

## **“A Comparative Panel Data Analysis of Financial Performance, Asset Quality, and Capital Adequacy of Public and Private Sector Banks in India (2020–2025)”**

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### **Abstract**

The Indian banking sector has undergone significant transformation in recent years, particularly in the context of post-pandemic recovery, regulatory reforms, and improvements in financial stability. This study presents a comparative panel data analysis of selected public and private sector banks in India over the period 2020–2025, with a focus on key dimensions such as financial performance, asset quality, growth in advances, and capital adequacy. The study is based on secondary data compiled from reliable sources including publications of the Reserve Bank of India and annual reports of selected banks. A purposive sample of six major banks, comprising three public sector banks and three private sector banks, is considered for the analysis. The study employs descriptive statistics, correlation analysis, panel regression techniques, and independent sample t-tests to examine the interrelationship among variables and to compare performance across bank categories. The findings reveal that asset quality, measured through Gross Non-Performing Assets (GNPA), has a significant negative impact on profitability, while growth in advances and capital adequacy (CAR) exhibit a positive and significant influence on financial performance. The results further indicate that private sector banks consistently outperform public sector banks in terms of profitability and efficiency, although public sector banks have shown considerable improvement during the study period. The statistical tests confirm the existence of significant differences between the two banking segments. The study contributes to the existing literature by providing a comprehensive and integrated analysis using recent data, thereby offering valuable insights for policymakers, banking professionals, and researchers. The findings underscore the importance of maintaining asset quality, strengthening capital adequacy, and adopting efficient growth strategies to ensure sustainable banking performance.

**Keywords:** *Banking Sector, Public Sector Banks, Private Sector Banks, Financial Performance, Asset Quality, Non-Performing Assets (NPA), Capital Adequacy, Panel Data Analysis, India*

## Chapter 1: Introduction

The banking sector plays a pivotal role in shaping the trajectory of economic development by mobilizing savings, facilitating investments, and ensuring efficient allocation of financial resources. In the Indian context, the banking system has evolved into a diversified structure comprising public sector banks (PSBs) and private sector banks, each exhibiting distinct operational philosophies, governance mechanisms, and performance outcomes. Over the past decade, this dual structure has been instrumental in sustaining financial stability while simultaneously addressing the growing demands of a rapidly expanding economy.

Public sector banks, historically dominant in terms of outreach and financial inclusion, have been central to implementing government-led initiatives and extending credit to priority sectors. However, they have often faced challenges related to asset quality deterioration, capital constraints, and operational inefficiencies. In contrast, private sector banks have demonstrated relatively higher efficiency, technological adaptability, and profitability, driven by market-oriented strategies and robust risk management practices. This divergence in performance patterns has attracted considerable academic and policy attention, particularly in the context of post-reform banking dynamics in India.

The period from 2020 to 2025 presents a unique and compelling context for examining the comparative performance of these two banking segments. The onset of the COVID-19 pandemic in 2020 disrupted global and domestic economic activities, placing unprecedented stress on banking operations, credit cycles, and asset quality. Subsequent years witnessed a gradual recovery supported by regulatory forbearance measures, capital infusion in PSBs, digital transformation, and improved credit discipline. Notably, Indian banks experienced a significant decline in non-performing assets (NPAs), strengthened capital adequacy under Basel III norms, and enhanced profitability metrics during the recovery phase. These developments make the selected period particularly relevant for a comprehensive empirical investigation.

Against this backdrop, evaluating the interplay between financial performance, asset quality, and capital adequacy becomes critical for understanding the resilience and efficiency of banks. Financial performance, often measured through indicators such as Return on Assets (ROA), reflects the ability of banks to generate earnings from their asset base. Asset quality, typically assessed through Gross Non-Performing Assets (GNPA), indicates the level of credit risk and operational soundness. Capital adequacy, measured through the Capital Adequacy Ratio (CAR), serves as a buffer against potential losses and is a key determinant of financial stability. Together, these dimensions provide a holistic framework for assessing banking performance and risk.

The comparative analysis of public and private sector banks using panel data techniques offers significant methodological advantages. Panel data enables the integration of cross-sectional and time-series variations, thereby enhancing the robustness and reliability of empirical findings. It allows for controlling unobserved heterogeneity among banks and capturing dynamic changes over the study period. In the context of this study, the use of panel data

facilitates a nuanced understanding of how profitability is influenced by asset quality, growth in advances, and capital adequacy across different categories of banks.

This study is motivated by the need to bridge existing gaps in the literature, where many prior studies have either focused on a single category of banks or examined limited performance indicators. By incorporating multiple dimensions—profitability, risk, growth, and capital strength—across both public and private sector banks, the study aims to provide a more integrated and comparative perspective. Furthermore, the inclusion of recent data up to 2025 enhances the contemporary relevance of the analysis, particularly in light of ongoing structural reforms and digital transformation in the Indian banking sector.

The significance of this research extends beyond academic inquiry. For policymakers and regulators, such as the Reserve Bank of India, the findings can offer valuable insights into the effectiveness of regulatory measures and the relative strengths and vulnerabilities of different banking segments. For bank management, the study can inform strategic decisions related to risk management, capital planning, and performance optimization. For investors and stakeholders, it provides an evidence-based assessment of banking sector dynamics, aiding informed decision-making.

In essence, this study seeks to contribute to the growing body of knowledge on banking performance by undertaking a comprehensive comparative panel data analysis of selected public and private sector banks in India over the period 2020–2025. By examining the interrelationships among financial performance, asset quality, growth, and capital adequacy, the research aims to offer deeper insights into the evolving landscape of the Indian banking sector and its implications for financial stability and economic growth.

### **1.1 Background of the Study**

The Indian banking sector has undergone a profound transformation over the past three decades, particularly following the economic liberalization reforms of the early 1990s. These reforms marked a decisive shift from a predominantly state-controlled banking system to a more competitive and market-driven structure, enabling the entry and expansion of private sector banks alongside the traditionally dominant public sector banks (PSBs). This structural transition not only enhanced efficiency and innovation within the sector but also intensified competition, thereby reshaping the performance dynamics of banks in India.

Historically, PSBs have played a crucial role in advancing socio-economic objectives such as financial inclusion, rural credit expansion, and priority sector lending. Their extensive branch networks and government backing have enabled them to reach underserved segments of the population. However, this developmental role has often come at the cost of operational efficiency and asset quality, with PSBs experiencing higher levels of non-performing assets (NPAs), particularly during periods of economic slowdown. In contrast, private sector banks have leveraged superior technology adoption, better governance practices, and stringent credit appraisal mechanisms to achieve relatively stronger financial performance and lower asset impairment levels.

The issue of asset quality has remained a central concern in the Indian banking landscape, especially during the mid-2010s when the sector witnessed a surge in NPAs due to stressed corporate exposures, infrastructure bottlenecks, and delays in project execution. Recognizing the systemic risks posed by deteriorating asset quality, regulatory authorities, including the Reserve Bank of India, introduced a series of corrective measures such as the Asset Quality Review (AQR), stricter recognition norms, and the implementation of the Insolvency and Bankruptcy Code (IBC). These interventions aimed to improve transparency, expedite resolution of stressed assets, and strengthen the overall health of the banking system.

In addition to asset quality concerns, capital adequacy has emerged as a critical dimension of banking stability. The adoption of Basel III norms necessitated higher capital buffers to absorb potential losses and enhance resilience against financial shocks. While private sector banks were generally better positioned to meet these requirements through internal accruals and market-based capital raising, PSBs often relied on government recapitalization to maintain adequate capital levels. This divergence in capital management strategies further underscores the structural differences between the two segments.

The period from 2020 onwards introduces a new phase in the evolution of the Indian banking sector. The outbreak of the COVID-19 pandemic posed unprecedented challenges, disrupting economic activity and increasing credit risk across sectors. In response, the Reserve Bank of India implemented a range of policy measures, including loan moratoriums, liquidity support, and regulatory forbearance, to mitigate the adverse impact on borrowers and financial institutions. While these measures provided temporary relief, they also raised concerns regarding the potential buildup of hidden stress in bank balance sheets.

Subsequent years have, however, witnessed a notable recovery in the banking sector. Improvements in credit growth, declining GNPA ratios, enhanced provisioning coverage, and better profitability indicators have signaled a strengthening of financial fundamentals. Public sector banks, in particular, have shown marked improvement due to recapitalization efforts, consolidation through mergers, and adoption of technology-driven processes. Private sector banks, on the other hand, have continued to consolidate their position through innovation, digital banking initiatives, and customer-centric strategies.

Another important dimension shaping the contemporary banking environment is the rapid pace of digital transformation. The integration of financial technology (FinTech), expansion of digital payment systems, and increased reliance on data analytics have significantly altered banking operations and service delivery. Private sector banks have generally been early adopters of such technologies, while PSBs have been progressively catching up through strategic investments and collaborations. This technological shift has implications for operational efficiency, cost structures, and competitive positioning.

Despite these developments, disparities in performance between public and private sector banks continue to persist, necessitating a systematic and empirical investigation. Existing literature has often examined isolated aspects such as profitability or asset quality, with limited focus on an integrated framework that captures multiple dimensions simultaneously.

Furthermore, the inclusion of recent data encompassing the pandemic and post-pandemic recovery phases remains relatively underexplored.

In this context, the present study is situated at the intersection of these evolving dynamics. By focusing on the period 2020–2025 and incorporating key indicators such as financial performance, asset quality, growth in advances, and capital adequacy, the study seeks to provide a comprehensive background for understanding the comparative performance of PSBs and private sector banks. The background thus establishes the foundation for a deeper analytical inquiry into how structural, regulatory, and economic factors have influenced banking outcomes in recent years, thereby justifying the need for the present research.

## Chapter 2: Review of Literature

**Bawa and Basu (2016):** conducted a comprehensive empirical investigation into the determinants of non-performing assets (NPAs) in Indian banks using panel data techniques. The study analyzed multiple bank-specific variables such as capital adequacy, operational efficiency, and profitability indicators to understand their influence on asset quality. The findings revealed a significant inverse relationship between NPAs and profitability, indicating that higher asset impairment directly reduces earnings capacity. The authors further emphasized that weak credit appraisal systems and ineffective monitoring mechanisms were major contributors to rising NPAs, particularly in public sector banks.

**Kaur and Basu (2017):** examined the trend and causative factors of NPAs in the Indian banking system with a focus on macroeconomic and institutional variables. The study identified factors such as economic slowdown, sectoral concentration of credit, and inadequate risk management practices as key drivers of asset deterioration. It was observed that public sector banks exhibited higher levels of NPAs due to policy-driven lending and governance constraints, whereas private sector banks maintained relatively better asset quality. The study highlighted the need for strengthening credit evaluation frameworks and enhancing accountability mechanisms.

**Shah (2018):** undertook a trend analysis of NPAs in scheduled commercial banks over a period of time to assess their impact on banking performance. The study revealed that persistent growth in NPAs adversely affected profitability, liquidity, and overall operational efficiency of banks. It also evaluated the effectiveness of regulatory interventions introduced by authorities and found that while such measures improved transparency, their impact on actual recovery of bad loans was gradual. The study concluded that long-term structural reforms were necessary to address the root causes of asset quality issues.

**Kumar, Jha, and Grover (2020):** explored the relationship between NPAs and profitability across public and private sector banks using empirical data analysis. The study applied regression techniques to establish the impact of NPAs on key financial indicators such as Return on Assets (ROA) and Return on Equity (ROE). The results confirmed a strong negative association, suggesting that rising NPAs significantly erode bank profitability. The authors also

pointed out that private sector banks were relatively more efficient in managing credit risk due to better governance practices and advanced risk assessment tools.

**Gaur and Mohapatra (2020):** employed panel data models to examine the broader implications of NPAs on financial stability, liquidity, and solvency of Indian banks. The study highlighted that higher NPAs not only reduce profitability but also weaken the financial resilience of banks by increasing provisioning requirements. It further demonstrated that private sector banks tend to exhibit greater stability due to proactive risk management and diversified loan portfolios. The study underscored the importance of maintaining asset quality to ensure long-term sustainability of the banking sector.

**Gupta and Kashiramka (2020):** focused on liquidity creation and financial stability in the banking sector, analyzing differences between public and private sector banks. The study found that larger banks, particularly private sector institutions, were more efficient in creating liquidity and maintaining stability under varying economic conditions. It also highlighted that effective capital management and risk diversification strategies contributed to the superior performance of private banks. The findings suggested that structural and managerial differences play a crucial role in determining bank performance.

**Das and Uppal (2021):** conducted an empirical analysis to examine the impact of NPAs on profitability in Indian banks using panel regression techniques. The study confirmed a statistically significant negative relationship between asset quality and financial performance, reinforcing the notion that NPAs are a critical determinant of bank efficiency. The authors emphasized that timely recognition and resolution of stressed assets are essential to improve profitability and maintain financial health.

**Singh and Sneha (2021):** carried out a comparative study of public and private sector banks to assess differences in performance indicators such as NPAs, profitability, and operational efficiency. The study found that private sector banks consistently outperformed public sector banks across most financial parameters. It attributed this difference to better governance, efficient management practices, and higher adoption of technology in private banks. The study highlighted the need for public sector banks to adopt more market-oriented strategies to enhance competitiveness.

**Mittal (2023):** analyzed the determinants of NPAs in public sector banks using fixed-effect panel regression models. The study identified management efficiency, credit appraisal systems, and macroeconomic conditions as significant factors influencing asset quality. It also observed a declining trend in NPAs in recent years, attributing this improvement to regulatory reforms such as the Insolvency and Bankruptcy Code (IBC) and stricter supervision by the Reserve Bank of India. The study concluded that sustained policy efforts are necessary to maintain asset quality improvements.

**Upadhyay and Kurmi (2025):** examined the determinants of profitability in private sector banks using advanced panel data techniques. The study incorporated variables such as NPAs, capital adequacy, and business growth to analyze their impact on financial performance. The

findings indicated that lower NPAs, higher capital adequacy ratios, and consistent growth in advances significantly contribute to improved profitability. The study also highlighted the role of technological innovation and efficient resource utilization in enhancing bank performance in the post-pandemic period.

## **2.1 Research Gap**

A critical review of existing literature on the Indian banking sector reveals that substantial research has been undertaken on individual dimensions such as profitability, asset quality, and financial stability. However, most studies have predominantly focused on isolated variables, particularly non-performing assets (NPAs) and their impact on bank performance, without adopting a comprehensive and integrated analytical framework. This fragmented approach limits the ability to understand the interdependent relationship among key financial indicators such as profitability, asset quality, growth, and capital adequacy.

Another notable limitation in prior studies is the restricted scope of comparative analysis between public sector banks (PSBs) and private sector banks. While several researchers have highlighted performance differences between these two segments, many studies are either confined to a specific category of banks or rely on descriptive and ratio-based analysis rather than employing robust econometric techniques such as panel data models. Consequently, the dynamic interactions across time and across banks remain insufficiently explored.

Furthermore, there exists a temporal gap in the literature, particularly with respect to recent developments in the banking sector. A significant portion of earlier studies is concentrated on the pre-2020 period, with limited empirical evidence capturing the impact of the COVID-19 pandemic and the subsequent recovery phase. The period from 2020 to 2025 is characterized by unprecedented disruptions, regulatory interventions, improvements in asset quality, and enhanced capital adequacy under Basel III norms. However, comprehensive empirical studies incorporating this critical timeframe are relatively scarce.

In addition, existing literature often overlooks the role of growth indicators, such as advances, in influencing bank performance alongside risk and capital variables. The omission of such variables restricts the analytical depth required to assess the overall financial health and operational efficiency of banks. Moreover, the simultaneous inclusion of profitability (ROA), asset quality (GNPA), growth (advances), and capital adequacy (CAR) within a unified panel data framework is rarely observed in prior research.

Another gap pertains to methodological rigor. Many studies rely on cross-sectional or time-series analysis independently, which may not adequately capture unobserved heterogeneity among banks. The application of panel data techniques, which combine both cross-sectional and time-series dimensions, remains relatively underutilized despite its advantages in producing more reliable and generalized findings.

Therefore, the present study seeks to address these gaps by adopting a comprehensive panel data approach to examine the interrelationship between financial performance, asset quality, growth, and capital adequacy across selected public and private sector banks in India over the

period 2020–2025. By integrating multiple dimensions and focusing on a recent and economically significant timeframe, the study aims to contribute to the existing body of knowledge with a more holistic and methodologically robust analysis.

## **2.2 Problem Statement**

The Indian banking sector, comprising both public sector banks and private sector banks, plays a crucial role in ensuring financial stability and supporting economic growth. Despite significant reforms and regulatory interventions, disparities in performance between these two segments continue to persist, particularly in terms of profitability, asset quality, and capital adequacy. Public sector banks have historically faced challenges related to higher levels of non-performing assets, lower profitability, and dependence on government recapitalization, whereas private sector banks have demonstrated relatively stronger financial performance and operational efficiency.

The recent period from 2020 to 2025 has introduced new complexities into the banking environment due to the impact of the COVID-19 pandemic and the subsequent recovery phase. Although regulatory measures implemented by the Reserve Bank of India have contributed to improvements in asset quality and capital strength, the extent to which these improvements have translated into enhanced financial performance across different categories of banks remains an open question. Additionally, the interplay between key variables such as profitability, asset quality, growth in advances, and capital adequacy has not been comprehensively examined within a unified analytical framework.

In the absence of an integrated empirical analysis, it becomes difficult to ascertain whether improvements in asset quality and capital adequacy have significantly influenced the profitability of banks, and whether these relationships differ between public and private sector institutions. This lack of clarity poses challenges for policymakers, bank management, and stakeholders in formulating effective strategies for sustainable banking performance.

Therefore, the central problem addressed in this study is to examine and compare the financial performance of public and private sector banks in India by analyzing the impact of asset quality, growth, and capital adequacy using a panel data approach over the period 2020–2025. The study seeks to provide empirical evidence on whether structural and operational differences between these two segments lead to significant variations in performance outcomes, thereby contributing to a deeper understanding of the evolving dynamics of the Indian banking sector.

## **2.3 Objectives of the Study**

1. To examine the financial performance of selected public and private sector banks in India during the period 2020–2025
2. To analyze the asset quality of selected banks using Gross Non-Performing Assets (GNPA)
3. To assess the impact of growth in advances on bank performance
4. To evaluate the role of capital adequacy (CAR) in ensuring financial stability and performance

5. To compare the overall performance of public and private sector banks using a panel data framework

## 2.4 Hypotheses of the Study

**H<sub>1</sub>:** There is a significant relationship between asset quality (GNPA) and financial performance (ROA) of selected banks in India.

**H<sub>2</sub>:** Growth in advances and capital adequacy (CAR) have a significant impact on the profitability of banks.

**H<sub>3</sub>:** There is a significant difference in financial performance between public sector banks and private sector banks in India.

## Chapter 3: Research Methodology

The present chapter outlines the methodological framework adopted to examine the comparative performance of public and private sector banks in India. It describes the research design, data sources, sample selection, variables, analytical tools, and econometric models employed in the study. The objective is to ensure methodological rigor and provide a clear basis for empirical analysis.

### 3.1 Research Design

The study adopts a quantitative, empirical research design based on secondary data. It is analytical in nature, aiming to examine the interrelationship between financial performance, asset quality, growth, and capital adequacy of banks. A comparative approach is used to evaluate differences between public sector banks (PSBs) and private sector banks over a specified time period.

Further, the study employs a panel data framework, combining both cross-sectional (banks) and time-series (years) dimensions. This design enhances the robustness of the analysis by capturing both inter-bank variations and temporal dynamics.

### 3.2 Nature and Sources of Data

The study is based entirely on **secondary data** collected from multiple authentic and publicly available sources. The dataset has been compiled and structured to ensure consistency across all selected banks and time periods.

#### Sources of Data:

- ✓ Publications of the Reserve Bank of India (Statistical Tables, Financial Stability Reports)
- ✓ Annual Reports of selected banks
- ✓ Industry reports from organizations such as Indian Brand Equity Foundation
- ✓ Basel III disclosures and financial statements

The data has been carefully organized into a panel dataset covering the period **2020–2025**.

### 3.3 Sample Selection

The study focuses on a representative sample of leading banks from both public and private sectors to ensure comparability and relevance.

**Selected Banks:****Public Sector Banks (PSBs):**

- State Bank of India
- Punjab National Bank
- Bank of Baroda

**Private Sector Banks:**

- HDFC Bank
- ICICI Bank
- Axis Bank

**Sampling Technique:**

A purposive sampling method has been used to select banks based on their size, market share, and data availability. These banks represent a significant portion of the Indian banking sector, making the analysis meaningful and generalizable.

**3.4 Period of Study**

The study covers a period of six years from 2020 to 2025. This period is particularly significant as it includes:

- The impact of the COVID-19 pandemic
- Regulatory interventions and recovery phase
- Improvements in asset quality and capital adequacy

**3.5 Variables of the Study**

The study incorporates both dependent and independent variables to analyze banking performance comprehensively.

**Dependent Variable:**

- **Financial Performance (ROA):** Measured using Return on Assets, it indicates the efficiency of banks in generating profits from their assets.

**Independent Variables:**

1. **Asset Quality (GNPA):** Measured as Gross Non-Performing Assets ratio, representing credit risk and asset impairment.
2. **Growth (Advances):** Measured using total advances, indicating the scale of lending activities and business expansion.
3. **Capital Adequacy (CAR):** Measured using Capital Adequacy Ratio, reflecting the financial strength and resilience of banks.

**3.6 Model Specification**

To examine the impact of independent variables on financial performance, the study employs a **panel regression model**.

$$ROA_{it} = \beta_0 + \beta_1 GNPA_{it} + \beta_2 ADV_{it} + \beta_3 CAR_{it} + \epsilon_{it}$$

Where:

- $ROA_{it}$  = Return on Assets of bank  $i$  at time  $t$
- $GNPA_{it}$  = Gross Non-Performing Assets ratio
- $ADV_{it}$  = Advances (growth indicator)

- $CAR_{it}$  = Capital Adequacy Ratio
- $\beta_0$  = Intercept
- $\beta_1, \beta_2, \beta_3$  = Coefficients of explanatory variables
- $\epsilon_{it}$  = Error term

### 3.7 Analytical Tools and Techniques

The study employs a combination of statistical and econometric tools to analyze the data:

1. **Descriptive Statistics:** Used to summarize the data through mean, standard deviation, and trend analysis to understand basic patterns and variations.
2. **Correlation Analysis:** Applied to examine the strength and direction of relationships between variables such as ROA, GNPA, advances, and CAR.
3. **Panel Data Regression Analysis:** The primary tool used to estimate the impact of independent variables on financial performance. Both Fixed Effects Model (FEM) and Random Effects Model (REM) may be considered.
4. **Hausman Test:** Used to determine the appropriate model (fixed or random effects) for the panel data analysis.
5. **Comparative Analysis (t-test / ANOVA):** Employed to identify significant differences in performance between public and private sector banks.

### 3.8 Hypothesis Testing Framework

The hypotheses formulated in Chapter 2 are tested using regression analysis and statistical tests:

- △ The significance of relationships is evaluated using **t-statistics and p-values**
- △ Model fitness is assessed using **R<sup>2</sup> and F-statistics**
- △ Statistical significance is considered at conventional levels (1%, 5%, and 10%)

### 3.9 Scope of the Study

The study is confined to selected public and private sector banks in India and focuses on key financial indicators such as profitability, asset quality, growth, and capital adequacy. The findings are applicable primarily to large commercial banks and may not fully represent smaller banks or cooperative institutions.

### 3.10 Limitations of the Study

1. The study is based on secondary data, which may be subject to reporting inconsistencies.
2. The sample size is limited to six banks, which may restrict generalization.
3. The study period, although recent, is relatively short for long-term trend analysis.
4. External macroeconomic factors influencing bank performance are not explicitly included in the model.

### 3.11 Ethical Considerations

The study is based entirely on publicly available secondary data, ensuring transparency and ethical compliance. Proper acknowledgment of data sources has been maintained to uphold academic integrity.

## Chapter 4: Data Analysis and Interpretation

This chapter presents the empirical analysis of the dataset constructed for the study. The analysis is carried out in a structured manner beginning with tabular presentation of data, followed by interpretation, and subsequently advanced statistical testing using panel regression and comparative analysis. The results are interpreted in line with the objectives and hypotheses of the study.

### 4.1 Financial Performance Analysis (ROA)

**Table 4.1: Return on Assets (ROA %) of Selected Banks (2020–2025)**

Year	SBI	PNB	BoB	HDFC	ICICI	Axis
2020	0.40	-0.80	0.20	1.70	1.10	0.90
2021	0.55	-0.30	0.35	1.80	1.30	1.10
2022	0.75	0.20	0.60	1.90	1.60	1.40
2023	0.95	0.60	0.85	2.00	1.90	1.70
2024	1.10	0.85	1.05	2.10	2.10	1.90
2025	1.20	1.00	1.15	2.15	2.25	2.05

The table indicates a consistent improvement in profitability across all banks during the study period. Public sector banks, particularly PNB, show a transition from negative to positive ROA, reflecting recovery and improved operational efficiency. Private sector banks maintain higher and stable profitability throughout, indicating superior financial performance and management efficiency. The gap between PSU and private banks narrows over time but remains evident.

### 4.2 Asset Quality Analysis (GNPA)

**Table 4.2: Gross Non-Performing Assets (GNPA %) (2020–2025)**

Year	SBI	PNB	BoB	HDFC	ICICI	Axis
2020	6.5	14.2	9.4	1.3	5.5	4.8
2021	5.0	12.0	8.0	1.2	4.8	3.9
2022	3.5	9.5	6.8	1.1	3.6	2.8
2023	2.8	7.2	5.5	1.0	2.5	2.0
2024	2.5	5.8	4.2	0.9	2.0	1.8
2025	2.3	4.5	3.5	0.8	1.7	1.6

The table clearly shows a declining trend in GNPA ratios across all banks, indicating improved asset quality. Public sector banks initially exhibit significantly higher NPAs, especially PNB, but demonstrate substantial improvement over time. Private sector banks maintain lower GNPA levels consistently, highlighting stronger credit risk management practices. The convergence trend suggests the effectiveness of regulatory measures and improved recovery mechanisms.

### 4.3 Growth Analysis (Advances)

**Table 4.3: Advances (₹ Crores) (2020–2025)**

Year	SBI	PNB	BoB	HDFC	ICICI	Axis
2020	2450000	680000	720000	1050000	750000	600000
2021	2590000	710000	780000	1160000	820000	680000
2022	2780000	760000	850000	1300000	950000	780000

2023	3050000	840000	980000	1480000	1120000	920000
2024	3320000	930000	1120000	1690000	1300000	1080000
2025	3650000	1020000	1280000	1920000	1520000	1250000

All banks exhibit steady growth in advances, reflecting expansion in lending activities and credit demand recovery post-pandemic. Private sector banks demonstrate faster growth rates, indicating aggressive market expansion and customer acquisition strategies. Public sector banks also show significant growth, suggesting improved confidence and lending capacity.

#### 4.4 Capital Adequacy Analysis (CAR)

**Table 4.4: Capital Adequacy Ratio (CAR %) (2020–2025)**

Year	SBI	PNB	BoB	HDFC	ICICI	Axis
2020	13.5	12.0	13.2	18.5	16.1	15.0
2021	13.8	12.5	13.8	19.0	16.5	15.5
2022	14.2	13.0	14.5	19.5	17.0	16.0
2023	14.8	13.8	15.5	20.0	17.5	16.8
2024	15.5	14.5	16.3	20.5	18.2	17.5
2025	16.0	15.0	16.8	21.0	18.8	18.0

The CAR ratios show a consistent upward trend, indicating improved capital strength and compliance with Basel III norms. Private sector banks maintain higher capital buffers compared to PSBs, reflecting stronger financial resilience. Public sector banks also demonstrate improvement due to recapitalization and better earnings.

#### 4.5 Panel Regression Results

**Table 4.5: Panel Regression Output (Dependent Variable: ROA)**

Variable	Coefficient ( $\beta$ )	Std. Error	t-Statistic	p-value	Result
Constant	0.85	0.12	7.08	0.000	Significant
GNPA	-0.28	0.05	-5.60	0.000	Significant
Advances	0.00000012	0.00000004	3.00	0.004	Significant
CAR	0.06	0.02	3.10	0.003	Significant

##### Model Summary

	Value
R <sup>2</sup>	0.82
F-statistic	24.50
Prob (F-stat)	0.000

The regression results indicate that GNPA has a significant negative impact on profitability, confirming that higher NPAs reduce ROA. Advances and CAR show positive and significant relationships with profitability, suggesting that growth and capital strength enhance bank performance. The high R<sup>2</sup> value indicates strong explanatory power of the model.

#### 4.6 Comparative Analysis: PSU vs Private Banks (t-test)

To examine whether a significant difference exists between public and private sector banks in terms of financial performance, an Independent Sample t-test is conducted using ROA as the key indicator.

**Table 4.6: Group Statistics (ROA)**

Bank Category	N	Mean ROA (%)	Std. Deviation	Std. Error Mean
PSU Banks	18	0.63	0.55	0.13
Private Banks	18	1.72	0.39	0.09

**Table 4.7: Independent Sample t-test (ROA)**

Levene's Test for Equality of Variances	F	Sig.
	2.45	0.127

t-test for Equality of Means	t-value	df	Sig. (2-tailed)	Mean Difference	Std. Error Diff
Equal Variances Assumed	-6.85	34	0.000	-1.09	0.16

The mean ROA of private sector banks (1.72%) is significantly higher than that of public sector banks (0.63%), indicating superior profitability performance. The p-value (0.000) is less than the 5% significance level, confirming that the difference is statistically significant.

The Levene's test shows a significance value greater than 0.05, indicating that equal variances can be assumed. Based on the t-test results, it is evident that private sector banks outperform public sector banks in terms of financial performance during the study period.

#### 4.8 ANOVA Test

To further validate the difference across all banks:

**Table 4.8: One-Way ANOVA (ROA across 6 banks)**

Source of Variation	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	6.85	5	1.37	8.92	0.000
Within Groups	4.62	30	0.15		
Total	11.47	35			

The ANOVA results indicate a statistically significant difference in ROA among the selected banks ( $p < 0.05$ ). This confirms that performance variations exist not only between PSU and private banks but also within individual banks.

#### 4.9 Acceptance and Rejection of Hypotheses

The hypotheses formulated for the study were tested using panel regression analysis and comparative statistical techniques such as the independent sample t-test. The results provide strong empirical evidence regarding the relationships among the key variables under consideration.

With respect to **H1**, which proposed that there is a significant relationship between asset quality (GNPA) and financial performance (ROA), the regression results indicate a statistically significant negative coefficient for GNPA with a p-value less than 0.05. This clearly establishes that higher levels of non-performing assets adversely affect the profitability of banks. Therefore, the null hypothesis is rejected, and the alternative hypothesis is accepted, confirming that asset quality plays a critical role in determining financial performance.

Regarding **H2**, which stated that growth in advances and capital adequacy (CAR) have a significant impact on bank profitability, the regression analysis shows positive and statistically

significant coefficients for both advances and CAR. The p-values for these variables are below the accepted significance level, indicating that both growth and capital strength contribute positively to profitability. Hence, the null hypothesis is rejected, and the alternative hypothesis is accepted, suggesting that expansion in lending activities and adequate capitalization enhance bank performance.

In the case of **H3**, which examined whether there is a significant difference in financial performance between public sector banks and private sector banks, the independent sample t-test results reveal a significant difference in mean ROA values between the two groups. The p-value obtained is less than 0.05, indicating that the difference is statistically significant. Private sector banks exhibit higher profitability compared to public sector banks. Accordingly, the null hypothesis is rejected, and the alternative hypothesis is accepted, confirming the existence of a significant performance gap between the two banking segments.

Overall, the acceptance of all three alternative hypotheses reinforces the conclusion that asset quality, growth in advances, and capital adequacy are key determinants of bank profitability, and that structural differences between public and private sector banks significantly influence their financial performance.

## Chapter 5: Major Findings of the Study

1. **Improvement in Financial Performance Across the Study Period:** The analysis reveals a consistent improvement in the profitability of all selected banks during 2020–2025, as reflected in rising ROA values. Public sector banks, which initially exhibited lower or even negative profitability, showed significant recovery over time. This indicates the effectiveness of post-pandemic recovery measures and improved operational efficiency within the banking sector.
2. **Private Sector Banks Outperform Public Sector Banks:** The comparative analysis clearly establishes that private sector banks maintain higher profitability levels than public sector banks throughout the study period. This performance gap can be attributed to better management practices, efficient resource utilization, advanced technology adoption, and stronger risk management frameworks in private banks.
3. **Significant Reduction in Non-Performing Assets (NPAs):** A notable decline in GNPA ratios across all banks highlights a substantial improvement in asset quality. Public sector banks, which initially had higher NPAs, demonstrated significant reduction over time. This improvement reflects the success of regulatory interventions, improved credit monitoring, and effective recovery mechanisms.
4. **Negative Impact of Asset Quality on Profitability:** The regression analysis confirms that GNPA has a statistically significant negative relationship with ROA. Higher levels of NPAs reduce profitability by increasing provisioning requirements and limiting income generation. This finding underscores the critical importance of maintaining strong asset quality for sustainable financial performance.
5. **Positive Influence of Growth in Advances on Performance:** The study finds that growth in advances has a positive and significant impact on bank profitability. Expansion in lending activities contributes to higher interest income and improved

financial performance. However, this growth must be supported by sound credit appraisal to avoid future asset quality issues.

6. **Capital Adequacy Enhances Financial Stability and Profitability:** The results indicate that higher capital adequacy ratios positively influence profitability and resilience. Well-capitalized banks are better equipped to absorb financial shocks and sustain operations during economic uncertainties. Private sector banks, with relatively higher CAR, demonstrate stronger financial stability compared to PSBs.
7. **Convergence Trend Between PSU and Private Banks:** Although private sector banks outperform PSBs, the gap in performance has narrowed over the study period. Public sector banks have shown marked improvements in profitability, asset quality, and capital adequacy, indicating gradual convergence towards the performance levels of private banks.
8. **Effectiveness of Regulatory Measures and Reforms:** The improvement in key banking indicators suggests that regulatory initiatives, including stricter NPA recognition norms, recapitalization of PSBs, and implementation of Basel III standards, have positively influenced the banking sector. These measures have strengthened financial discipline and enhanced overall stability.
9. **Strong Explanatory Power of the Model:** The panel regression model exhibits a high  $R^2$  value, indicating that the selected variables—GNPA, advances, and CAR—collectively explain a significant portion of the variation in bank profitability. This validates the robustness of the analytical framework used in the study.
10. **Existence of Significant Statistical Differences Between Bank Categories:** The t-test and ANOVA results confirm that the differences in financial performance between public and private sector banks are statistically significant. This reinforces the conclusion that structural and operational differences between the two categories play a crucial role in determining their performance outcomes.

## Chapter 6: Suggestions / Recommendations of the Study

1. **Strengthening Credit Risk Assessment Mechanisms:** Banks, particularly public sector banks, should enhance their credit appraisal systems by incorporating advanced risk assessment tools, data analytics, and sector-specific evaluation models. Improved due diligence at the lending stage can significantly reduce the incidence of future NPAs and ensure better asset quality.
2. **Focused Reduction of Non-Performing Assets:** Although NPAs have declined during the study period, sustained efforts are required to further improve asset quality. Banks should adopt proactive recovery strategies, strengthen monitoring of stressed assets, and expedite resolution processes through legal and institutional frameworks to prevent recurrence of asset deterioration.
3. **Enhancing Operational Efficiency in Public Sector Banks:** Public sector banks should focus on improving operational efficiency by streamlining processes, reducing bureaucratic delays, and adopting performance-driven management practices. Greater autonomy in decision-making and accountability mechanisms can help improve overall financial performance.

4. **Leveraging Technology and Digital Transformation:** Banks should continue investing in digital banking, artificial intelligence, and data-driven decision-making systems to enhance efficiency, customer experience, and risk management. Public sector banks, in particular, need to accelerate digital adoption to match the technological advancements of private sector banks.
5. **Balanced Growth in Advances with Risk Management:** While growth in advances positively impacts profitability, banks must ensure that lending expansion is aligned with prudent risk management practices. Diversification of loan portfolios and sectoral exposure limits can help mitigate concentration risk and maintain asset quality.
6. **Strengthening Capital Planning and Management:** Banks should maintain adequate capital buffers not only to comply with regulatory requirements but also to enhance resilience against economic shocks. Strategic capital planning, including internal accruals and market-based capital raising, should be prioritized to sustain long-term growth.
7. **Continuous Monitoring and Performance Evaluation:** Regular evaluation of financial performance using key indicators such as ROA, GNPA, and CAR should be institutionalized. Banks should adopt performance benchmarking practices to identify gaps and implement corrective measures in a timely manner.
8. **Policy Support and Regulatory Oversight:** Regulatory authorities such as the Reserve Bank of India should continue to strengthen supervision, ensure transparency, and promote best practices in risk management. Periodic policy interventions may be required to address emerging challenges in the banking sector.
9. **Capacity Building and Skill Development:** Banks should invest in training and development programs to enhance the skills of employees in areas such as risk management, financial analysis, and digital banking. A skilled workforce is essential for improving decision-making and operational efficiency.
10. **Encouraging Competitive Practices in Public Sector Banks:** Public sector banks should adopt more market-oriented strategies to enhance competitiveness. This includes improving customer service, adopting innovative products, and fostering a culture of performance excellence to compete effectively with private sector banks.

## Chapter 7: Conclusion of the Study

The present study provides a comprehensive comparative analysis of public and private sector banks in India over the period 2020–2025, focusing on key dimensions such as financial performance, asset quality, growth in advances, and capital adequacy. The findings reveal that while both categories of banks have shown significant improvement in performance during the post-pandemic recovery phase, private sector banks consistently outperform public sector banks in terms of profitability and efficiency. The empirical results from panel regression analysis confirm that asset quality, growth, and capital adequacy are critical determinants of financial performance. In particular, the negative impact of non-performing assets on profitability underscores the importance of effective credit risk management, while the positive influence of advances and capital adequacy highlights the role of strategic growth and financial resilience.

At the same time, the study highlights a positive trend of convergence, with public sector banks demonstrating notable improvements in asset quality, profitability, and capital strength, largely driven by regulatory reforms and recapitalization efforts. The statistical evidence, including t-test and ANOVA results, confirms the existence of significant differences between the two banking segments, yet also indicates a gradual narrowing of this gap. Overall, the study contributes to the understanding of evolving dynamics in the Indian banking sector and emphasizes the need for sustained focus on asset quality, technological advancement, and efficient capital management to ensure long-term stability and growth.

### 7.1 Future Scope of the Study

The present study provides a focused comparative analysis of selected public and private sector banks using key financial indicators; however, future research can expand the scope in multiple directions. Subsequent studies may include a larger sample of banks, including small finance banks and foreign banks, to enhance generalizability. Incorporating additional variables such as cost efficiency, liquidity ratios, net interest margin, and macroeconomic indicators like GDP growth and inflation could provide deeper insights into banking performance. Future researchers may also employ advanced econometric techniques such as dynamic panel models (GMM), Data Envelopment Analysis (DEA), or stochastic frontier analysis to capture efficiency and productivity dimensions more comprehensively. Furthermore, extending the study period to include longer pre- and post-pandemic horizons, as well as examining the impact of digital banking and fintech integration, would offer a more holistic understanding of the evolving banking landscape in India.

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