

# SMART

## Journal of Business Management Studies

(A Professional, Refereed, International and Indexed Journal)

---

**Vol-20 Number-1**

**January - June 2024**

**Rs. 500**

---

ISSN 0973-1598 (Print)

ISSN 2321-2012 (Online)

**Professor MURUGESAN SELVAM, M.Com, MBA, Ph.D, D.Litt**

Founder - Publisher and Chief Editor



SCIENTIFIC MANAGEMENT AND ADVANCED RESEARCH TRUST  
(SMART)

***TIRUCHIRAPPALLI (INDIA)***

***www.smartjournalbms.org***

**DISCOVERING THE RELATIONSHIP BETWEEN BAD LOANS (NPAs)  
AND THE PROFITABILITY OF PUBLIC SECTOR BANKS IN INDIA:  
A PANEL ANALYSIS**

**Azeem Ahmad Khan**

Department of Accounting, Faculty of Business Administration,  
Al-Baha University, Al Baha, Kingdom of Saudi Arabia  
aakcommerce@gmail.com

*Abstract*

*The aim of this paper is to discover the relationship between net NPAs and financial profitability, by estimating the determinants of profitability, for 12 public sector banks in India, for the period 2011–2023. The author employed three panel regression models: fixed, random, and PLS regression models. The author used bank-specific variables (deposit, CDR, DER) and economic indicators like GDP growth rate, inflation, and interest rate as explanatory variables, along with net NPAs. The results revealed that the RE model was a valid and efficient model, that is best suited for public sector banks in India. The result also found that NPAs exerted detrimental effect on the rate of profitability of public sector banks, by using a set of bank-specific and macroeconomic predictors of profitability. The result recommends that public-sector banks must lower their NPAs and debt-to-equity ratios, in order to become more profitable. Total bank deposits demonstrated neither positive nor negative effects. Only the credit deposit ratio was found to be positively significant, under the study.*

*Keywords: NPAs, Fixed Effects, Random Effects, PLS, Indian Bank Performance, PSBs.*

*JEL Code : P34, M41, M49 and P45*

*Paper Received : 03.10.2023*

*Revised : 30.11.2023*

*Accepted : 29.12.2023*

---

**\* Corresponding Author**

## 1. Introduction

The country's non-performing assets (NPAs) are increasing and have been a major problem for the India's banking industry, for several years. NPAs are not a recent issue for the banking industry in India. India's banking sector has seen two episodes of crises about the nonperformance of their advances or loans, in the last three decades: the first occurred in the mid-1990s, and the second has been ongoing since 2014–2015 (Das, 2023). While there seem to be some similarities between the two stages of the crisis, the number of failed loans, that are now non-performing advances (NPAs), which have an impact on the banks' financial stability, makes the present NPA situation more serious. One of the main causes of stress for the financial sector is the rising number of loan defaults. Public sector banks (PSBs) are primarily affected more than their private counterparts, during both periods (Kaur et al., 2023). There are several causes of NPA accumulations in Indian banks like lending practices, economic slowdown, corporate governance issues, and policy-related matters. The major contribution to NPAs in the public sector banks is only because of their exposure to large corporate borrowers, who have often defaulted on their loans. The paper analyzes the relationship between NPAs and the profitability of public sector banks, along with bank size and macroeconomic factors in India, thereby guiding strategic decisions and policy formulations in the banking sector. There are very few studies that have analyzed the bank-specific drivers of the current phase of NPAs in India's banks. Goyal et al., 2023 studied the causes of non-performing assets (NPAs) in poor countries. The study used the panel regression method to find the connection between bank-specific macroeconomic factors and non-performing assets (NPAs), using country-level panel data

from developing countries, from 2010 to 2020. Sharma et al., 2023 conducted the study that examined the association between the GNPA ratio and profitability ratio, that is, net profit ratio, return on assets ratio, and return on equity ratio. Javheri and Gawali, 2022 studied the public and private sector banks in India and found both to have been adversely affected by the rising NPA. Mukhopadhyay, 2022 studied the determinants of non-performing assets of Indian scheduled commercial banks. The NPA is the major detractor of the banking industry's profits because NPA carries the most negative regression coefficient, which is highly significant (Gaur and Mohapatra, 2021; Jain, 2021; Murthy and Gopal krishnan, 2022; Pramahender, 2021). In this study, the impact of NPAs on the profitability of the public sector banks in India, has been examined. Non-performing assets, deposits, the credit deposit ratio, and the debt-equity ratio were the bank-specific variables. Beside this, interest rates, inflation, and GDP growth rate were considered as macroeconomic factors (Table-1). The paper is spread over thirteen sections. The paper starts with an introduction, followed by a review of the literature, statement of the problem, the need for the study, objectives, hypotheses, research methodology, data analysis, findings, suggestions, conclusion, limitations, and scope for further studies.

## 2. Review of Literature

This study aims to quantify the way NPAs affect Indian public sector banks' profitability. Over the past 20 years, NPA has had a negative effect on public sector banks' profitability. Bank size and macroeconomic factors also impact banks' profitability in India, in addition to NPAs and other factors discussed in this literature review. Agrawal and Magar, 2023 and Goyal et al., 2023 studied, in their paper, the drivers of non-performing assets (NPAs) in developing

countries. They indicated that loan defaults often occur at a lower rate during periods of high economic growth, consequently reducing NPAs. **Mukhopadhyay, 2022**, in his study, demonstrated that the gross NPA ratio of banks is persistently impacted by the rate of return on total investment of the borrowers, the rate of economic growth, the rate of expansion of bank credit, and the average interest rate provided by banks to the borrowers. **Rahaman and Sur, 2021** asserted that bank NPAs significantly impact operating efficiency, priority sector lending, inflation, and real interest rates. **Gaur and Mohapatra, 2020 and Pramahender, 2021** investigated the connection between NPAs and profitability of the Indian banking industry, to assess how seriously NPAs affected the bank profitability. The impact of additional bank - specific, sector - specific, and macroeconomic factors on banking profits, has also been examined. **Agarwala and Agarwala, 2019** and **Korde and Laghate, 2020** examined the specific contributions made by the various banks to the NPA in the industry, by reviewing its growth pattern from 2010 to 2017. **Mehta and Malhotra, 2014** and **Rao and Patel, 2015** highlighted that one of the leading causes of concern for the Indian banking sector is non-performing assets (NPAs). There are two aspects to non-performing assets. Even if the bank is compelled to create provisions like assets, they did not generate any income.

**Goddard et al., 2004, Mohan, 2006 and Mittal, 2007** looked at the dynamic panel, pooled cross-sectional, and cross-sectional models. According to the authors, the capital-assets ratio favorably correlated with profitability. The authors examined how public and private sector banks handle non-performing assets (NPAs) and merger and acquisition announcements. Researchers indicated strong and positive correlation between bank's

profitability and capital adequacy in Nigeria (**Paramasivan, 2013; Ong and Teh, 2013; Olalekan and Adeyinka, 2013; Lartey et al., 2013**). Researchers studied the factors influencing the profitability of Indian public sector banks and discovered that only two of these independent variables, the credit deposit ratio and net interest income, influenced the net profitability of Indian public sector banks (**Barua et al., 2016; Varshney, 2016; Kedia, 2016**). The return volatility of the BANKEX might be impacted by the volatility of the foreign market or by an external shock. Researchers discovered that in Malaysian listed businesses, there was significant positive correlation between firm size, working capital, business efficiency (assets turnover ratio), and profitability (**Adelopo et al., 2018; Brahmaiah, 2018; Bapat, 2018 ; Bansal et al., 2018; Alarussi and Alhaderi, 2018; Almaqtari et al., 2019**). **Table-2**, presents all the description of the variables, along with the references.

### 3. Statement of the Problem

The Indian banking industry has faced severe problems with NPAs, which has had noticeable effect on banks' financial health and the overall economy. Now a days, the public sector banks were facing issues with NPAs, and this hurt profitability. Insolvency and illiquidity are commonly considered manifestations of the crisis in the banking sector. Several studies have been conducted to date, (**Khan and Zia, 2019; Jun Jin and Hutagaol-martowidjojo, 2019; Rafiq et al., 2020; Biswas and Bhattacharya, 2020; Joshi, 2020; Khan, 2022**), which have examined vital determinants of bank profitability. The present research's objectives are to examine how NPAs, bank size variables, and macroeconomic factors affected a bank's profitability, over a wider range of Indian PSBs' financial, for the period between 2011 to 2023.

#### 4. Need of the Study

The desire to comprehend how NPAs might significantly increase bank profitability, led to the necessity of this study. There are several reasons why this research is crucial. First, PSB mergers occurred in the Indian banking industry. Banks' yearly reports showed that loan recovery performance had improved. Second, only a small number of studies have previously looked at the impact of net NPAs, macroeconomic factors, and bank size factors on profitability after the consolidation of nationalized banks in 2021. Thirdly, this study includes a distinctive framework that will help banks, business consultants, and researchers, to identify and comprehend the aspects, that increase banks' profitability. It employed all Indian banking data in the current situation.

#### 5. Objective of the Study

The objective of this study was to comprehensively explore and understand the relationship between NPAs and the profitability of public sector banks in India, to find out whether NPAs adversely impacted profitability, and to provide insight that could aid in improving the financial health and stability of these banks.

#### 6. Hypotheses of the Study

**H<sub>0,1</sub>:** There is no significant impact of net NPAs (predictor variable) on the profitability (response variable) of public sector banks in India.

**H<sub>0,2</sub>:** There is no significant impact of the bank-specific variables (predictor variables) on the profitability (response variable) of public sector banks in India.

**H<sub>0,3</sub>:** There is no significant impact of macroeconomic variables (predictor variable) on the profitability (response variable) of public sector banks in India.

#### 7. Research Methodology

##### 7.1 Sample Selection

In the Indian banking sector, out of 34 banks, only 12 are public sector banks and the rest of them are private banks. Hence only 12 public sector banks were taken for the study. For this study, purposive sampling method was used in order to ensure that the sample was representative and aligned with the objectives.

##### 7.2 Source of Data

The financial statements of public sector banks (profit and loss account, balance sheet, and annual statement) were compiled, from reports for the previous 13 years from the BSE (from April-March 2011 to March 2023). The information for macroeconomic indicators was collected from the central bank (RBI). The NPA information for PSBs and the financial ratios, exclusive to banks, were collected from the banks' annual financial reports.

##### 7.3 Period of the Study

The financial information about public sector banks, reported between April 2011 and March 2023, was gathered and used for the study.

##### 7.4 Tools Used in the Study.

The regression model method was used, based on the works of **Gujarati (2004)** and **Dougherty (2011)**. PLS, fixed effect, and random effect models were considered appropriate for this investigation. After applying the panel data regression model, to achieve the study's objectives, the author employed the Hausman Test to pick the best model. Profitability (ROA) served as the model's response variable. The bank-specific variables like net NPAs, deposit, debt-equity ratio, and credit deposit ratio were utilized as explanatory factors. The macroeconomic indicators were also employed, to develop the profitability model for the Indian banking industry

## Model

The factors, influencing profitability, were examined, using the functional connection, shown below.

$$\begin{aligned} \text{Profitability}_{i,t} = & \quad \mathbf{0} + \mathbf{1} \text{Net Non-Performing Assets}_{i,t} \\ & + \mathbf{2} \text{Lndeposits}_{i,t} + \mathbf{3} \text{Credit Deposit Ratio}_{i,t} \\ & + \mathbf{4} \text{Debt Equity Ratio}_{i,t} + \mathbf{4} \text{GDP growth rate}_t \\ & + \mathbf{4} \text{Inflation Rate}_t + \mathbf{9} \text{Interest Rate}_t + \varepsilon_{i,t} \end{aligned}$$

where  $i$  = bank, 1... to...12, and  $t$  = time, 1...to...13.  $\varepsilon_{i,t}$  is the error term.

The fixed effects model can be express mathematically in this form

$$P_{i,t} = C + X_{i,t} + \mu_i + u_{i,t} \dots\dots\dots (2)$$

The following equation can express the RE model's general form.

$$P_{i,t} = C + X_{i,t} + \mu + u_{i,t} + \varepsilon_{i,t} \dots\dots\dots (3)$$

## 8. Data analysis, showing the relationship between bad loans (NPAs) and the profitability of public sector banks in India

The results of the unit root test revealed that all the explanatory factors, which were used in the estimation of profitability, were found to be stationary at the first difference of the panel data set. In **Table-3**, the summary of each variable's mean, standard deviation, and range of values (minimum and maximum) within the dataset, is shown, for the period between 2011 and 2023.

The descriptive statistics revealed that profitability (ROA) ranged from - 3.29 to 1.46, with a mean ROA value of 0.11. All explanatory variables recorded maximum and minimum values, that ranged from low to high. The data also demonstrated how each explanatory variable's mean and standard deviation, varied from one another. **Table-4** shows the results of the variance inflation factors, using the variables' centered VIF values. The results revealed no multicollinearity in the data. The results confirmed that there was no multicollinearity in the estimated model. The results of the VIF test showed that the centered VIF value was less

than 10, which indicated that there was no severe multicollinearity, among the explanatory variables. The author estimated three models, namely the panel least squares (PLS), the fixed effect model, and the random effect model, in order to determine the best model for estimating the profitability of PSBs in India.

The PLS model revealed an inverse relationship between profitability (ROA) and net NPA. In other words, there was negative impact on ROA. The p-value was less than 0.05, and therefore it was statistically significant. The direction of the relationship indicated that as the net NPA increased, the profitability (ROA) declined (**Table-5**). Similarly, in the case of the debt-to-equity ratio (DER), as the DER increased, the profitability of banks (ROA) declined. In other words, there was negative relationship with ROA. The p-value was less than 0.05, and therefore it was deemed to be statistically significant. and the credit deposit rate (CDR) exerted statistically significant positive influence on ROA. It means that as CDR rises, banks' profitability (ROA) rises as well. The p-value was more than 0.05, and hence the other bank factor, deposits, did not affect ROA

statistically significant. The other bank factor, the deposits, did not have statistically significant impact on ROA as the p-value was greater than 0.05. The other macroeconomic variables, such as the GDP growth rate, inflation, and interest rate, reported positive relationships but they were not statistically significant because their p-values were higher than 0.05. The R-squared value of 0.682731 indicated that the model could explain approximately 68.27% of the variance in the dependent variable (ROA). The F-statistic and its associated p-value demonstrated that the overall model was statistically significant.

The Breusch-Pagan Langrage Multiplier (LM) Test was used, to determine whether the PLS model was appropriate because the p-value was significantly below 0.05 (**Table-6**). The outcome strongly established that the data, specifically in terms of cross-section, time, and both taken together, revealed heteroskedasticity. Therefore, in order to estimate the best-fit profitability model for Indian public sector banks, the author employed fixed effect and random effect models.

The estimation of the FE model indicated reverse link between profitability (ROA) and net non-performing assets, and the relationship was statistically significant, with a p-value of 0.00 (**Table- 7**). In other words, there was negative relationship between net NPA and ROA. A one-unit increase in net NPA directly resulted in the decrease of approximately 0.1684 units in ROA, holding other variables constant. DER and ROA exerted statistically significant inverse relationship. A one-unit increase in DER is associated with a decrease of approximately 0.0005 units in ROA. The other factors, like deposits and credit deposit ratios, reported positive relationship with profitability (ROA) but they were not statistically significant. The economic factors like GDP growth rate, inflation,

and interest rate reported positive relationship with profitability (ROA). However, these variables did not have statistically significant relationships with ROA, as their p-values were greater than 0.05. Overall, the fixed effect model could explain around 70.9% of the variation in ROA, as indicated by the R-squared value. The F-statistic and its associated p-value established that the model was statistically significant.

$$ROA_{i,t} = C + 1NNPA_{i,t} + 2LnTD_{i,t} + 3CDR_{i,t} + 4DER_{i,t} + 5GDP_t + 6INFR_t + 7IR_t + \mu_i + u_{i,t} \dots\dots\dots(4)$$

The estimation of the random model, the coefficient estimates and t-statistics, and also the regression estimates of the RE model, yielded a comparable outcome. However, the Random Effect Model assumes that the individual-specific effects are random and uncorrelated with the independent variables and it does not provide individual fixed effects for each cross-sectional unit (bank). The variable of net NPA exerted negative coefficient and it was statistically significant (p-value 0.05). In other words, a rise in net NPA was linked to a considerable decline in the profitability (ROA) of Indian public sector banks. Hence the  $H0_1$  was rejected. DER and ROA reported negative relationship, which was statistically significant (p-value < 0.05). Under the RE model, the explanatory variable of CDR reported positive relationship with ROA. A one-unit increase in CDR was associated with an increase of approximately 0.017 units in ROA. Therefore, it was statistically significant. Hence the  $H0_2$  was rejected. Deposits were found to be insignificant under the RE model. The other three explanatory economic variables, like GDP growth rate, inflation, and interest rate, did exert positive association with ROA but they were found to be statistically insignificant (p-value >

0.05), suggesting that they were not major predictors of profitability (ROA) in the estimated model. Consequently,  $H_0$  was accepted. The Random Effect Model's R-squared value was 0.674852, and it accounted for roughly 67.4% of the variance in ROA. The Random Effect Model's F-statistic was 43.88247, with a p-value of 0.000, suggesting that the model was statistically significant. The Hausman Test was used to test whether the fixed effects model was preferable and whether the random effects assumption was true. The p-value was greater than 0.05, indicating that the Random Effects Model was a valid and efficient model and the best fit for public sector banks in India (Table 8).

$$ROA_{i,t} = C + 1NNPA_{i,t} + 2LnTD_{i,t} + 3CDR_{i,t} + 4DER_{i,t} + 5GDP_t + 6INFR_t + 7IR_t + \mu_i + u_{i,t} + \dots \quad (5)$$

## 9. Findings of the Study

Under both FE/ RE models, the Non-Performing Assets Ratio (NNPA) negatively influenced public sector banks' profitability (ROA). The debt-equity ratio was statistically significant and reported negative connection with ROA. As the debt-equity ratio increased, profitability (ROA) tended to decline. Credit Deposits Ratio (CDR) recorded positive impact on bank profitability. Hence it was statistically significant. In other words, the size of deposits may positively affect ROA, but it was not conventionally statistically significant. The macroeconomic variables like GDP Growth Rate, Inflation, and Interest Rate, did not affect ROA in any statistically significant fashion. The estimated profitability models of Indian public sector banks reported relatively high R-squared values, indicating a good fit, and the F-statistic indicated that the models were statistically significant. The findings revealed that net NPAs and debt-equity ratios exercised negative effect,

and the credit deposit ratio positively affected the PSB bank's profitability in India, over the last 13 years. The findings of the study confirmed the previous findings (Sharma et al., 2023; Das and Uppal, 2021).

## 10. Suggestions

Public sector banks are advised to manage and reduce NPAs for sound banking operations. In order to mitigate the adverse effects of NPAs, banks should implement strategies such as improving credit risk assessment, strengthening loan recovery mechanisms, and adopting prudent lending practices. Regulatory authorities may also take measures to address the issue, such as introducing stricter provisioning norms or initiating corrective actions against banks with high NPAs. The author also advises the investors to know the bank's debt-equity ratio before investing, which would help them make informed financial decisions. A negative D/E ratio suggests that the bank has more equity than debt, which is against the norm for banks. The PSB banks should go for further investigation and analysis, to understand whether it poses any risks to their financial health.

## 11. Conclusion

With the focus on the period 2011 to 2023, this study used empirical research, to investigate the characteristics that account for the profit of PSBs in India. In order to understand how net NPAs and declining bank profitability are inversely related, the author employed the PLS, FE, and RE models to estimate the profitability, by using a set of bank-specific and macroeconomic variables. The analysis of 12 public sector banks revealed that the rise in NPAs did exert detrimental impact on earnings. Profitability was also found to be adversely correlated with the debt-equity ratio. Profitability was positively correlated with the credit deposit ratio. Deposits, GDP growth rate, inflation, and



interest rates may have positively impacted public sector banks, according to the estimates from the FE and RE models, but they were not statistically significant. Due to the borrowers' failure to make payments on time, the bank's credibility heavily suffered. In other words, a rise in NPAs can hurt a PSB's profitability and make it difficult for banks to turn a profit. The bank had to deal with declining interest income, rising provisioning needs, and rising operating expenses. Legal fees and human costs are involved in dealing with NPAs. A large percentage of NPAs can harm banks' ability to maintain an adequate amount of capital as well as their creditworthiness. According to the study, in order to boost profitability, PSBs must reduce their NPAs and increase their debt-to-equity ratio.

### 12. Limitations of the Study

The analysis employed a sample of Indian public sector banks (PSBs), over a period from 2011 to 2023. The data, used for this investigation were derived from bank annual reports. The transition period ended recently, after a number of mergers within public sector banks, between 2020 and 2021. Expanding the potential list of explanatory factors would be beneficial, but incorporating all private and international banks in the estimation of the profit model would be a difficult task. But this would have helped to obtain a more precise estimation model.

### 13. Scope for further research

Specifically, NPAs in Indian PSBs were the focus of this investigation. Any study in future may yield more insightful findings if it takes into account national, international, and private banks. This analysis examined NPAs, deposits, debt-to-equity ratios, credit deposit ratios, and other macroeconomic indicators. It would be desirable to introduce more novel aspects while performing future study. The study considered

only numerical information. Future research on profitability should employ both quantitative and qualitative techniques, to assess the outcomes. In 2020–2021, mergers happened in the banking sector of India. Future studies can examine the impact of mergers on bank NPAs and bank profitability.

### 14. References

- Adelopo, I., Lloydking, R., & Tauringana, V. (2018).** Determinants of bank profitability before, during, and after the financial crisis. *International Journal of Managerial Finance*, 14(4), 378–398.
- Agarwala, V., & Agarwala, N. (2019).** tabA critical review of non-performing assets in the Indian banking industry. *Rajagiri Management Journal*, 13(2), 12–23. <https://doi.org/10.1108/ramj-08-2019-0010>
- Agrawal, Dr. V., & Magar, Dr. A. (2023).** Non-Performing Assets (NPA) in Indian Banking: Causes, consequences, and remedial measures. *International Journal of Research in Management*, 5(2), 62–65. <https://doi.org/10.33545/26648792.2023.v5.i2a.95>
- Alarussi, A. S., & Alhaderi, S. M. (2018).** Factors affecting profitability in Malaysia. *Journal of Economic Studies*, 45(3), 442–458.
- Ali, M. and Puah, C.H. (2019).** “The internal determinants of bank profitability and stability: An insight from banking sector of Pakistan”, *Management Research Review*, Vol. 42 No. 1, pp. 49-67.
- Almaqtari, F. A., Al-Homaidi, E. A., Tabash, M. I., & Farhan, N. H. (2019).** The determinants of profitability of Indian commercial banks: A panel data approach. *International Journal of Finance and Economics*, 24(1), 168–185.
- Amnas, M. B., Selvam, M., Raja, M., Santhoshkumar, S., & Parayitam, S. (2023).** Understanding the Determinants of

- FinTech Adoption: Integrating UTAUT2 with Trust Theoretic Model. *Journal of Risk and Financial Management*, 16(12), 505.
- Bansal, R., Singh, A., Kumar, S., & Gupta, R. (2018).** Evaluating factors of profitability for Indian banking sector: a panel regression. *Asian Journal of Accounting Research*, 3(2), 236–254.
- Bapat, D. (2018).** Profitability drivers for Indian banks: a dynamic panel data analysis. *Eurasian Business Review*, 8(4), 437–451.
- Barua, R., Roy, M., & Raychaudhuri, A. (2016).** Structure, Conduct and Performance Analysis of Indian Commercial Banks. *South Asian Journal of Macroeconomics and Public Finance*, 5(2), 157–185.
- Berger A (1995)** The relationship between capital and earnings in bank- ing. *J Money Credit Bank* 27(2):432–456
- Biswas, S., & Bhattacharya, M. (2020).** Financial Performance Analysis of “New Generation Private Sector Banks”: A Camel. *Journal of Commerce & Accounting Research*, 9(4), 37–44.
- Brahmaiah, B. (2018).** Factors Influencing Profitability of Banks in India. *Theoretical Economics Letters*, 3046–3061.
- Das, S. K. (2023).** NPAs in India’s banks: trends and determinants. *Journal of Money and Business*.
- Das, S. K., & Uppal, K. (2021).** NPAs and profitability in Indian banks: an empirical analysis. *Future Business Journal*, 7(1). <https://doi.org/10.1186/s43093-021-00096-3>
- Dougherty, C. (2011).** Introduction to Econometrics, Fourth Edition., Oxford University Press. United States
- Gaur, D., & Mohapatra, D. R. (2020).** Non-performing Assets and Profitability: Case of Indian Banking Sector. *Vision: The Journal of Business Perspective*, 25(2), 180–191. <https://doi.org/10.1177/0972262920914106>
- Gaur, D., & Mohapatra, D. R. (2021).** Non-performing Assets and Profitability: Case of Indian Banking Sector. *Vision*, 25(2), 180–191. <https://doi.org/10.1177/0972262920914106>
- Goddard, J., Molyneux, P., & Wilson, J. O. S. (2004).** The profitability of European banks: A cross-sectional and dynamic panel analysis. *Manchester School*, 72(3), 363–381.
- Goyal, S., Prosad, J. M., Mishra, N., & Singhal, N. (2023).** Non-performing Assets and Institutional Quality Indicators: Evidence from Developing Countries. *Vision: The Journal of Business Perspective*, 2147483647. <https://doi.org/10.1177/09722629221145805>
- Iqbal, N., Kryeziu, N., Abonazel, M. R., Harymawan, I., Mai, G., Yuan, D., Abu Issa Gazi, M., Kumar Dhar, B., & Ishaque Hossain, A. (2022).** Profitability determining factors of banking sector: Panel data analysis of commercial banks in South Asian countries.
- Jain, S. K. (2021).** Non Performing Assets (NPA) in Banks – Control is a Panacea for Bank’s Profitability and India’s Economic Revival – How is Possible? *The Management Accountant Journal*, 56(2), 102. <https://doi.org/10.33516/maj.v56i2.102-106p>
- Javheri, J., & Gawali, R. (2022).** A study on NPAs of selected private & public sector banks in India. *Indian Journal of Finance and Banking*, 9(1), 129-139.
- Jun Jin, Y., & Hutagaol-Martowidjojo, Y. (2019).** Determinants of Bank Competitiveness in Digital Era A Case Study of South Korea. *Journal of Banking and Financial Economics*, (2 (12)), 39-55.
- Joshi, M. K. (2020).** Financial performance analysis of select Indian Public Sector Banks using Altman’s Z-Score model. *SMART Journal of Business Management Studies*, 16(2), 74. <https://doi.org/10.5958/2321-2012.2020.00018.4>

- Kantharia, N. J., & Biradar, J. (2022).** What influence the performance of banks? Evidence from public sector banks in India. *Journal of Indian Business Research*, (ahead-of-print).
- Kaur, B., Kaur, R., Sood, K., & Grýma, S. (2023).** Impact of Non-Performing Assets on the Profitability of the Indian Banking Sector. In *Contemporary Studies of Risks in Emerging Technology, Part A* (pp. 257-269). Emerald Publishing Limited.
- Kedia, N. (2016).** Determinants of Profitability of Indian Public Sector Banks. *Ira-International Journal of Management & Social Sciences*, 02(03), 1–16.
- Khan, A. A. (2022).** Evaluating the decisive factors of profitability of the banking sector using a panel regression model. *Publishing India*. <http://publishingindia.com/jcar/>
- Khan, A. A. (2022).** The impact of financial leverage and return on assets on banks' profitability: Empirical evidence from banking sector. *SMART Journal of Business Management Studies*, 18(2), 90–97. <https://doi.org/10.5958/2321-2012.2022.00020.3>
- Korde, A., & Laghate, K. (2020).** A Study of Gross and Net Non-Performing Assets of Select Public Sector Banks in India for the Period 2007–2008 to 2017–2018. *Indian Journal of Finance and Banking*, 4(1), 42–64. <https://doi.org/10.46281/ijfb.v4i1.522>
- Lartey, V. C., Antwi, S., & Boadi, E. K. (2013).** The Relationship between Liquidity and Profitability of Listed Banks in Ghana. *International Journal of Business and Social Science*, 4(3), 48–56.
- Masood, O. Ashraf, M (2012)** Bank-specific and macroeconomic profitability determinants of Islamic banks: the case of different countries. *Qual Res Financ Mark* 4(2/3):255–268
- Mehta, L., & Malhotra, M. (2014).** Empirical Analysis of Non Performing Assets Related to Private Banks of India. *International Journal of Management Excellence*, 3(1), 386. <https://doi.org/10.17722/ijme.v3i1.156>
- Menicucci, E., & Paolucci, G. (2016).** Factors affecting bank profitability in Europe: an empirical investigation. *Afr J Bus Manag* 10(17):410–420
- Mittal, M. (2007).** Profitability and Productivity in Indian Banks/ : A Comparative Study. *AIMS International*, 1969.
- Mohan, K. (2006).** Dynamics of VRS in banking sector: A case study in the pondicherry region. *SMART Journal of Business Management Studies*, 2(1), 12-19.
- Mukhopadhyay, D. (2022).** Determinants of Non-Performing Assets of Indian Scheduled Commercial Banks: A Panel Data Analysis. *Global Business & Economics Anthology*, 2. <https://doi.org/10.47341/gbea.22121>
- Murthy, N., & Gopalkrishnan, S. (2022).** Creating a Nexus between Dark Triad Personalities, Non-Performing Assets, Corporate Governance and Frauds in the Indian Banking sector. *Journal of Financial Crime*, 30(4), 859–876. <https://doi.org/10.1108/jfc-05-2022-0097>
- Olalekan, A., & Adeyinka, S. (2013).** Capital Adequacy And Banks' Profitability/ : An Empirical Evidence From Nigeria. *American International Journal of contemporary Research*, 3(10), 87–93.
- Ong, T., & Teh, B. (2013).** Factors affecting the profitability of Malaysian commercial banks. *African Journal of Business Management*, 7(8), 649–660.
- Paramasivan, C. (2013).** Economic Empowerment of Women Through Shg In Kolli Hills, *Research Explorer*, 2(4), 4–7.
- Petria, N., Capraru, B., & Ihnatov, I. (2015).** Determinants of Banks' Profitability: Evidence from EU 27 Banking Systems. *In*

*Procedia Economics and Finance* (Vol. 20, pp. 518–524).

**Pramahender. (2021).** Critical Perspectives to Non-performing Assets of Indian Banks, Shrinking Balance Sheet, Challenges and Way Ahead. *FIIB Business Review*, 11(2), 130–136. <https://doi.org/10.1177/23197145211040271>

**Prasad, K. V.N and Chari, A.A (2011).** Financial Performance of Public and Private Sector Banks/ : An Application of Post-Hoc Tukey HSD Test. *Indian Journal of Commerce & Management Studies*,2(5).

**Rafiq, M. Z., Jun, J. C., Ali, R., Majeed, M. K., & Mohsin, M. (2020).** Impact of corporate image, switching cost and customer trust on customer satisfaction: Evidence from listed banking sector. *SMART Journal of Business Management Studies*, 16(1), 26-34.

**Rahaman, S. M., & Sur, D. (2021).** Identifying Key Drivers of Non-Performing Assets in Indian Public Sector Banks: A Panel Data Analysis. *IIM Kozhikode Society & Management Review*, 2147483647. <https://doi.org/10.1177/22779752211000146>

**Rao, M., & Patel, A. (2015).** A study on non performing assets management with reference to public sector banks, private sector banks and foreign banks in india. *Journal of Management and Science*, 1(1), 30–43. <https://doi.org/10.26524/jms.2015.4>

**Rao, Y., Hadri, K., & Bu, R. (2010).** Testing for stationarity in heterogeneous panel data in the case of model misspecification. *Bulletin of Economic Research*, 62(3), 209–225. Banks with Special Reference to State Bank of India and Punjab.Voice of Research,

**Selvam, M., Gayathri, J., Vasanth, V., Lingaraja, K., & Marxiaoli, S. (2016).** Determinants of firm performance: A subjective model. *Int'l J. Soc. Sci. Stud.*, 4, 90.

**Sharma, P., Mishra, B. B., & Rohatgi, S. K. (2023a).** Revisiting the Impact of NPAs on Profitability, Liquidity and Solvency: Indian Banking System. *IMIB Journal of Innovation and Management*. <https://doi.org/10.1177/ijim.221148863>

**Varshney, N. (2016).**A Study on the Comparison of Financial Performance of Public Sector Vol.5(3).

**Table-1: List of Public Sector Banks in India.**

S.No	Name of bank	Government Shareholding % (as at end-March 2023)	Category
1	State Bank of India	57.59%	PSB
2	Canara Bank	62.93%	PSB
3	Bank of Baroda	63.97%	PSB
4	Punjab National Bank	73.15%	PSB
5	Indian Bank	79.86%	PSB
6	Bank of India	81.41%	PSB
7	Union Bank of India	83.49%	PSB
8	Bank of Maharashtra	90.90%	PSB
9	Central Bank of India	93.08%	PSB
10	UCO Bank	95.39%	PSB
11	Indian Overseas Bank	96.38%	PSB
12	Punjab and Sind Bank	98.25%	PSB

**Source:** Reserve Bank of India

**Table-2: Description of Variables used for the study Discovering the Relationship between Bad Loans (NPAs) and the Profitability of Public Sector Banks in India**

Notation	Expansion	Description/ Formula	References
ROA	Return on Asset	Ratio of Profit after Tax to Average Total Assets (%)	(Berger, 1995 ; Das & Uppal, 2021)
NNPA	Net Non-performing assets	Ratio of Net NPA to Net Advances (%)	(Masood, 2012), (Das & Uppal, 2021)
lnTD	Total Deposits	Natural Logarithm of Total Deposit	(Menicucci and Paolucci, 2016; Das and Uppal, 2021)
CDR	Credit deposit ratio	Total advance /total deposits (%)	(Kantharia and Biradar, 2022; Khan, 2022)
DER	Debt-Equity ratio	Total Debt/Total equity (%)	(Iqbal et al.,2022)
GDP	GDP growth rate	Annual economic growth rate (%)	(Das & Uppal, 2021), (Iqbal et al.,2022)
INF	Inflation	Annual rate of Inflation (%)	(Iqbal et al.,2022; Das & Uppal, 2021)
IR	Interest rate	Annual Average repo rate (%)	(Das & Uppal, 2021; Ergec and Arslan 2013)

Source: Author own compilation

**Table-3: Descriptive statistics of the dependent and explanatory variables of Public Sector Banks in India**

Variable	Observations	Mean	Std. Dev.	Minimum	Maximum
ROA	156	0.1112	0.840473	-3.29107	1.466562
NNPA	156	4.052546	3.061573	0.254163	15.39727
LnTD	156	12.75841	0.923983	10.99748	15.31257
CDR	156	69.5555	8.028712	47.24521	85.82944
DER	156	1402.217	258.5523	746.4399	2563.035
GDP	156	5.81	3.847716	-6.6	8.68
INFR	156	6.153077	2.10971	3.33	10.02
IR	156	6.166621	1.155352	4	8

Source: Computed and compiled using Eviews

**Table-4: Result of Variance Inflation Factors Test Regarding the Relationship between NPAs and the Profitability**

<i>Variable</i>	<i>Coefficient Variance</i>	<i>Centered VIF</i>
C	0.653942	NA
NNPA	0.000344	2.127664
LnTD	0.002347	1.323053
CDR	4.68E-05	1.992824
DER	2.71E-08	1.195180
GDP	0.000154	1.505366
INFR	0.000680	1.997284
IR	0.002666	2.349874

Source: Computed and compiled using Eviews

**Table-5: Result of Panel Least Square test (PLS) regarding the relationship between NPAs and the profitability**

<i>Variable</i>	<i>Panel Least Squares</i>		
	Coefficient	t-Statistic	Prob.
<i>Dependent variable ROA</i>			
<i>Explanatory variables</i>			
NNPA	-0.18089	-9.756626	0.000
LnTD	0.018805	0.388195	0.6984
CDR	0.014532	2.123931	0.0353
DER	-0.00042	-2.550867	0.0118
GDP	0.007608	0.613135	0.5407
INFR	0.009454	0.362665	0.7174
IR	0.050353	0.97524	0.331
C	-0.230808	-0.285417	0.7757
Number of (balanced) observation	156		
Number of Banks (Cross Section)	12		
R-squared	0.682731		
Adjusted R-squared	0.667725		
F-statistic	45.49727		
Prob(F-statistic)	0.000		

Source: Computed and compiled using Eviews

**Table-6: Result of Breusch-Pagan test Lagrange Multiplier (LM) Test Regarding the Relationship between NPAs and the Profitability**

Null (no rand. effect)	Cross-section	Period	Both
Alternative	One-sided	One-sided	
Breusch-Pagan	0.086501	15.24221	15.32871
<i>p</i> -values	(0.7687)	(0.0001)	(0.0001)

Source: Computed and compiled using Eviews

**Table-7: Result of Fixed and Random effect Model for the estimation of profitability of PSBs for the period 2011-2023**

<i>Variable</i>	<i>Fixed Effect Model</i>			<i>Random Effect Model</i>		
	Coefficient	t-Statistic	Prob.	Coefficient	t-Statistic	Prob.
<i>Dependent variable ROA</i>						
<i>Explanatory variables</i>						
NNPA	-0.168361	-8.00607	0.000	-0.179997	-9.542626	0.000
LnTD	0.234462	1.5894	0.1143	0.026363	0.480134	0.6318
CDR	0.017013	1.974014	0.0504	0.014403	2.017258	0.0455
DER	-0.000546	-2.7692	0.0064	-0.000428	-2.528657	0.0125
GDP	0.006469	0.521949	0.6025	0.007491	0.606063	0.5454
INFR	0.027438	0.918772	0.3598	0.010528	0.397661	0.6915
IR	0.077342	1.36097	0.1758	0.052395	1.002711	0.3176
C	-3.298855	-1.520459	0.1307	-0.329016	-0.369406	0.7124
Number of (balanced) observation	156			156		
Number of Banks (Cross Section)	12			12		
R-squared	0.709001			0.674852		
Adjusted R-squared	0.670768			0.659473		
F-statistic	18.54402			43.88247		
Prob(F-statistic)	0.000			0.000		

Source: Computed and compiled using Eviews

**Table-8: Hausman Test Results for comparison Regarding the Relationship between NPAs and the Profitability**

<i>Test Summary</i>	<b>Chi-Sq. Statistic</b>	<b>Chi-Sq. d.f.</b>	<b>Prob.</b>
Cross-section random	1.73892	7	0.9421

Source: Computed and compiled using Eviews