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## What Explains NPAs in India's Banks? Assessment of Bank Specific Factors

Santosh Kumar Das

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# **What Explains NPAs in India's Banks?**

## **Assessment of Bank Specific Factors**

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# What Explains NPAs in India's Banks?

## Assessment of Bank Specific Factors

*Santosh Kumar Das\**

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*[Abstract: From the perspective of a bank, the determinants of NPAs can be classified into two major categories – internal factors and external factors. Internal factors are those which are internal to the banks and their operation. On the other side, external factors are external to the banks and their operation. The paper has analysed the determinants of NPAs in India's banks using factors that are internal to the banks for the period 2005 to 2020. A panel estimation of a total of 45 public sector, private, and foreign banks suggests that the earnings management and the quality of lending are responsible for the NPA crisis in India's banks. Operating cost has not contributed to the mounting of NPAs as generally perceived. It therefore suggests that there is a need for revisiting the earning and lending strategy of the banks in India.*

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### 1. Introduction

India's banking sector is facing the daunting challenge of growing incidence of loan failures, which has resulted in substantial rise in the accumulation of non-performing assets (NPAs). The mammoth volume of NPAs is a matter of concern as it can potentially affect the stability of the banking system. Given the important role that banks play in the process of financial intermediation in a developing country like India, the deterioration in the quality of their asset is likely to result in adverse consequences for growth and development.

India's banking system is dominated by its public sector banks (PSBs) in all spheres of banking operation. However, in recent years, especially during the period of liberalisation, there has been a significant decline in their dominance. However, PSBs continue to

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function as banker to the country. This bank group constitutes nearly 60 percent share in banking assets, 65 percent share in bank deposits, and nearly 60 percent share in total advances. On the other side, the presence of private banks has increased significantly.

In recent years, the incidence of bad loans or loan failures in India's banks has increased considerably. The current crisis in India's banking sector is largely due to the unprecedented accumulation of bad or non-performing loans. Banks, irrespective of their ownership, have registered substantial volume of bad loans, though the incidence of NPA is prevalent in the PSBs in comparison to the private and foreign banks. The widespread prevalence of bald loans came to light with the conduct of asset quality review (AQR) in 2015 by the Reserve Bank of India (RBI). As per the recent data, the gross non-performing asset (GNPA) ratio of all scheduled commercial banks (SCBs) improved marginally to 7.5 percent as of March 2021 (RBI, 2021). While there has been a marginal decline in the NPAs, the volume of NPAs is worrisome. Moreover, the accumulation of NPAs by the PSBs continues to be a cause of concern, though in recent years there has been a rise in the NPA volume of the private banks, too. As of March 2021, the GNPA ratio of PSBs stood at 9.5 percent. The volume of NPAs in all SCBs stood at Rs 896082.5 core (as of March 2020), of which PSBs constitute more than 75 percent (Rs 678317 crores). The NPA volume of private banks stood at Rs 205848 crores, which is about 23 percent of the total outstanding NPAs. Between 2016 and 2019, there was rapid increase in the volume of NPAs in the private banks. However, the GNPA ratio of the foreign banks declined to 2.4 percent as of March 2021. Given its unfavourable impact on the banks and the economy in general, it is important to understand the major contributing factors that have led to such large volume of NPAs. Identifying the causes of NPAs will be helpful for formulation of appropriate policy to contain it.

There can be several contributing factors responsible for the accumulation of NPAs in Indian banks. From a bank's perspective, the determinants of NPAs can be classified into two major categories – internal factors and external factors. Internal factors are those which are internal to the banks and their operation. On the other side, external factors are external to the banks and their operation. External factors that have been identified in the literature as major determinants of NPAs include adverse economic conditions, weak banking regulations and supervision, inadequate corporate governance, and weak market monitoring. The key internal factors at the sphere of banks and their operation that have been identified as major drivers of NPAs include operational inefficiency, allocative inefficiency, and capital adequacy.

The paper analyses the factors responsible for NPAs in India's banks, with focus on the bank specific factors or drivers of NPAs. Consequently, the determinants of NPAs using bank specific variables have been estimated. The paper spreads over five sections. The background of the paper is presented in the Introduction section. A brief review of literature discussing the major internal factors that drive loan failure is presented in the following section. While the data, variables, and estimation model are elaborated in the methodology section, the findings of the study are discussed in the following section. The

summary of the paper describing the findings and its potential implication for policy is elaborated in the concluding section.

## 2. Review of Literature

The factors responsible for NPAs can broadly be categorised into internal and external factors from the banks' perspective. While the internal factors refer to issues that are internal to the bank and its operation, the external factors are largely issues that are external to the bank and its operation. External factors that have been identified in the literature as major determinants of NPAs include adverse economic conditions, weak banking regulations and supervision, inadequate corporate governance, and weak market monitoring. The key internal factors, at the sphere of banks and their operation, that have been identified as the major drivers of NPAs include operational inefficiency, allocative inefficiency, and capital adequacy. This section elaborates on the major contributing factors responsible for loan failures in banks, with focus on the bank specific factors or drivers of NPAs in India's banks.

### 2.1 Operational Aspects

*Operational (in)efficiency:* Managerial inefficiency can result into operational inefficiency, which can lead to higher NPAs in banks. Due to the agency problem between the shareholders and managers of the bank, there is high possibility that managers will pursue the high loan growth objective over efficiency. It is because the performance of the managers is usually assessed on the indicators of expansion of business, which is expansion of lending in this case. This might result in banks willing to undertake risky lending by providing greater proportion of loans to borrowers with compromised credit quality. The increase in the proportion of low quality credit might lead to higher proportion of assets turning into NPAs. The agency problem is greater for the banks with diversified ownership as opposed to banks with concentrated ownership (Salas and Saurina, 2002; and, Kwan and Eisenbeis, 1997). According to the 'bad management hypothesis,' poor management quality, as reflected in operational inefficiency, is likely to result in poor credit appraisal and weak monitoring system. The decline in such efficiency is likely to increase NPAs (Berger and DeYoung, 1997; and, Resti, 1995). Low cost efficiency is an indication of poor management practices. It can possibly happen in a scenario when the managers do not monitor and control their operating expenses efficiently. The absence of practice of adequate loan underwriting, monitoring, and control can result in inefficiency. Usually managers with poor credit rating skills choose a higher proportion of loans with very low or negative net present values. They fail to appraise the value of collateral pledged against loans. They do not monitor borrowers after the loan is provided to ensure the borrower complies with the covenants. Because of bad management or poor management on part of the managers of banks, the operating expenses increase and result in lower cost-efficiency, which in turn leads to higher NPAs (Berger and DeYoung, 1997).

*Bank Capital:* According to the moral hazard hypothesis, banks with lower capital take on more risk in the presence of deposit insurance because part of the risk is borne by another party, and this might cause NPAs to rise (Berger and DeYoung, 1997). So, banks with higher capital (which could be a proxy for leverage) have higher operating efficiency and they tend to take less credit risk compared to those with lower capital (Kwan and Eisenbeis, 1997).

*Ownership Concentration:* Ownership concentration is another factor that can potentially lead to increase in NPAs. It is argued that increased ownership concentration leads to increased liquidity of the banks. A study by Chalermchatvichien *et al.* (2014) finds the inflection point of ownership to be at 41.91 percent. Below this threshold level, the relationship between ownership concentration and capital stability tends to be negative. On the other side, above this point, the relationship tends to be positive. Therefore, with the increase in ownership concentration, banks become more capitalised and more stable. In a limited liability firm, owners do not have their capital locked in a particular firm. In order to increase the value of their capital, they have the incentive to push the banks to assume greater risk. On the other side, banks with greater ownership concentration are likely to avoid greater risk-taking due to pressure from its shareholders. Therefore, market-discipline is imposed on banks through greater ownership concentration, which leads to better capital adequacy, liquidity, and stability of banks (Chalermchatvichien *et al.*, 2014).

*Branch Expansion:* When banks expand their branch network and enter a new geographical area or market, there is a possibility of the problem of adverse selection. If the bank does not have any past experience in the sector or geographical area in which it intends to operate, then there is high possibility of higher NPAs due to the adverse selection problem. This problem arises due to the fact that the bank may not be in a position to adequately assess the quality of the borrowers. There is a high possibility that the newly entrant bank will receive low quality loan application or borrowers who have not been provided loans by other banks in the locality (Salas and Saurina, 2002).

*Bank Competition:* The degree of competition among banks is another factor that can potentially contribute to the problem of loan defaults. Higher competition might result in compromising with credit standards and screening of borrowers. In the process of competition, the managers of banks tend to take untimely risk. Often, they are tempted to lend to customers with lower credit quality, which might translate into higher loan defaults. Therefore, higher competition could lead to higher NPAs (Salas and Saurina, 2002).

## **2.2 Credit Model of Banks**

Any shortcomings in credit appraisal such as lack of rigorous verification and screening of applications, absence of supervision subsequent to credit disbursal or any shortcomings in credit disbursal mechanism and recovery mechanism of banks can lead to larger NPAs (Gandhi, 2014). There are three critical components of the credit model of a bank – the

process of screening of loan applications, assessment of risk, and supervision and monitoring of loans. The overall credit approach of a bank also plays an important role.

***Screening of loan applications:*** Screening of loan applications is critical to the future performance of the loans. In this process, the bank must carefully assess the credit risks associated with a loan application. The assessment of credit risk includes knowing the risk, measuring it, and controlling it to keep it within the bank's risk appetite. Firstly, the credit risk comes from the possibility that a business might not take off as expected (Vishwanathan, 2016). While a credit proposal is made, it is quite possible that the project report submitted was optimistic but the projections have either not been achieved or have become unachievable over time due to several external factors. This requires proper evaluation of a business proposal to see whether the projections are close to reality. This is done through a sensitivity analysis by the banks before credit approval. Several factors should be taken into consideration while evaluating the project, such as competition from abroad, domestic competition, and forex risks (Vishwanathan, 2016). If the underwriting standards are lowered, it may result in deterioration of asset quality of banks. A strong underwriting system requires proper understanding and mitigation of risks, which can be done through portfolio diversification. A credit portfolio that is highly concentrated in terms of counter-party, geography, or economic activity is likely to be riskier than diversified portfolios. Another element of pre-disbursement credit risk control is waiving sanction terms. If banks waive sanction terms liberally, without being careful of the risk, it could lead to higher credit risk for the bank, resulting in poor asset quality. A proper evaluation of the waivers, modifications, and suggestions of alternate measures to substitute waived requirements would help in reducing credit risk significantly (Vishwanathan, 2016).

***Risk assessment model of banks:*** Banks usually use internal credit ratings mechanisms or external ratings by credit rating agencies for assessment of credit risk of a loan application. Both the mechanisms help the bank in assessing the credit risk of loan profiles. Credit ratings are forward looking assessments by external credit rating agencies of the ability and willingness of the borrower to meet their obligations in time. Since credit ratings are a measure of credit risk, it has a strong relationship with NPAs. Borrowers with higher credit ratings are likely to have lower probability of default on their loans (Gandhi, 2014). Banks can use external ratings of credit rating agencies before disbursing loans either individually or by combining them with their own internal credit ratings in order to check the growth of NPAs and stressed assets. However, banks need to be cautious of the dangers of over dependence on external credit ratings. The 'issuer pays' model in which the borrower pays to obtain the rating – which our country also follows – was seen as a cause of the financial and economic crisis in the United States. In this model, the credit rating agencies tend to inflate the ratings with an objective to retain the existing clients and acquire new clients. The income and profits of such rating agencies depends on the volume of ratings they assign (Gandhi, 2014). Lack of effective co-ordination between banks and

financial institutions with regard to large value projects, even at the implementation stage, can lead to higher NPAs (Muniappan, 2002).

***Supervision of loan profiles:*** After the disbursal of credit, a strong monitoring system is essential to avoid funds being used for purposes other than those for which loans were taken (Vishwanathan, 2016). Inadequate supervision or monitoring has led to diversion of funds, which can further result in higher NPAs (Muniappan, 2002). Close monitoring mechanism is helpful as it keeps track of the progress of the funded project. It will help reduce the risk of default and also diversion of funds. Internal audit officers must provide assurance to the senior management and the board on how effectively the organisation identifies, assesses, and manages its risks. In the case of any discrepancy in the functioning of any of the three departments, the bank will face higher risk of default and deterioration in asset quality (Vishwanathan, 2016).

***Credit approach (concentration):*** Credit concentration in a few sectors like energy, real estate, and construction is another factor that can potentially lead to higher NPAs, as the banks are exposed to greater risk of default in case of an adverse shock, like closing of a major plant which could have ripple effect on other firms in that sector (Keeton and Morris, 1987). It is also argued that large banks are more likely to have higher opportunities for portfolio diversification as compared to smaller banks. The large banks are better placed to manage their credit risk compared to smaller banks and so they have lower probability of default compared to smaller ones (Keeton and Morris, 1987).

### **3. Data and Methodology**

#### **3.1 Data**

For estimation purpose, a total of 45 SCBs have been considered. It includes 20 PSBs, 20 private banks, and five foreign banks. These 45 banks constitute more than 98 percent of the key banking indicators like assets, deposits, and lending. For estimation purpose, data has been used for the time period 2005 to 2020. The annual data for a sample of 45 banks have been obtained from various publications of the RBI. The RBI publications include Statistical Tables Relating to Banks in India, the Handbook of Statistics on Indian Economy, and Annual Reports of the Banks. Separate estimations have been carried out as per bank groups.

#### **3.2 Variables**

In this study, the determinants of NPAs in India's banks have been estimated for all banks and separate bank groups like the PSBs and the private banks. The dependent variable NPA is determined by a set of variables or factors that are internal to the banks. In the estimation, the net non-performing asset (NNPA) has been used as a proxy for NPAs. In the estimation, NNPA has been used as the dependent variable. The following set of explanatory variables has been used that are internal to the banks and their operation –

Operating Cost (OC), Interest Income (II), Non-Interest Income (NII), Loans to Sensitive Sector (LSS), Capital Adequacy Ratio (CAR), Return on Assets (ROA), and Secured Loans (SL).

**Non-Interest Income to total income and NPAs:** This ratio signifies diversification of bank business. Some studies have found a positive relationship between non-interest income to total income ratio, signifying that banks that focus more on diversifying their businesses overlook basic banking services and so they have lower NPAs (Bawa *et al.*, 2019).

**NIM & NPAs:** NIM is the difference between interest income earned and interest paid to depositors as a percentage of total assets of a bank. It reflects a bank's earnings quality. Studies have found a negative relationship between NIM and NPAs, which tells us that a decrease in interest margin may induce a bank to take on more risk by lending more, in order to earn more interest. This could lead to higher NPAs (Dhar and Bakshi, 2015; and, Salas and Saurina, 2002).

**ROA and NPAs:** ROA is a measure of profitability of banks. Banks with good managerial efficiency are able to convert their asset into returns. Thus, a good management would lead to lower NPAs. The relationship between NPA and ROA is negative (Dimitrios, Helen, and Mike, 2016; and, Godlewski, 2004).

**Capital Adequacy Ratio and NPAs:** Higher capital adequacy shows that a bank has higher strength to absorb risks. Studies have found a negative relationship between NPAs and capital adequacy (Makri, Tsagkanos, and Bellas, 2014; and, Bardhan and Mukherjee, 2013). This shows that the higher the capital adequacy of a bank, the lower will be its NPAs.

**Ratio of intermediation cost to total assets:** It represents a bank's operating capability. A bank with higher intermediation costs would mean that it spends more on loan monitoring, which would reduce the credit risk of default, leading to lower NPAs of the bank. Thus, there is a negative relationship between intermediation cost and NPA (Bawa *et al.*, 2019).

**Loan to sensitive sectors and NPAs:** Higher lending to sensitive sectors by banks increases NPAs because the credit risk of banks increases. Thus, there is a positive relationship between NPAs and loans to sensitive sector (Dhar and Bakshi, 2015).

### 3.3 Estimation Model

In order to examine the factors that are responsible for NPAs, which are internal to the banks and their operation, the determinants of NPAs using bank specific variables have been estimated. Panel data estimation has been undertaken to estimate factors that have affected NPAs in Indian banks. The determinants of NPAs have been estimated with the following functional relationship.

$$NNPA_{i,t} = \beta_0 + \beta_1 \text{Operating cost}_{i,t} + \beta_2 \text{interest income}_{i,t} + \beta_3 \text{non - interest income}_{i,t} + \beta_4 \text{capital adequacy}_{i,t} + \beta_5 \text{loans to sensitive sectors}_{i,t} + \beta_6 \text{return on assets}_{i,t} + \beta_7 \text{secured loans}_{i,t} + \varepsilon_{i,t} \quad [1]$$

where,  $i = \text{bank}, 1, \dots, 45$ , and  $t = \text{time}, 1, \dots, 16$ .  
 $\varepsilon_{i,t}$  is the error term.

Both the FE and RE models will be estimated to examine the factors that determine NPAs in Indian banks.

The following FE model will be estimated to explore the determinants of NPAs.

$$NNPA_{i,t} = C + \beta_1 OC_{i,t} + \beta_2 II_{i,t} + \beta_3 NII_{i,t} + \beta_4 CRA_{i,t} + \beta_5 LSS_{i,t} + \beta_6 ROA_{i,t} + \beta_7 SL_{i,t} + \mu_i + u_{i,t} \quad [2]$$

where,  $i = \text{bank}, 1, \dots, 45$ , and  $t = \text{time}, 1, \dots, 16$ .

In equation (2), the dependent variable  $NNPA_{i,t}$  is determined by a set of regressors that includes the bank specific variables. The unobserved individual bank effect is  $\mu_i$ , and random error is  $u_{i,t}$ . It is assumed that the set of explanatory variables is uncorrelated with the error term  $u_{i,t}$ , and the error term is normally distributed,  $u_{i,t} \sim N(0, \sigma_u^2)$ , where,  $\sigma_u^2 > 0$ .

The following RE model will be estimated to analyse the determinants of NPAs in Indian banks

$$NNPA_{i,t} = C + \beta_1 OC_{i,t} + \beta_2 II_{i,t} + \beta_3 NII_{i,t} + \beta_4 CRA_{i,t} + \beta_5 LSS_{i,t} + \beta_6 ROA_{i,t} + \beta_7 SL_{i,t} + \mu + u_{i,t} + \varepsilon_{i,t} \quad [3]$$

#### 4. Analysis of Results

The above equations (2 & 3) have been estimated to analyse the factors that affect NPAs in Indian banks. The estimation is focused on exploring the determinants of NPAs that are internal to the banks. Both the FE model and RE model have been estimated for all banks (45 banks); PSBs (20 banks), private banks (20) and foreign banks (5).

Both the FE and RE models were estimated to explore the determinants of NPAs in Indian banks for the period 2005 to 2020. The FE model estimation of 45 banks suggests that there exists an inverse relationship between NPAs and operating cost. The relationship is statistically significant (Table 1). As discussed, the operating cost reflects the operational efficiency of a bank, which ultimately reflects the quality of management. Higher operating cost reflects lower efficiency, which might indicate poor management, including management of credit. Also, it can lead to higher NPAs (Berger & DeYoung 1997). Berger & DeYoung (1997) have also argued differently, suggesting that higher efficiency gained due to lower operating cost might also result in higher NPAs in the future as the banks have not spent adequate resources in the credit appraisal and monitoring. The inverse relationship as suggested in the results indicate that the banks spend significant amount on evaluation and monitoring of the projects, which results in low NPAs. The non-interest income is found to be positively associated with NPAs and the relationship is statistically significant. The ROA, which reflects the earnings management of a bank, is found to be negatively associated with NPAs and the association is statistically significant. It suggests that banks with lower earnings tend to take excessive risk in lending, which can turn into

NPAs. Secured loan as a percentage of total loans is found to be positively associated with NPAs. It has been discussed in the literature that usually there will be an inverse relationship between the two. A higher share of secured loans should ideally result in less credit risks (Boot and Thakor, 1994). The relationship between NNPA and secured loans is found to be statistically significant in the case of FE estimation. The results of FE model show that it is largely the operational inefficiency, earning inefficiency, and loan quality that has resulted in higher NPAs in Indian banks. The results of the RE model also suggest similar relationships.

**Tables 1: Bank Specific Determinants of NPAs: All Banks, 2005–2020**

Dependent Variable: NNPA

<i>Independent Variables</i>	<i>FE Model</i>	<i>RE Model</i>
OC	-5.643** (1.897)	-6.150*** (1.685)
II	0.0249 (0.285)	0.0726 (0.210)
NII	1.122*** (0.269)	1.020*** (0.219)
LSS	-0.00567 (0.00716)	-0.00197 (0.00484)
CAR	0.0144 (0.0309)	-0.000659 (0.0327)
ROA	-1.658*** (0.174)	-1.728*** (0.173)
SL	0.0438** (0.0143)	0.0101 (0.00824)
Constant	0.190 (1.416)	3.321** (1.101)
Observations	687	687
R <sup>2</sup>	0.674	
Hausman Statistics	27.87 (0.18)	

Notes: Standard errors in parentheses; \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ ; Hausman statistic is asymptotically  $\chi^2$  distributed with p-values in brackets

Source: Author's calculation.

The Hausman Test was conducted to confirm an appropriate test between FE and RE. The Hausman test result indicates that the RE estimate is appropriate for the drawn sample as the value of 'p' is greater than 0.05 (Table 1). As per the estimates of the RE model, there are three critical factors that seem to be affecting NPAs in India's banks. These are: operating cost, non-interest income, and earnings management as reflected in ROA. It exhibits an inverse relationship between OC and NPAs, thereby suggesting that high operating cost due to greater provision for project evaluation and monitoring can result in low NPAs. Increase in NII income also drives the banks to undertake risky lending, which results in high NPAs. The earnings of the banks (ROA) demonstrates an inverse relationship with NPAs. It suggests that lower earnings drive excessive risk taking or that undertaking risky projects in order to maximise the earnings by the banks results in NPAs.

The results of the determinants of PSBs for the time period 2005 to 2020 shows that there exists a negative relationship between NPAs and operating cost (Table 2). However, the relationship is not found to be statistically significant in case of both the estimations. The

estimation results of both the FE and RE model suggest similar direction in terms of association between the independent variable and the explanatory variables. The results show that there exists an inverse relationship between the NPAs and interest income. The association is statistically significant. The ROA is found to be negatively associated with the NPAs in PSBs in India. The result broadly suggests that banks have taken excessive risks to maximise earnings, which has led to greater credit risk. The quality of lending as reflected in the lending to sensitive sectors and the share of secured loans in total loan portfolio have also contributed to NPAs in PSBs. However, the relationship is not statistically significant. One interesting aspect that emerges from the estimation is that in PSBs, it is largely the weak earnings management which is responsible for high NPAs. Operational efficiency is not found to be a critical factor in the accumulation of NPAs in PSBs. The Hausman test indicates the RE model to be appropriate for the sample (Table 2).

**Table 2: Determinants of NPA in PSBs, 2005–2020**  
Dependent Variable: NNPA

<i>Independent Variables</i>	<i>FE Model</i>	<i>RE Model</i>
OC	-1.586 (4.645)	-0.512 (3.910)
II	-0.795* (0.316)	-0.794* (0.344)
NII	1.100 (0.774)	1.009 (0.767)
LSS	0.0373 (0.0360)	0.0226 (0.0234)
CAR	-0.112 (0.101)	-0.121 (0.105)
ROA	-0.608** (0.206)	-0.741** (0.243)
SL	0.0381 (0.0329)	0.0549* (0.0264)
Constant	2.058 (3.207)	0.850 (2.344)
Observations	316	316
$R^2$	0.867	
Hausman Statistics	27.96 (0.177)	

Notes: Standard errors in parentheses; \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ ; Hausman statistic is asymptotically  $\chi^2$  distributed with p-values in brackets

Source: Author's calculation.

The results of the determinants of NPAs in private banks show that operational management, reflected in operating cost, is negatively associated with NPAs (Table 3). As per the estimations of RE model, their association is found to be statistically significant. It suggests that operational inefficiency is not the reason behind rising NPAs in private banks. The indicators of earnings management as reflected in interest income and non-interest income suggest that their association with the NPAs is positive. However, the ROA is found to have inverse association with the NPAs. It suggests that excessive risk aimed at maximising earnings though lending had resulted in high NPAs in private banks. The Hausman test result suggests that the RE model is appropriate for the sample (Table 3).

**Table 3: Determinants of NPA in Private Banks, 2005–2020**

Dependent Variable: NNPA

<i>Independent Variables</i>	<i>FE Model</i>	<i>RE Model</i>
OC	-3.068 (3.303)	-6.270*** (1.818)
II	0.575** (0.145)	0.425*** (0.112)
NII	0.669 (0.478)	0.861* (0.352)
LSS	-0.00243 (0.00389)	0.00137 (0.00329)
CAR	-0.000494 (0.0206)	0.0110 (0.0203)
ROA	-1.609*** (0.167)	-1.720*** (0.145)
SL	0.0194 (0.0152)	0.0159 (0.0106)
Constant	0.489 (1.627)	1.806 (1.073)
Observations	288	288
R <sup>2</sup>	0.634	
Hausman Statistics	9.15 (0.992)	

Notes: Standard errors in parentheses; \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ ; Hausman statistic is asymptotically  $\chi^2$  distributed with p-values in brackets

Source: Author's calculation.

Data suggests that NPAs started rising after 2013 and more so after the AQR exercise in 2015. Therefore, it is important to understand the factors that have led to high NPAs in the Indian banks during the post-crisis period. The estimation results of determinants of NPAs in Indian banks for the post-crisis period show that operational inefficiency as reflected in high operating cost is found to be negatively associated with NPAs (Table 4). On earnings indicators, both the interest income and ROA are found to be negatively associated with NPAs, thereby suggesting that banks have undertaken risk lending which has resulted in credit risk. Secured loans as a share of total lending is found to be positively associated with NPAs. The relationship is statistically significant in the case of FE estimation. In the literature, it has been discussed that usually there will be an inverse relationship between the two. Higher share of secured loans should ideally result in less credit risks (Boot and Thakor, 1994). However, the inverse relationship can also hold true in a scenario where the asset prices are in a downward spiral due to several macroeconomic factors. The scenario of devaluation of mortgaged assets due to a fall in asset price may encourage the borrower to default as the loan repayment amount is substantially higher than the value of the asset. The Hausman test result indicates that the FE model is appropriate for the sample as the 'p' value is smaller than 0.05 (Table 4).

A closer look at the determinants of NPAs of PSBs during the post-crisis period shows that it is largely the earnings indicators like interest income and ROA which explain high NPAs in the PSBs (Table 5). The relationship between the NPAs and the interest income and ROA is found to be negative. It suggests that to maximise earnings, PSBs have undertaken risk lending which has resulted in credit risk and loan failures. Secured loans is found to be positively associated with the NPAs. As discussed, it is due to depreciation of asset prices, which can potentially lead to loan failures. To sum up, in the case of NPAs in PSBs in recent

years, weak earnings and devaluation of collaterals have played key roles in the increase in NPAs. Between FE and RE, the Hausman test result suggests that the FE is appropriate for the sample (Table 5).

**Table 4: Determinants of NPAs: All banks, Post-Crisis Period (2011–2020)**

Dependent Variable: NNPA

<i>Independent Variables</i>	<i>FE Model</i>	<i>RE Model</i>
OC	-7.343 (4.290)	-7.899** (3.065)
II	-0.931* (0.439)	-0.779* (0.368)
NII	2.306*** (0.462)	1.648*** (0.409)
LSS	-0.0412 (0.0345)	-0.0104 (0.0143)
CAR	0.0380 (0.0514)	-0.00243 (0.0528)
ROA	-1.273*** (0.207)	-1.504*** (0.217)
SL	0.0736*** (0.0192)	0.00366 (0.0101)
Constant	-1.346 (1.497)	4.969*** (1.291)
Observations	430	430
R <sup>2</sup>	0.658	
Hausman Statistics	48.64 (0.00)	

Notes: Standard errors in parentheses; \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ ; Hausman statistic is asymptotically  $\chi^2$  distributed with p-values in brackets

Source: Author's calculation.

**Table 5: Determinants of NPAs: PSBs, Post-Crisis Period (2011–20)**

Dependent Variable: NNPA

<i>Independent Variables</i>	<i>FE Model</i>	<i>RE Model</i>
OC	-4.886 (5.103)	-4.772 (4.828)
II	-1.320* (0.510)	-1.303** (0.465)
NII	1.528 (1.593)	1.903 (1.381)
LSS	0.0353 (0.0645)	0.0284 (0.0416)
CAR	-0.0370 (0.143)	-0.0744 (0.152)
ROA	-0.443 (0.243)	-0.653* (0.261)
SL	0.0927* (0.0424)	0.107** (0.0377)
Constant	-2.492 (3.363)	-3.190 (3.296)
Observations	200	200
R <sup>2</sup>	0.845	
Hausman Statistics	48.08 (0.00)	

Notes: Standard errors in parentheses; \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ ; Hausman statistic is asymptotically  $\chi^2$  distributed with p-values in brackets

Source: Author's calculation.

The estimation results of private banks for the post-crisis period show that operational inefficiency, as reflected in rising operating cost, is found to be negatively associated with NPAs (Table 6). The non-interest income is found to be positively associated with NPAs, which is contrary to the dominant understanding that higher non-interest income is likely to reduce NPA. In this case, the positive association between NPAs and non-interest income may happen due to risky lending with the understanding that as the overall earning of the bank is robust, there is some room for risk taking. This is reflected in negative ROA that suggests that banks have undertaken risky lending to maximise earnings. In order to identify an appropriate estimate for the sample, the Hausman test was conducted. It suggests that the FE is appropriate for the sample as the 'p' value is less than 0.05 (Table 6).

**Table 6: Determinants of NPAs: Private Banks, Post-Crisis Period (2011–20)**

Dependent Variable: NNPA

<i>Independent Variables</i>	(1)	(2)
OC	-2.400 (6.567)	-8.351** (2.886)
II	-0.219 (0.392)	-0.0486 (0.352)
NII	2.360* (1.016)	1.246* (0.613)
LSS	-0.0721 (0.0639)	0.000979 (0.0190)
CAR	0.00836 (0.0471)	0.0108 (0.0361)
ROA	-1.513*** (0.250)	-1.642*** (0.131)
SL	0.0412 (0.0254)	0.00774 (0.0157)
Constant	-1.818 (1.809)	2.487 (2.302)
Observations	180	180
R <sup>2</sup>	0.610	
Hausman Statistics	28.9 (0.0264)	

Notes: Standard errors in parentheses; \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ ; Hausman statistic is asymptotically  $\chi^2$  distributed with p-values in brackets

Source: Author's calculation.

## 5. Conclusion

There are several contributing factors that are likely to have impacted the NPAs in Indian banks. Broadly, these factors can be classified into two from a bank's perspective – internal and external. The internal factors are internal to the bank and its operation, whereas external factors are external to the banks. The key constituents of the external factors include macroeconomic factors, industry specific factors, and misconduct by borrowers along with regulatory aspects. While all issues or factors that can lead to NPAs in banks have been discussed in the literature section, empirically the focus has been on estimating the determinants of NPAs that are internal to the banks and their operation. The estimation

result suggests that operational efficiency, as reflected in increasing operating cost, is not the driving force behind high NPAs in Indian banks. The association between NPAs and operating cost is found to be negative for all bank groups for the entire study period, and holds true for all bank groups during the post-crisis period. The results suggest that the earnings management as reflected in the interest income and ROA has played a critical role in NPA accumulation in banks. While the interest income is found to have a negative association with NPAs in the case of PSBs, their association is positive in the case of private banks. The ROA is found to be negatively associated with NPAs for all bank groups across time periods. The negative association suggests that banks have undertaken risky lending in order to maximise their earnings, which resulted in credit risk and loan failures. The loan quality as reflected in the share of secured lending in total lending and lending to sensitive sectors suggests that their relationship with NPAs varies among bank groups and time periods. The relationship between the share of sensitive lending in total lending and NPAs is not found to be statistically significant in the case of any single bank groups. On the other side, the share of secured lending in total lending is found to have statistically significant relationship with the NPAs. In most of the cases, their association is found to be positive, which is contrary to the dominant understanding that the higher the loan share backed by collaterals, the lower is the NPA. It can happen in a scenario when the valuation of a collateral declines substantially due to a fall in asset price. This leads to loan failures, as the amount of loan to be repaid is much higher than the collateral.

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## Annexure 1

### List of Banks Used for Regression Analysis

<i>Bank Name</i>	<i>Type of Bank</i>
Allahabad Bank	PSB
Andhra Bank	PSB
Bank of Baroda	PSB
Bank of India	PSB
Bank of Maharashtra	PSB
Canara Bank	PSB
Central Bank of India	PSB
Corporation Bank	PSB
Dena Bank	PSB
Indian Bank	PSB
Indian Overseas Bank	PSB
Oriental Bank of Commerce	PSB
Punjab and Sind Bank	PSB
Punjab National Bank	PSB
Syndicate Bank	PSB
UCO Bank	PSB
Union Bank of India	PSB
United Bank of India	PSB
Vijay Bank	PSB
SBI	PSB
Axis Bank	Private
Catholic Syrian Bank Ltd	Private
City Union Bank Limited	Private
DCB Bank Limited	Private
Dhanalakshmi Bank Ltd	Private
Federal Bank	Private
HDFC Bank	Private
ICICI Bank	Private
IDBI Bank Limited	Private
IndusInd Bank	Private
Jammu & Kashmir Bank Ltd	Private

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<i>Bank Name</i>	<i>Type of Bank</i>
Karnataka Bank Ltd	Private
Karur Vysya Bank	Private
Kodak Mahindra Bank Ltd	Private
Lakshmi Vilas Bank	Private
Nainital Bank	Private
RBL Bank	Private
South Indian Bank	Private
Tamilnad Mercantile Bank Ltd	Private
Yes Bank Ltd	Private
Barclays Bank	Foreign
Citibank	Foreign
DBS Bank India ltd.	Foreign
HSBC Ltd	Foreign
Standard Chartered Bank	Foreign

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## Annexure 2

**Table 5.1A: All Banks (2005–2020): Summary Statistics of the Dependent and Explanatory Variables**

<i>Variables</i>	<i>Obs.</i>	<i>Mean</i>	<i>Std. dev</i>	<i>Min</i>	<i>Max</i>
NNPA	688	2.37	2.65	0.01	16.69
OC	688	0.26	0.09	0.11	0.77
II	688	2.82	0.83	0.13	6.31
NII	688	1.25	0.63	-0.44	4.87
LSS	687	19.77	13.45	0.75	227.67
CAR	688	13.48	3.78	1.12	56.41
ROA	688	0.69	1.06	-5.49	3.13
SL	688	81.95	14.34	12.56	99.85

Source: Author's calculation.

**Table 5.2A: All Banks (2005-2020): Correlation Matrix**

	<i>NNPA</i>	<i>OC</i>	<i>II</i>	<i>NII</i>	<i>LSS</i>	<i>CAR</i>	<i>ROA</i>	<i>SL</i>
NNPA	1							
OC	-0.11	1						
II	-0.43	0.45	1					
NII	-0.22	0.63	0.47	1				
LSS	-0.07	0.18	0.22	0.30	1			
CAR	-0.31	0.15	0.33	0.09	0.08	1		
ROA	-0.64	0.07	0.60	0.42	0.15	0.34	1	
SL	0.29	-0.53	-0.41	-0.49	-0.29	-0.20	-0.36	1

Source: Author's calculation.

**Table 5.3A: PSBs (2005–2020): Summary Statistics of the Dependent and Explanatory Variables**

<i>Variable</i>	<i>Obs.</i>	<i>Mean</i>	<i>Std. Dev.</i>	<i>Min</i>	<i>Max</i>
NNPA	320	3.29	3.12	0.15	16.49
OC	320	0.22	0.06	0.13	0.56
II	320	2.48	0.52	1.04	3.78
NII	320	0.99	0.30	0.16	2.52
LSS	319	16.65	4.62	0.75	31.80
CAR	320	12.13	1.49	2.00	18.16
ROA	317	0.34	1.00	-5.49	2.01
SL	320	83.84	10.38	-0.19	97.12

Source: Author's calculation.

**Table 5.4A: PSBs (2005–2020): Correlation Matrix**

	<i>NNPA</i>	<i>OC</i>	<i>II</i>	<i>NII</i>	<i>LSS</i>	<i>CAR</i>	<i>ROA</i>	<i>SL</i>
<i>NNPA</i>	1							
<i>OC</i>	0.11	1						
<i>II</i>	-0.47	0.41	1					
<i>NII</i>	0.001	0.50	0.269	1				
<i>LSS</i>	0.17	0.24	-0.030	0.10	1			
<i>CAR</i>	-0.44	-0.12	0.29	0.15	-0.03	1		
<i>ROA</i>	-0.66	-0.23	0.47	0.09	-0.28	0.55	1	
<i>SL</i>	0.50	-0.007	-0.09	-0.06	0.01	-0.30	-0.37	1

Source: Author's calculation.

**Table 5.5A: Private Banks (2005–2020): Summary Statistics of the Dependent and Explanatory Variables**

<i>Variable</i>	<i>Obs.</i>	<i>Mean</i>	<i>Std.</i>	<i>Min</i>	<i>Max</i>
<i>NNPA</i>	288	1.73	1.90	0.07	16.69
<i>OC</i>	288	0.26	0.08	0.11	0.54
<i>II</i>	288	2.96	0.82	0.23	5.62
<i>NII</i>	288	1.34	0.50	0.42	2.70
<i>LSS</i>	288	19.31	16.53	1.90	227.67
<i>CAR</i>	288	14.44	4.81	1.12	56.41
<i>ROA</i>	288	0.83	0.99	-4.68	2.02
<i>SL</i>	288	87.81	8.96	51.41	99.85

Source: Author's calculation.

**Table 5.6A: Private Banks (2005–2020): Correlation Matrix**

	<i>NNPA</i>	<i>OC</i>	<i>II</i>	<i>NII</i>	<i>LSS</i>	<i>CAR</i>	<i>ROA</i>	<i>SL</i>
<i>NNPA</i>	1							
<i>OC</i>	0.08	1						
<i>II</i>	-0.32	0.32	1					
<i>NII</i>	-0.17	0.33	0.25	1				
<i>LSS</i>	0.03	0.00	0.03	0.25	1			
<i>CAR</i>	-0.26	0.10	0.37	0.06	0.02	1		
<i>ROA</i>	-0.74	-0.22	0.50	0.36	0.04	0.31	1	
<i>SL</i>	0.17	-0.42	0.33	-0.49	-0.14	-0.13	-0.19	1

Source: Author's calculation.

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