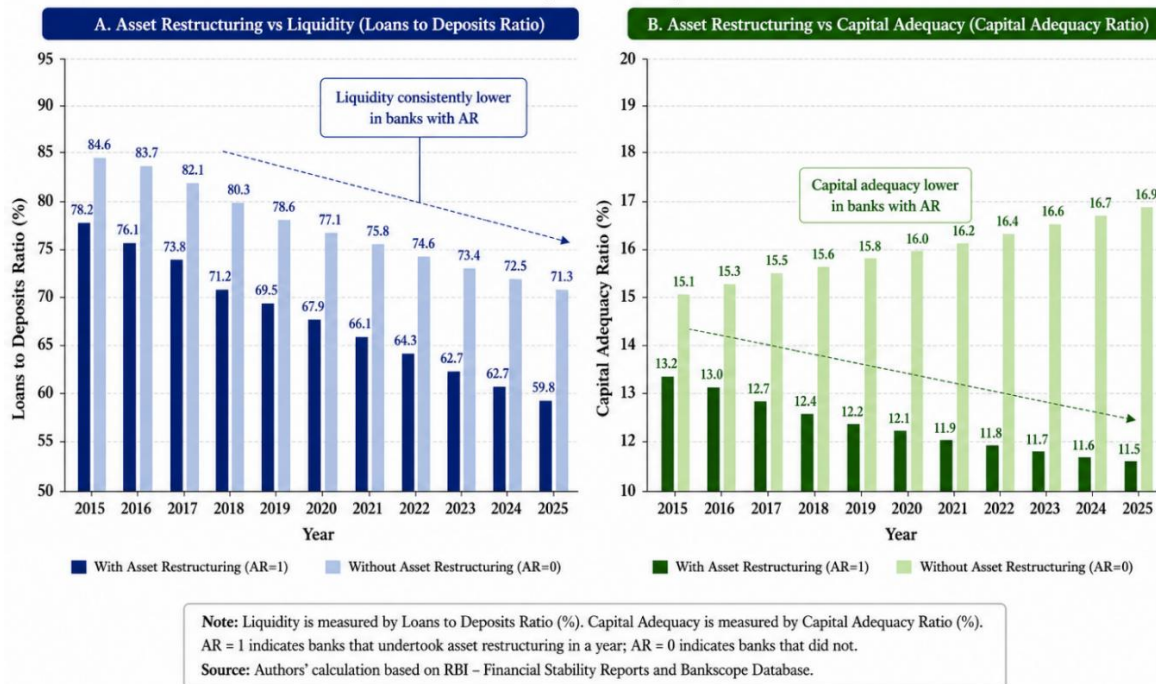


Figure 3. Impact of asset restructuring on bank liquidity and capital adequacy (2015–2025)

The negative ROA values in table 2 indicate that higher levels of asset restructuring are associated with reduced profitability, mainly due to lower interest income and higher costs. However, positive profitability may not be significantly affected by restructuring, provided the capital requirements for Indian banks remain strong ($\mu = 19.194$). NPAs are particularly high for larger banks, particularly public sector banks, which have greater exposure to stressed assets and find it difficult to maintain CAR [20]. These results suggest that banks that choose to undertake restructuring may be temporarily making gains in profitability by delaying losses at the expense of higher risk and reduced financial safety.

Table 6. Robustness check: two-step GMM results

Variables	Asset Quality	Z-Score	CAR	Loans/Deposits
Y_{t-1}	0.312** (0.142)	0.185 (0.221)	0.274* (0.159)	0.346** (0.168)
AR	-0.184 (0.156)	0.142 (0.198)	-0.487** (0.219)	-6.128** (2.874)
NPA Prov	2.480* (1.312)	0.254 (0.376)	1.892* (0.984)	-4.216 (3.542)
ROA	-0.460* (0.256)	0.682 (0.512)	1.456** (0.624)	2.954** (1.386)
Size	-0.178 (0.384)	0.224 (0.346)	-1.126 (0.782)	-8.452 (5.124)
I Div	-0.142 (0.098)	0.184 (0.164)	0.486 (0.312)	6.824* (2.148)
CIR	3.246** (1.624)	1.842* (0.986)	4.128** (1.842)	8.216* (4.326)
Inflation Rate	0.428 (0.356)	-0.086 (0.124)	-0.346* (0.186)	-0.264 (0.148)
GDP Growth	-0.286 (0.184)	0.312 (0.286)	0.542 (0.426)	2.592** (1.184)
Repo Rate	0.412 (0.264)	-0.186 (0.178)	-0.324 (0.384)	-1.446 (1.042)
Bank FE	Yes	Yes	Yes	Yes
Year FE	N	N	N	N
Obs	608	608	608	608
R ²	0.284	0.196	0.218	0.242
AR1	0.042	0.018	0.026	0.044
AR2	0.245	0.212	0.286	0.348

Note: *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Source: calculations. All bank-specific variables are treated as endogenous with lagged instruments—source:

calculations.

The analysis shows that the repo rate significantly affects NPAs, and higher interest rates exacerbate the challenges of managing restructured assets due to higher borrowing costs [22] [14]. However, a negative relationship, suggesting that banks can recover more interest income during high-rate periods, which decreases NPAs [17]. Additionally, a higher repo rate may filter out risky borrowers and thus NPA growth may be prevented. The analysis finds that macro-economic factors do not significantly impact NPAs [17]. The above-stated reductions in capital adequacy of approximately -0.5% and in liquidity of -6% are obtained from statistically significant coefficients estimated using the two-step GMM estimator (see table 6). The negative coefficients for the asset restructuring variables confirm the slight decline in capital levels and the large decline in liquidity levels. This value is an indicator of the average marginal impact of asset restructuring in enhancing bank performance measures, as shown in previous research studies. In general, the results obtained from all the regression models show clearly that asset restructuring cannot be seen as a sustainable way of enhancing bank performance but can only serve as a transient process.

The strength of the model is proved by the AR (1), AR (2), and Hansen tests. The lack of second-order autocorrelation shows the consistency of the model, whereas the Hansen test proves the validity of the instruments chosen. This shows that the GMM estimations are accurate and unbiased.

The two-step GMM model (Table 6) provides a comprehensive analysis of the effect of AR, bank-specific variables, and macroeconomic variables on the financial health indicators of banks. The results confirm that AR's impact on asset quality is statistically insignificant, which suggests that AR does not directly affect asset quality. However, the lagged asset quality variable (AQ_{t-1}) has a significantly positive impact, indicating persistence in asset quality over time, whereby the previous periods' asset condition significantly influences the current asset quality of banks. NPA provisioning has a positive effect on asset quality (coefficient: 2.480*), indicating that higher provisioning for NPAs improves asset quality by better managing risky assets. In contrast, ROA exhibits a statistically significant negative association (-0.460^*), implying that more profitable banks may assume more risk and consequently asset quality may deteriorate. The CIR also contributes significantly to this, showing that the more cost-efficient the asset is, the better it is.

The financial stability model does not attribute significant impact to AR, meaning that neither restructuring nor the bank's past performance has a significant influence on financial stability within the scope of the proposed model. Among the institution-specific control variables, only CIR has a significant positive impact on Z-Score, implying that more cost-efficient banks are financially stable. This makes it a point to ensure operational efficiency to ensure bank stability. NPA provisioning, ROA and macroeconomic factors have insignificant impacts on Z-Score.

The findings further indicate that asset restructuring reduces the strength of bank capital because restructured debt generates higher risk, which in turn drives higher capital requirements. NPA provisioning and ROA also have significant positive impacts on capitalization; it appears that prudent provisioning and profitability positively affect a bank's ability to maintain adequate capital buffers. CIR also plays a considerable role in emphasizing the importance of strengthening banks' capital positions. The adverse effect of inflation on capital adequacy reflects broader economic forces exerting pressure on banks' capital base. For liquidity, AR has a significant negative impact, showing that restructuring curtails liquidity in Indian banks despite its stated goal. This may be because restructuring efforts prioritize stabilizing long-term solvency over short-term liquidity. Notably, ROA (2.954^{**}) and GDP growth (2.592^{**}) have suggestive positive impacts on the loan-to-deposit ratio, as does CIR, supporting the evidence that cost-efficient banks are better able to maintain liquidity. The overall results of the hypothesis tests for the empirical estimates are summarized in table 7.

The results align with the hypothetical expectations and simultaneously reveal unique characteristics of the Indian banking sector. Asset restructuring has historically served as an effective tool in the Indian banking system for managing distressed corporate debt. The peaks in asset restructuring in 2018 and 2022 are significantly correlated with deteriorating asset quality, reflecting the considerable risks AR

presents. These risks are reflected in the NPA provisions, lower profitability, and operational inefficiencies under high degrees of restructuring [18]. The present study finds that AR has mixed, and in many cases, adverse effects on the asset quality of Indian banks. The outcome suggests that while AR may delay loan defaults in the short term, it exerts pressure on asset quality and financial health over the long term. The findings confirm that AR allows the deferral of the recognition of distressed assets [9][21][13]. Therefore, Indian banks need to be cautious when implementing restructuring initiatives and to balance these efforts with initiatives to improve operational efficiency and profitability to offset the negative effects on asset quality. Restructuring is therefore a blessing and a curse that needs to be managed and supervised strategically [10].

Table 7. Hypothesis test result

Hypothesis	Statement	Result
H ₁	Asset restructuring is an effective mechanism to enhance asset quality in the Indian banking sector.	Not Supported
H ₂	Asset restructuring significantly contributes to enhancing financial stability.	Not Supported
H ₃	Asset restructuring reduces the ability to form capital.	Supported
H ₄	Asset restructuring moderates' liquidity creation.	Supported

The overall impact on Z-scores among the models shows that the size of the bank does not necessarily cushion institutions against the risks brought about by AR. The bigger banks might have more resources and be more diversified in their portfolios, but not immune to the distressed assets, as the examples of PNB, SBI and IDBI Bank demonstrate. Overall, the analysis shows that while AR is an important tool for managing distressed assets, it adversely affects bank stability. The Z-score analysis, in conjunction with the AR data, indicates how delicate an equilibrium bank must hold when dealing with NPAs and maintaining long-term stability. Heavy reliance on restructuring increases financial risk, as evidenced by lower Z-scores, underscoring the need for stronger risk management strategies. The comparatively low R² values in the models developed are mainly attributable to the effects of unobservable factors on financial stability. As mentioned by Jin and Myers (2006), the importance and direction of model coefficients are more meaningful than the level of explanatory power.

Based on the findings, the following action plans may be considered:

- The banking sector is advised to avoid overreliance on restructuring and enhance the credit appraisal process.
- The regulatory bodies need to monitor the restructured loans effectively to ensure that there is no moral hazard problem.
- The banks need to increase their capital to hedge against any restructuring risks.
- The liquidity position of the bank's needs improvement.

CONCLUSIONS

The present study aimed to investigate the effect of asset restructuring (AR) in the resolution of non-performing assets (NPAs) and financial stability of Indian banking system. The study analyzed the effect of AR on the asset quality, financial stability, capital adequacy, and liquidity of the 97 scheduled commercial banks across 608 observations over the period 2015–2025 using two-step system GMM estimation method. The results show that the restructuring of assets has no significant effect on financial stability in terms of the Z score nor on long-term asset quality, suggesting that restructuring of assets is not enough to resolve credit quality issues. The empirical findings present valuable statistical information about the trade-offs that are involved in restructuring mechanisms. GMM estimates indicate that capital adequacy and liquidity are adversely affected by restructuring of assets with estimates of about 0.5% and almost 6% respectively. The findings also show that the provisioning and the efficiency in running the NPA has positive effects on the bank capitalization and stability and profitability is also an important factor to enhance liquidity performance. However, excessive reliance on restructuring will lead to recognition of losses being delayed and increasing systemic risk in the long term. The paper is a

new addition to the literature since it provides a part of the dynamic empirical evidence on the systemic implications of AR in a growing economy. The results indicate that regulators and banks need to enhance monitoring mechanisms, credit appraisal processes, capital and liquidity buffers and carry out restructuring programs. Despite this contribution, the study has a number of shortcomings including absence of information on the borrower level, absence of sector specific analysis and absence of evaluation of the quality of the collateral. Future research may include comparative analysis of the borrower information of firms, both in emerging economies and the impact of regulatory reform such as Insolvency and Bankruptcy Code (IBC). Another area that is worth exploring is the connection between the asset restructuring, alternative resolution tools, and digital risk-monitoring systems to gain more insight into the possibility of their contribution to the stability of banks over the long term.

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