



# **IMPACT OF CAPITAL ADEQUACY RATIO ON OPERATING PERFORMANCE, PROFITABILITY AND RETURN RATIO: A COMPARISON BETWEEN SELECTED PUBLIC AND PRIVATE SECTOR BANKS IN INDIA**

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## ***Abstract***

*The aim of the study was to understand impact of capital adequacy ratio on operating performance, profitability and return ratio and understand this as a comparison between select public sector banks and private sector banks. For the purpose of this study, panel data was collected from twelve sample Indian banks over a period of ten years (2014-2023). These banks included six public sector banks and six private sector banks. Descriptive analysis, independent sample t-test and simple regression were performed on the data. It was found that private sector banks perform better than public sector banks. The private sector banks demonstrate stronger financial performance, higher efficiency, better asset quality and more aggressive lending strategies compared to public sector banks. These differences highlight the need for public sector banks to adopt more efficient practices and improve their financial health to compete effectively with private sector banks.*

**Keywords:** *BASEL Accord, Capital Adequacy, Operating Performance, Profitability Ratios*

## **INTRODUCTION**

In any economy, banks are the backbone of the financial system. The banks play crucial role in motivating people and organisations to save money and directing that savings towards people and organisations who need to make investments in the economy and other areas. This process raises people's standards of living, generates employment, and propels economic growth. The primary task of banks is to transfer money from savers, or surplus economic units, to users, or deficit economic units. The chance that a borrower may fail or not make payments or not follow the contractual responsibilities is known as credit risk. The interest on loans is source of income for banks and loans are also a significant source of *credit risk*. The ratio of non-performing assets (NPAs) to total advances, given as a percentage, can be used to analyse credit risk. (Alwi et al.). Banks are susceptible to many risks and another significant of which is the *liquidity risk*. Due to less liquidity banks are not able to pay back money to depositors. The primary reason for bank regulation is typical occurrence of market failures, which are frequently brought about by externalities, market power, or knowledge asymmetry between buyers and sellers. It is known as *market risk*. Regulation of banks is necessary because of the possibility of a systemic collapse and depositors' incapacity to keep an eye on the banks<sup>1</sup>.

The Basel Committee on Banking Supervision (BCBS), hosted under the Bank for International Settlements (BIS) and made up of central bank governors from the participating nations, was the first attempt at international cooperation in banking regulation<sup>2</sup>.

<sup>1</sup> <https://www.iibf.org.in/documents/reseach-report/report-25.pdf>

<sup>2</sup> <https://www.bis.org/bcbs/index.htm?m=88>



### **<sup>3</sup>Basel – I Accord**

BCBS created the risk-based capital adequacy criteria, which led to the formulation of the first agreement on bank regulation. As a result, the International Convergence of Capital Measurements and Capital Standards was introduced which is called as Basel – I accord. In 1988 Accord called for a minimum ratio of capital to risk-weighted assets of 8% to be implemented by the end of 1992.

### **<sup>4</sup>Basel – II Accord**

The Committee released a proposal in June 1999 to replace the 1988 Accord with a new capital adequacy framework. As a result, in June 2004, an updated capital framework was published. It provides flexible, risk sensitive capital management. Often referred to as "Basel II," the updated framework was composed of three main components:

1. Minimum capital requirements, which sought to develop and expand the standardised rules set out in the 1988 Accord
2. Supervisory review of an institution's capital adequacy and internal assessment process
3. Effective use of disclosure as a lever to strengthen market discipline and encourage sound banking practices
- 4.

### **<sup>5</sup>Basel – III**

The three pillars created by Basel II are revised, strengthened, and expanded upon in various ways by the upgraded Basel framework. With the release of new guidelines for determining capital needs for credit risk, credit value adjustment risk, and operational risk, the Committee concluded its Basel III changes in 2017. A revised leverage ratio, a leverage ratio buffer for globally systemically significant banks, and an output floor based on the revised standardised methodologies are also included in the final changes. These measures restrict the amount of internal modelling that banks can use to lower risk-based capital needs. The pre-crisis regulatory structure's flaws are addressed by these last reforms, which also establish the regulatory framework needed for a strong banking sector that supports the real economy.

Seth et al., (2022) Said that one of the Basel committee's key initiatives was the adoption of capital adequacy standards is advised in order to curb any bank's excessive risk-taking conduct. India, one of the biggest rising economies, embraced Basel standards gradually over an extended period of time. The Reserve Bank of India (RBI), the banking regulator, has modified the normal BCBS regulations, resulting in notable alterations to the functioning of Indian banks.

As per Dr. Vighneshwara Swami's report, every increase in capital ratio decreases bank loan spread. The Basel requirements have increased capital requirement in banking system. This would enable the banks to plan their capital raising activity in tune with regulatory requirements.

Basel Committee on Banking Supervision [NO\_PRINTED\_FORM], The study finds no proof of the detrimental consequences of the Basel III reforms that were looked into. According to the report, banks that complied with Basel III criteria saw a decrease in both debt and equity expenses. The decline was especially noticeable for banks with lower starting capital ratios, indicating that market players acknowledged Basel III's de-risking of banks by reducing the cost of banks' access to capital markets.

## **LITERATURE REVIEW**

### **Impact of Capital Adequacy Ratio on Operating Performance and Profitability & Return Ratios**

Shukla (2018) conducted a study including 20 private sector banks and 26 public sector banks in India between 2006 and 2014. The study's primary goal was to determine how Basel III standards might affect Indian banks. It was shown that Indian banks have benefited from the precautionary measures taken by the Reserve Bank of India (RBI), such as increasing CAR to 9% from the globally recommended level of 8%. Higher capital adequacy, however, was probably going to have a negative effect on return on equity. For advances, net non-performing assets, and net profits, the co-relation co-efficient for CAR is negative.

Das et al. [NO\_PRINTED\_FORM] studied management of NPA via capital adequacy norms and its effect of credit to deposit ratio (CDR). The study was conducted for the time period for 1995-96 to 2009-10 for schedule commercial banks in India. It was found that NPA/Deposit is positively correlated with CRAR (capital to risk asset ratio or capital adequacy ratio). On the other side there is a negative relationship between cash to deposit ratio and CRAR.

Goh et al. [NO\_PRINTED\_FORM] have studied 23 banks listed on Indonesia stock exchange for the period of 2015-19. They found that capital adequacy has an impact on financial performance in banks. The loan to deposit

<sup>3</sup> <https://www.bis.org/bcbs/history.htm>

<sup>4</sup> <https://www.bis.org/publ/bcbs107.htm>

<sup>5</sup> <https://www.bis.org/bcbs/publ/d424.htm>



ratio does not effect financial performance. It was found that there is a relationship between CAR and loan to deposit ratio.

Al-Mamun, Islam, & Sarker (2022) have studied 20 banks of Bangladesh to understand affiliation between capital adequacy and bank's performance. The data of 20 banks was collected for the duration from 2010 to 2020. They found that the performance of banks are related to capital adequacy. The outcome of the study informs that the capital adequacy has negative impact on bank performance.

Parvez, Naveenan, Alymoor, Bansal, & Gupta (2023) have studied 65 Indian banks for the period of 2005 to 2018 and used panel regression. The study was aimed to understand impact of capital adequacy on bank performance. In the study, it was found that capital adequacy and non-performing assets (NPA) has negative impact on banks' profitability.

Al-Sharkas & Al-Sharkas (2022) have studied 24 banks of Jordan for the time period of 2008-2018 to understand impact of capital adequacy on banks profitability (ROE, ROA) in the context of Basel II Accord implementation in Jordan. ROA is negatively affected by capital adequacy ratio and ROE is positively affected by capital adequacy ratio.

Prabowo et al. (2021) studied capital adequacy ratio, non-performing loan, return on assets, return on equity, operating cost to operating income and loan to deposit ratio for four Indonesian banks for the period of 2010-17. It was found that capital adequacy ratio has negative influence of loan to deposit ratio.

Alwi et al. (2021) examined 29 Indonesian banks, both state-owned and privately held; data was gathered between 2015 and 2019. The study's findings showed that the total amount of non-performing assets (NPA) had a detrimental impact on state-owned commercial banks' and private banks' bank performance as determined by ROA, ROE, and NIM. By using the N-NPA and G-NPA ratios, NPA was calculated.

### **Comparison of Performance for Public Sector Bank and Private Sector Bank**

Saha et al., (2023) studied and compare financial performance of public and private sector banks in India. The study included data of five banks from each sector for 10 years duration. The capital adequacy was higher in private sector banks than public sector banks. It was found that asset quality was good in private sector banks, the public sector banks had higher NPAs. The private sector banks had better return on assets than PSBs. There was significant difference between public sector banks and private sector banks in terms of capital adequacy, assets quality, management efficiency, earning ability and liquidity.

ROE and NIM showed a strong and negative correlation with capital adequacy, however ROA showed no correlation at all. According to this, ROE and NIM are inversely correlated with CAR. For both state-owned and privately held commercial banks, this analysis reveals a substantial and favourable correlation between insolvency risk and ROA, ROE, and NIM. (Alwi et al.).

The performance of state and private banks that operated in Pakistan between 2011 and 2014 was compared by Waleed et al. (2015). The data of five public and sixteen private banks were used in the study. Financial measures including profitability and liquidity ratios were considered as well as bank size. It was discovered that private banks outperform public banks in terms of the debit ratio, return on equity, debt to equity ratio, and earnings per share. However, compared to private banks, the public returns on assets are higher.

From the literature review it was found that there were few studies done that compared public and private sector banks on the parameters like return, profitability and operational efficiency together. It can also be understood from the literature that no efforts were made to understand impact of capital adequacy ratio on return, profitability and operation ratio to compare public and private sector banks. On the basis of such gap, this research was an attempt to enrich body of knowledge with respect to subject area under study.

## **RESEARCH METHODOLOGY**

The research methodology outlines objectives, hypothesis, overall approach, data collection and data analysis techniques. The primary objective of this study is to determine how capital adequacy impacts selected dependent variables; bank profitability, return on assets, return on equity, net profit margin, operating profit margin, net interest margin and non-performing assets.

## **RESEARCH OBJECTIVES**

1. To study the difference between private banks and public banks with respect to Capital Adequacy Ratio, Operating Performance and Return Ratios

2. To compare impact of CAR on operating performance and Return Ratios between private and public banks

For the purpose of this study, panel data was collected from twelve sample Indian banks over a period of ten years (2014-2023). These banks included six public sector banks and six private sector banks. According to India: Largest Private Indian Banks by Asset 2024, Statista, 2024, these twelve banks control between seventy to eighty percentage of assets controlled by banking industry in India. The information was obtained from the standalone

balance sheet and profit and loss account. Respective banks' key ratios were also collected for each of the sample banks. In this investigation, secondary data were utilized. The websites Money Control and Stockedge were the primary sources of information for the aforementioned variables during the period of time spanning from 2014 to 2023. The capital adequacy ratio was calculated in order to determine the level of adequate capital. For the purpose of comparing the return and profitability of the banks, the following metrics were incorporated: return on assets, return on equity, net profit margin (%), operating profit margin (%); likewise to compare operating efficiency data of operating ratios were collected: net profit per employee (Rs.), business per employee (Rs.), net interest margin (%), cost to income ratio (%), interest income to total assets (%), gross non-performing assets (%) and net non-performing asset ratio (%). Apart from these data some other information was also collected including CASA %, non-interest income to total assets (%), credit to deposit ratio (%), operating expense to total assets (%). Linear regression was performed to comprehensively examine impact of capital adequacy ratio on return, profitability and operating ratios, eleven (11) variables for both public and private sector banks. This statistical method was chosen to elucidate and quantify relationship between capital adequacy ratio and each of above eleven variables, providing a deeper understanding of their interdependencies.

## HYPOTHESIS

$H_{0a}$ : There is no significant difference between private sector banks and public sector banks in terms of their operating, profitability and return ratios.

$H_{1a}$ : There is no significant difference between private sector banks and public sector banks in terms of their operating, profitability and return ratios.

## DATA ANALYSIS

Table No. 1: Comparison Between Private and Public Sector Banks (Descriptive and Independent Sample Test)					
Sr. No.	Particular	Private Sector Bank	Public Sector Bank	Independent Sample Test	
		Mean	Mean	p- Value	Statistical Difference
1	Capital Adequacy Ratio	16.57	12.70	0.000	Significant
2	Return on Assets	0.98	-0.01	0.000	Significant
3	Return on Equity	7.40	-0.82	0.003	Significant
4	Net Profit Per Employee	46,20,371.48	8,59,986.15	0.004	Significant
5	Business Per Employee	47,33,35,563.75	48,54,62,951.60	0.930	Not Significant
6	CASA %	44.18	35.94	0.000	Significant
7	Net Profit Margin	13.60	0.28	0.000	Significant
8	Operating Profit Margin	-8.99	-15.88	0.021	Significant
9	Net Interest Margin	3.20	2.21	0.000	Significant
10	Cost to Income	43.13	42.64	0.814	Not Significant
11	Interest Income to Total Assets	7.44	6.75	0.000	Significant
12	Non-Interest Income to Total Assets	1.62	1.05	0.000	Significant
13	Operating Profit to Total Assets	-0.64	-1.12	0.022	Significant
14	Operating Expense to Total Assets	2.13	1.51	0.000	Significant

15	Gross Non-Performing Asset	5.32	9.71	0.000	Significant
16	Net Non-Performing Asset	1.91	4.70	0.000	Significant
17	Credit to Deposit Ratio	89.41	70.04	0.000	Significant

There are clear differences in the financial parameters of Public Sector Banks and Private Sector Banks when compared (Table No. 1). With a p-value of 0.000, the Capital Adequacy Ratio is significantly greater for Private Sector Banks (16.57) than for Public Sector Banks (12.70), suggesting that the private sector has stronger capitalization.

The better performance of private sector banks is further demonstrated by Return on Equity (RoE) and Return on Assets (RoA). Public sector banks display a slightly negative mean RoA of -0.01 and a RoE of -0.82, whereas private sector banks have a positive mean RoA of 0.98 and a RoE of 7.40. These also proven by statistically significant differences with p-values of 0.000 and 0.003 respectively. It highlights the superior asset utilisation and profitability of private sector banks.

Private sector banks do much better than public sector banks in terms of staff productivity also. With a p-value of 0.004, the net profit per employee for private sector banks is ₹46,20,371.48, significantly higher than public sector banks, which is ₹8,59,986.15. However, both of them do not differ much in terms of business per employee; the statistics are ₹47,33,35,563.75 and ₹48,54,62,951.60, respectively, with a p-value of 0.930.

The Private Sector Banks outperform Public Sector Banks is the CASA (Current Account Savings Account) ratio, where they have a CASA ratio of 44.18% against 35.94% for Public Sector Banks, with a p-value of 0.000. This suggests a more favourable mix of deposits and possibly reduced funding costs for banks in the private sector. A p-value of 0.000 indicates that Private Sector Banks have a considerably higher Net Profit Margin (13.60%) than Public Sector Banks (0.28%).

With a significant p-value of 0.021 the Operating Profit Margin of Private Sector Banks is less negative (-8.99%) than that of Public Sector Banks (-15.88%). In addition to that with a p-value of 0.000 the Net Interest Margin (NIM) of Private Sector Banks is higher at 3.20% than Public Sector Banks which is 2.21%. The two sectors' respective Cost to Income ratios—Public Sector Banks at 42.64% and Private Sector Banks at 43.13% (p-value 0.814)—do not show a statistically significant difference.

In terms of interest income generated per asset, private sector banks generate 7.44% whereas public sector banks generate 6.75% (p-value 0.000). The Private Sector Banks have a higher Non-Interest Income to Total Assets ratio (1.62%) than Public Sector Banks (1.05%), with a p-value of 0.000. With a significant p-value of 0.022, Private Sector Banks' Operating Profit to Total Assets is less negative (-0.64%) than Public Sector Banks' (-1.12%).

Operating expenses as a proportion of total assets are higher in Private Sector Banks at 2.13% compared to 1.51% in Public Sector Banks with a p-value of 0.000. This might reflect higher costs associated with maintaining more extensive or sophisticated operations. However, asset quality indicators, such as Gross Non-Performing Assets (GNPA) and Net NPA, are better in Private Sector Banks. The Gross NPA ratio for Private Sector Banks is 5.32% lower than 9.71% for Public Sector Banks (p-value 0.000). Similarly, the Net NPA ratio is 1.91% for Private Sector Banks compared to 4.70% for Public Sector Banks, also with a p-value of 0.000.

The Credit to Deposit Ratio indicates lending aggressiveness. It is significantly higher in Private Sector Banks at 89.41% compared to 70.04% in Public Sector Banks, with a p-value of 0.000.

### Regression Analysis

Regression is the process of identifying a statistical link between two or more variables. In basic regression, there are only two variables: the dependent variable and the independent variable. The independent variable controls the behaviour of the dependent variable. Regression analysis can only be used to explain physical events, which means that independent variable X must physically affect dependent variable Y (Kothari, 1990).

$$Y = a + bX$$

### Regression Assumptions

Assumptions were evaluated before running a linear regression test with SPSS. A linear regression model is associated with four distinct assumptions: linearity, homoscedasticity, independence, and normalcy, according to the Boston University School of Public Health (2016). It was discovered that there was a linear relationship between the variable X and the mean of Y. Homoscedasticity is the property where the residual variance remains constant for a given value of X. The homoscedasticity assumptions were met by the test's outcomes. The observations were unrelated to one another for every regressing equation. Also evaluated and shown to be true was the normalcy assumption. These are the outcomes of the linear regression. The results are described as under.

**Regression Analysis for Public Sector Banks**

*H<sub>0b</sub>: There is no significant impact of capital adequacy on return and profitability ratio as of public sector banks.*

*H<sub>1b</sub>: There is a significant impact of capital adequacy on return and profitability ratio as of public sector banks.*

Mode l	Dependent Variable	R <sup>2</sup>	df	F	Significanc e	Constant (α)	Co-efficient (β)
1	Return on Asset	0.34 1	1 (58)	29.98 5	0.000	-3.215	0.252
2	Return on Equity	0.32 5	1 (58)	27.93 3	0.000	-57.27	4.444
3	Net Profit Margin	0.37	1 (58)	34.11 6	0.000	-49.262	3.900
4	Operating Profit Margin	0.17 4	1 (58)	12.24 9	0.001	-53.857	2.990

Independent Variable = Capital Adequacy Ratio (CAR)

The regression models for Public Sector Banks, as outlined in Table No. 2, examine the relationship between various dependent variables and the independent variable, Capital Adequacy Ratio (CAR). Each model provides insight into how CAR impacts return and profit ratio indicators.

1. **Return on Asset (RoA):** The model shows an R<sup>2</sup> of 0.34 indicating that 34.1% of the variation in RoA can be explained by CAR. The F-statistic of 29.985 and a p-value of 0.000 suggest this relationship is statistically significant. The regression equation is  $RoA = -3.215 + 0.252 \times CAR$ , implying that for each unit increase in CAR, RoA increases by 0.252.

2. **Return on Equity (RoE):** With an R<sup>2</sup> of 0.325, the model explains 32.5% of the variation in RoE. The F-statistic is 27.933 and the p-value is 0.000 indicating significance. The regression equation  $RoE = -57.27 + 4.444 \times CAR$  suggests a positive impact of CAR on RoE.

3. **Net Profit Margin (NPM):** The R<sup>2</sup> value is 0.37, showing that CAR accounts for 37% of the variation in Net Profit Margin. The F-statistic is 34.116 and the p-value is 0.000 indicating a significant relationship. The regression equation  $Net\ Profit\ Margin = -49.262 + 3.900 \times CAR$  suggests a positive relationship.

4. **Operating Profit Margin (OPM):** With an R<sup>2</sup> of 0.174, this model explains 17.4% of the variation in Operating Profit Margin. The F-statistic of 12.249 and a p-value of 0.001 indicating significance. The regression equation  $Operating\ Profit\ Margin = -53.857 + 2.990 \times CAR$  indicates a positive relationship.

*H<sub>0c</sub>: There is no significant impact of capital adequacy on operating ratio as of public sector banks.*

*H<sub>1c</sub>: There is a significant impact of capital adequacy on operating ratio as of public sector banks.*

Mod el	Dependent Variable	R <sup>2</sup>	df	F	Significanc e	Constant (α)	Co-efficient (β)
1	Net Profit Per Employee	0.09 9	1 (58)	6.345	0.015	-7094143.137	626227.211
2	Business Per Employee	0.08 2	1 (58)	5.15	0.027	1063766456.9 62	121970560.9 68
3	Net Interest Margin	0.22 6	1 (58)	16.95 4	0.000	1.280	0.073
4	Cos to Income	0.00 6	1 (58)	0.371	0.545	NA	NA
5	Interest Income to Total Assets	0.47 2	1 (58)	51.76 3	0.000	10.598	-0.303
6	Gross Non-Performing Assets	0.15 4	1 (58)	10.56 6	0.002	22.976	-1.044
7	Net Non-Performing Assets	0.37 1	1 (58)	34.26 2	0.000	17.583	-1.015

Independent Variable = Capital Adequacy Ratio (CAR)

The regression models for Public Sector Banks as outlined in Table No. 3 examine the relationship between various dependent variables and the independent variable Capital Adequacy Ratio (CAR). Each model provides insight into how CAR impacts operating ratio indicators.

- Net Profit Per Employee (NPPE):** This model has an  $R^2$  of 0.099, meaning CAR explains 9.9% of the variation in Net Profit Per Employee. The F-statistic of 6.345 and a p-value of 0.015 indicate a significant relationship. The regression equation  $\text{Net Profit Per Employee} = -7094143.137 + 626227.211 \times \text{CAR}$  shows a positive association.
- Business Per Employee (BPE):** Here, the  $R^2$  is 0.082 with CAR explaining 8.2% of the variation in Business Per Employee. The F-statistic is 5.15 and the p-value is 0.027 indicating significance. The regression equation  $\text{Business Per Employee} = -1063766456.962 + 121970560.968 \times \text{CAR}$  implies a positive impact.
- Net Interest Margin (NIM):** The model shows an  $R^2$  of 0.226 with CAR explaining 22.6% of the variation in NIM. The F-statistic is 16.954 and the p-value is 0.000 suggesting significance. The regression equation  $\text{NIM} = 1.280 + 0.073 \times \text{CAR}$  implies a positive impact.
- Cost to Income (CTI):** This model has an  $R^2$  of 0.006 indicating that only 0.6% of the variation in Cost to Income can be explained by CAR. The F-statistic of 0.371 and a p-value of 0.545 indicate that the relationship is not statistically significant. The coefficients are not applicable (NA).
- Interest Income to Total Assets (IITA):** The  $R^2$  value is 0.472 showing that CAR explains 47.2% of the variation in Interest Income to Total Assets. The F-statistic is 51.763 and the p-value is 0.000 indicating a significant relationship. The regression equation  $\text{Interest Income to Total Assets} = 10.598 - 0.303 \times \text{CAR}$  suggests a negative impact of CAR on this metric.
- Gross Non-Performing Assets (GNPA):** With an  $R^2$  of 0.154 the model explains 15.4% of the variation in Gross NPA. The F-statistic of 10.566 and a p-value of 0.002 indicate significance. The regression equation  $\text{Gross NPA} = 22.976 - 1.044 \times \text{CAR}$  shows a negative relationship suggesting that higher CAR is associated with lower Gross NPA.
- Net Non-Performing Assets (NNPA):** The  $R^2$  value is 0.371 with CAR explaining 37.1% of the variation in Net NPA. The F-statistic is 34.262 and the p-value is 0.000 indicating a significant relationship. The regression equation  $\text{Net NPA} = 17.583 - 1.015 \times \text{CAR}$  also suggests a negative impact of CAR on Net NPA.

#### Regression Analysis for Private Sector Banks

$H_{0d}$ : There is no significant impact of capital adequacy on return and profitability ratio as of private sector banks.

$H_{1d}$ : There is a significant impact of capital adequacy on return and profitability ratio as of private sector banks.

Model	Dependent Variable	$R^2$	df	F	Significance	Constant ( $\alpha$ )	Co-efficient ( $\beta$ )
1	Return on Asset	0.564	1 (58)	26.986	0.000	-3.592	0.276
2	Return on Equity	0.522	1 (58)	21.721	0.000	-41.216	2.935
3	Net Profit Margin	0.555	1 (58)	25.858	0.000	-48.396	3.742
4	Operating Profit Margin	0.576	1 (58)	28.732	0.000	-74.486	3.953

Independent Variable = Capital Adequacy Ratio (CAR)

The regression models for Private Sector Banks, as displayed in Table No. 4 & Table No. 5, explore the relationship between various dependent variables and the independent variable, Capital Adequacy Ratio (CAR). Each model reveals how CAR influences different performance metrics in Private Sector Banks.

1. **Return on Asset (RoA):** This model has an  $R^2$  of 0.564, indicating that 56.4% of the variation in RoA can be explained by CAR. The F-statistic is 26.986 and the p-value is 0.000 signifying a significant relationship. The regression equation is  $\text{RoA} = -3.592 + 0.276 \times \text{CAR}$  showing that for each unit increase in CAR, RoA increases by 0.276.

2. **Return on Equity (RoE):** With an  $R^2$  of 0.522 the model explains 52.2% of the variation in RoE. The F-statistic is 21.721 and the p-value is 0.000, indicating significance. The regression equation  $\text{RoE} = -41.216 + 2.935 \times \text{CAR}$  suggests a strong positive impact of CAR on RoE.

3. **Net Profit Margin:** The  $R^2$  value is 0.555 showing that CAR accounts for 55.5% of the variation in Net Profit Margin. The F-statistic is 25.858 and the p-value is 0.000 indicating a significant relationship. The regression equation  $\text{Net Profit Margin} = -48.396 + 3.742 \times \text{CAR}$  suggests a positive correlation.

4. **Operating Profit Margin:** With an  $R^2$  of 0.576 this model explains 57.6% of the variation in Operating Profit Margin. The F-statistic of 28.732 and a p-value of 0.000 indicate significance. The regression equation  $\text{Operating Profit Margin} = -74.486 + 3.953 \times \text{CAR}$  indicates a positive relationship.

$H_{0e}$ : There is no significant impact of capital adequacy on operating ratio as of private sector banks.

$H_{1e}$ : There is a significant impact of capital adequacy on operating ratio as of private sector banks.

Mode 1	Dependent Variable	R <sup>2</sup>	df	F	Significanc e	Constant (α)	Co-efficient (β)
1	Net Profit Per Employee	0.03 7	1 (58)	0.8	0.778	NA	NA
2	Business Per Employee	0.12	1 (58)	0.847	0.361	NA	NA
3	Net Interest Margin	0.64 7	1 (58)	41.67 9	0.000	0.459	0.165
4	Cos to Income	0.15 8	1 (58)	1.492	0.227	NA	NA
5	Interest Income to Total Assets	0.36 6	1 (58)	6.658	0.004	9.509	-0.125
6	Gross Non-Performing Assets	0.41 1	1 (58)	11.82 1	0.001	23.336	-1.087
7	Net Non- Performing Assets	0.54 4	1 (58)	24.31 9	0.000	12.046	-0.612

Independent Variable = Capital Adequacy Ratio (CAR)

- Net Interest Margin (NIM):** This model shows an R<sup>2</sup> of 0.647 with CAR explaining 64.7% of the variation in NIM. The F-statistic is 41.679 and the p-value is 0.000 suggesting significance. The regression equation  $NIM=0.459+0.165 \times CAR$  implies a positive impact.
- Cost to Income:** The model has an R<sup>2</sup> of 0.158, indicating that 15.8% of the variation in Cost to Income can be explained by CAR. The F-statistic of 1.492 and a p-value of 0.227 indicate that the relationship is not statistically significant.
- Interest Income to Total Assets:** The R<sup>2</sup> value is 0.366 showing that CAR explains 36.6% of the variation in Interest Income to Total Assets. The F-statistic is 6.658 and the p-value is 0.004 indicating a significant relationship. The regression equation  $Interest\ Income\ to\ Total\ Assets=9.509-0.125 \times CAR$  suggests a negative impact of CAR on this metric.
- Gross Non-Performing Assets (NPA):** With an R<sup>2</sup> of 0.411, the model explains 41.1% of the variation in Gross NPA. The F-statistic of 11.821 and a p-value of 0.001 indicate significance. The regression equation  $Gross\ NPA=23.336-1.087 \times CAR$  shows a negative relationship, suggesting that higher CAR is associated with lower Gross NPA.
- Net Non-Performing Assets (NPA):** The R<sup>2</sup> value is 0.544 with CAR explaining 54.4% of the variation in Net NPA. The F-statistic is 24.319, and the p-value is 0.000 indicating a significant relationship. The regression equation  $Net\ NPA=12.046-0.612 \times CAR$  also suggests a negative impact of CAR on Net NPA.

#### Comparison of Regression Equations of Private Sector Banks and Public Sector Banks

Model	Dependent Variable	Public Sector Bank	Private Sector Bank
1	Return on Asset	ROA = -3.215 + 0.252 CAR	ROA = -3.592 + 0.276 CAR
2	Return on Equity	ROE = -57.27 + 4.444 CAR	ROE = -41.216 + 2.935 CAR
3	Net Profit Margin	NPM = -49.262 + 3.900 CAR	NPM = -48.396 + 3.742 CAR
4	Operating Profit Margin	OPM = -53.857 + 2.990 CAR	OPM = -74.486 + 3.953 CAR

The regression equations provided in the table no. 6 and table no. 7, compare public sector banks (PSBs) and private sector banks (PVSBS).

- Return on Asset (ROA):** ROA measures how efficiently a bank utilizes its assets to generate profit. Both PSBs and PVSBS show a positive relationship between ROA and CAR, indicating that as the Capital Adequacy Ratio increases, so does the return on assets. The PVSBS have a slightly higher coefficient, it indicates that they may be more efficient in generating returns from their assets compared to PSBs.
- Return on Equity (ROE):** ROE measures the profitability of a bank in relation to its shareholders' equity. Similar to ROA, both PSBs and PVSBS show a positive relationship between ROE and CAR. The PSBs exhibit a higher sensitivity to changes in CAR, suggesting that improvements in capital adequacy have a more significant impact on their return on equity compared to PVSBS.
- Net Profit Margin (NPM):** NPM indicates the profitability of a bank's operations after accounting for all expenses and taxes. Both PSBs and PVSBS show a positive relationship between NPM and CAR, suggesting that the Capital Adequacy Ratio increases the net profit margin also increases. The PVSBS have a slightly lower intercept and coefficient, implying that they may have lower profitability margins compared to PSBs, but still benefit from improvements in capital adequacy.



4. **Operating Profit Margin (OPM):** OPM measures the profitability of a bank's core business activities. Both PSBs and PVSBS exhibit a positive relationship between OPM and CAR, it suggests that improvements in capital adequacy leads to higher operating profit margins. The PVSBS have a higher coefficient, suggesting that they may be more efficient in generating operating profits compared to PSBs.

<b>Table No. 7: Comparison of Regression Equation (Operating Ratio)</b>			
<b>Model</b>	<b>Dependent Variable</b>	<b>Public Sector Bank</b>	<b>Private Sector Bank</b>
1	Net Profit Per Employee	$NPPE = -7094143.137 + 626227.211 \text{ CAR}$	NA
2	Business Per Employee	$BPE = -1063766456.962 + 121970560 \text{ CAR}$	NA
3	Net Interest Margin	$NIM = 1.280 + 0.073 \text{ CAR}$	$NIM = 0.459 + 0.165 \text{ CAR}$
4	Cos to Income	NA	NA
5	Interest Income to Total Assets	$IITA = 10.598 - 0.303 \text{ CAR}$	$IITA = 9.509 - 0.125 \text{ CAR}$
6	Gross Non-Performing Assets	$GNPA = 22.976 - 1.044 \text{ CAR}$	$GNPA = 23.336 - 1.087 \text{ CAR}$
7	Net Non-Performing Assets	$NNPA = 17.583 - 1.015 \text{ CAR}$	$NNPA = 12.046 - 0.612 \text{ CAR}$

1. **Net Profit Per Employee (NPPE):** This metric reflects the efficiency of a bank in generating profits per employee. The regression equation provided is only available for PSBs. It shows a positive relationship between NPPE and CAR. It indicates that as the Capital Adequacy Ratio increases, PSBs tend to generate higher profits per employee.

2. **Business Per Employee (BPE):** BPE measures the amount of business generated per employee. This metric also is available for only PSBs and shows a positive relationship with CAR. As the Capital Adequacy Ratio increases, PSBs tend to conduct more business per employee.

3. **Net Interest Margin (NIM):** NIM reflects the difference between the interest income earned by a bank and the interest paid out to its lenders. Both PSBs and PVSBS have a positive relationship between NIM and CAR. PVSBS have a higher coefficient, suggesting that improvements in capital adequacy have a greater impact on their net interest margins compared to PSBs.

4. **Cost to Income:** This metric measures the efficiency of a bank's operations by comparing its operating costs to its operating income. Statistically cost to income and CAR has insignificant relationship for both PVSBS and PSBs.

5. **Interest Income to Total Assets (IITA):** IITA measures the efficiency of a bank in generating interest income relative to its total assets. Both PSBs and PVSBS show a negative relationship between IITA and CAR. This implies that as the Capital Adequacy Ratio increases, the efficiency of generating interest income from total assets decreases.

6. **Gross Non-Performing Assets (GNPA):** GNPA reflects the proportion of a bank's total assets that are classified as non-performing. Both PSBs and PVSBS exhibit a negative relationship between GNPA and CAR, indicating that improvements in capital adequacy are associated with lower levels of gross non-performing assets.

7. **Net Non-Performing Assets (NNPA):** NNPA measures the proportion of a bank's net assets that are classified as non-performing. Similar to GNPA, both PSBs and PVSBS show a negative relationship between NNPA and CAR, suggesting that higher capital adequacy is associated with lower levels of net non-performing assets.

## CONCLUSION

The analysis of financial parameters reveals significant differences between public and private sector banks, with private sector banks consistently outperforming their public counterparts across most metrics. In terms of capital adequacy and profitability, the private sector banks exhibit stronger capitalization and superior profitability. Their higher Capital Adequacy Ratio (16.57 vs. 12.70), positive Return on Assets (0.98 vs. -0.01), and Return on Equity (7.40 vs. -0.82) underscore their robust financial health and effective asset utilization. In terms of staff Productivity, the net profit per employee is significantly higher in private sector banks (₹46,20,371.48) compared to public sector banks (₹8,59,986.15), indicating greater efficiency and productivity among private bank employees. Next parameter is deposit mix and margins, the CASA ratio and Net Profit Margin of private sector banks (44.18% and 13.60%, respectively) are significantly better than those of public sector banks (35.94% and 0.28%), suggesting a more favourable deposit mix and higher profitability in the private sector. The operating performance of both sectors show negative operating profit margins, private sector banks are less negative (-



8.99%) compared to public sector banks (-15.88%). The Net Interest Margin is also higher in private sector banks (3.20% vs. 2.21%). In terms of Income and Expenses the private sector banks generate higher interest income (7.44% of total assets) and non-interest income (1.62% of total assets) than public sector banks. Despite higher operating expenses (2.13% vs. 1.51%) private sector banks maintain better overall performance. In terms of asset quality private sector banks have significantly lower Gross and Net Non-Performing Asset ratios (5.32% and 1.91%, respectively) compared to public sector banks (9.71% and 4.70%), indicating superior asset quality. In terms lending practices, the Credit to Deposit Ratio is much higher in private sector banks (89.41%) compared to public sector banks (70.04%), reflecting more aggressive lending practices in the private sector.

The private sector banks demonstrate stronger financial performance, higher efficiency, better asset quality, and more aggressive lending strategies compared to public sector banks. These differences highlight the need for public sector banks to adopt more efficient practices and improve their financial health to compete effectively with private sector banks.

The Capital Adequacy Ratio (CAR) plays a crucial role in shaping the financial performance of public sector banks. Higher CAR is positively associated with improved profitability (RoA, RoE, NPM), better staff productivity (NPPE, BPE), and enhanced margins (NIM). It also contributes to better asset quality by reducing non-performing assets (GNPA, NNPA). However, CAR has a negligible effect on the cost-to-income ratio and a negative impact on interest income relative to total assets.

The analysis reveals that the Capital Adequacy Ratio (CAR) significantly impacts key performance metrics in private sector banks. Higher CAR is positively associated with improved profitability (RoA, RoE, NPM, OPM) and net interest margin (NIM). However, CAR does not significantly influence the cost-to-income ratio and negatively affects the efficiency of generating interest income relative to total assets (IITA). Importantly, higher CAR is associated with lower levels of non-performing assets (GNPA, NNPA), reflecting better asset quality.

Overall, the Capital Adequacy Ratio (CAR) positively impacts key profitability metrics (ROA, ROE, NPM, OPM) for both public and private sector banks, with private sector banks often demonstrating greater efficiency and responsiveness to CAR improvements. While CAR enhances net profit per employee and business per employee in public sector banks, it also positively influences the net interest margin more significantly in private sector banks. However, CAR does not significantly affect the cost-to-income ratio and negatively impacts the efficiency of generating interest income from total assets in both sectors. Importantly, higher CAR is consistently associated with lower levels of non-performing assets, highlighting its role in improving asset quality across both public and private sector banks. These findings underscore the critical role of maintaining robust capital adequacy to ensure financial stability and operational efficiency in private and sector banks.

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