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A Comparative Analysis of Capital Adequacy Ratio (CAR) of Selected Public and Private Sector Banks in India: A Secondary Data-Based Study

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Abstract

Capital Adequacy Ratio (CAR) is a key indicator of a bank's ability to absorb losses and honour its financial obligations, and is widely used to assess the solvency of banking institutions. This study presents a comparative analysis of the CAR of five leading public sector banks (State Bank of India, Punjab National Bank, Bank of India, Union Bank of India, and Bank of Maharashtra) and five leading private sector banks (HDFC Bank, ICICI Bank, Axis Bank, Federal Bank, and RBL Bank) operating in India, over a ten-year period from 2013 to 2022. The study is based entirely on secondary data drawn from the balance sheets and profit and loss accounts of the selected banks, as published by the Reserve Bank of India. Descriptive statistics, the Wilcoxon-Mann-Whitney test, the Kruskal-Wallis test, and the Dwass-Steel-Critchlow-Fligner (DSCF) pairwise comparison test were applied to examine differences in CAR between and within the two banking sectors. The results indicate that private sector banks maintained a significantly higher average CAR than public sector banks during the study period, that CAR varied significantly among private sector banks, and that the variation among public sector banks was comparatively modest.

Keywords: Capital Adequacy Ratio; Public Sector Banks; Private Sector Banks; Bank Solvency; Secondary Data Analysis; Wilcoxon-Mann-Whitney Test; Kruskal-Wallis Test

1. Introduction

Ratio analysis is one of the most widely used tools in accounting and finance for evaluating the financial position and performance of an organisation. Ratios in accounting and finance can be classified into several categories based on the type of information they provide and the financial aspects they analyse.

Liquidity ratios, for instance, assess a company's ability to meet its short-term financial obligations. Common liquidity ratios include the Current Ratio (current assets divided by current liabilities) and the Quick Ratio (quick assets divided by current liabilities); these ratios help determine a bank's ability to cover its immediate debts. Understanding and analysing the different categories of ratios is essential for investors, analysts, and financial professionals, as each type of ratio provides valuable insight into a particular aspect of a bank's financial health and performance.

Among the various ratios used to evaluate banks, the Capital Adequacy Ratio (CAR) occupies a central place, as it measures a bank's capital in relation to its risk-weighted assets and reflects its capacity to absorb a reasonable amount of loss before becoming insolvent. Given the structural differences between public sector and private sector banks in India in terms of ownership, governance, and operational practices, an examination of how their CAR has evolved over time, and whether it differs significantly between the two sectors, is of considerable relevance to regulators, investors, and researchers alike. The present study undertakes such a comparison for the period 2013 to 2022.

2. Research Methodology

2.1 Secondary Data Analysis

Secondary data analysis is a way of conducting research that involves examining and re-analysing data that was already collected for another study. To answer new research questions, or to look into different aspects of existing datasets, researchers do not need to collect new data. The following considerations were kept in mind while conducting secondary data analysis for this study.

Data Sources: Government agencies, academic institutions, research groups, and publicly available datasets are among the places where secondary data can be found. It can include quantitative data (e.g., surveys, census data) and qualitative data (e.g., interview transcripts, textual documents).

Research Efficiency: Because the data is already available, secondary data analysis can be a cost-effective and time-efficient research method. Instead of collecting data, researchers can concentrate their efforts on data analysis and interpretation.

Data Quality: The quality of secondary data can vary. Researchers should critically evaluate the source, methodology, and validity of the original data collection to ensure it is suitable for the new research question.

Research Questions: Researchers must clearly define their research questions and objectives before embarking on secondary data analysis. The existing data should align with the research goals.

Ethical Considerations: Ethical issues related to data privacy and consent may arise when using secondary data. Researchers should be aware of and adhere to relevant ethical guidelines and regulations.

Data Cleaning and Transformation: Secondary data often requires cleaning and transformation to make it suitable for analysis. This may involve handling missing data, recoding variables, or aggregating data at different levels.

Statistical Techniques: Researchers can use a variety of statistical and analytical techniques, such as regression analysis, content analysis, or thematic coding, depending on the type of data and research question.

Generalizability: The generalizability of findings from secondary data analysis depends on how representative the original data is of the population of interest. Researchers should be cautious about making broad generalisations.

Publication and Citation: When conducting secondary data analysis, researchers should acknowledge and cite the original data sources, respecting the work of the original data collectors and contributors.

Validation: Researchers should consider conducting sensitivity analyses or validation studies to assess the robustness of their findings based on secondary data.

In summary, secondary data analysis is a valuable research approach that can provide insights, answer research questions, and generate new knowledge without the need for primary data collection. It requires

careful planning, data evaluation, and ethical consideration to ensure the validity and reliability of the findings.

2.2 Data Source and Period of the Study

For the purpose of the above analysis, secondary data was of prime importance and needed to be collected from various authentic and reliable sources. The data has been collected from the Reserve Bank of India for the relevant years. The balance sheets and profit and loss accounts of the selected banks have been arranged for the period 2013 to 2022, covering five public sector banks (State Bank of India, Punjab National Bank, Bank of India, Union Bank of India, and Bank of Maharashtra) and five private sector banks (HDFC Bank, ICICI Bank, Axis Bank, Federal Bank, and RBL Bank).

2.3 Hypotheses of the Study

The following hypotheses have been formulated and tested in this study, under the broad head of testing the solvency of the selected banks through their Capital Adequacy Ratio:

H_0: There is no significant difference between the solvency ratios (Capital Adequacy Ratio) of public sector and private sector banks.

H_1: There is a significant difference between the solvency ratios (Capital Adequacy Ratio) of public sector and private sector banks.

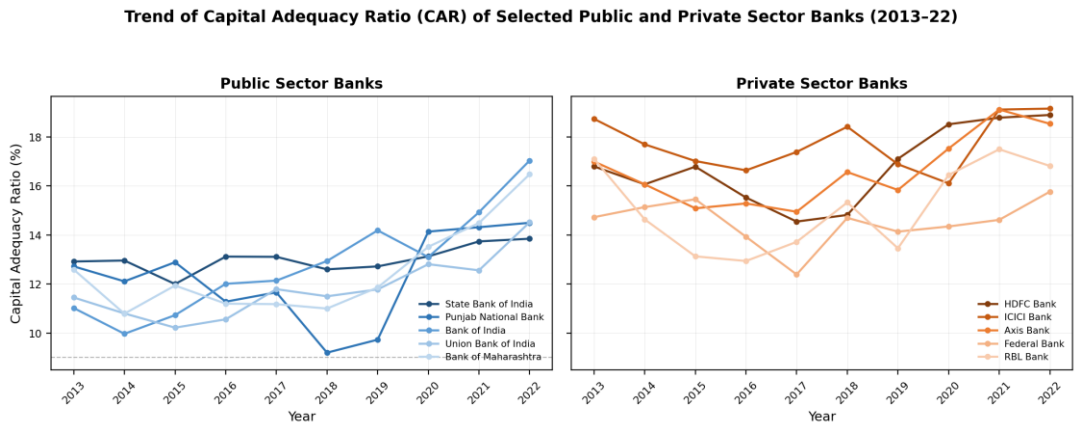
3. Data Analysis and Interpretation

3.1 Capital Adequacy Ratio of Selected Banks (2013–2022)

Table 1: Capital Adequacy Ratio of Selected Public and Private Sector Banks (2013–2022)

Sector	Bank	2022	2021	2020	2019	2018	2017	2016	2015	2014	2013
Public	State Bank of India	13.85	13.74	13.13	12.72	12.60	13.11	13.12	12.00	12.96	12.92
	Punjab National Bank	14.50	14.32	14.14	9.73	9.20	11.66	11.28	12.89	12.11	12.72
	Bank of India	17.04	14.93	13.10	14.19	12.94	12.14	12.01	10.73	9.97	11.02
	Union Bank of India	14.52	12.56	12.81	11.78	11.50	11.79	10.56	10.22	10.80	11.45
	Bank of Maharashtra	16.48	14.49	13.52	11.86	11.00	11.18	11.20	11.94	10.79	12.59
Private	HDFC Bank	18.90	18.79	18.52	17.11	14.82	14.55	15.53	16.79	16.07	16.80
	ICICI Bank	19.16	19.12	16.11	16.89	18.42	17.39	16.64	17.02	17.70	18.74
	Axis Bank	18.54	19.12	17.53	15.84	16.57	14.95	15.29	15.09	16.07	17.00
	Federal Bank	15.77	14.62	14.35	14.14	14.70	12.39	13.93	15.46	15.14	14.73
	RBL Bank	16.82	17.50	16.45	13.46	15.33	13.72	12.94	13.13	14.64	17.11

Source: Table relating to Banks in India, Reserve Bank of India publication for the relevant years.



Graph 1: Capital Adequacy Ratio Trend of Selected Public and Private Sector Banks (2013–2022)

Source: Secondary data.

3.2 Sector-wise Comparison of Capital Adequacy Ratio

H_0: There is no significant difference between average CAR values between public and private sector banks.

H_1: There is a significant difference between average CAR values between public and private sector banks.

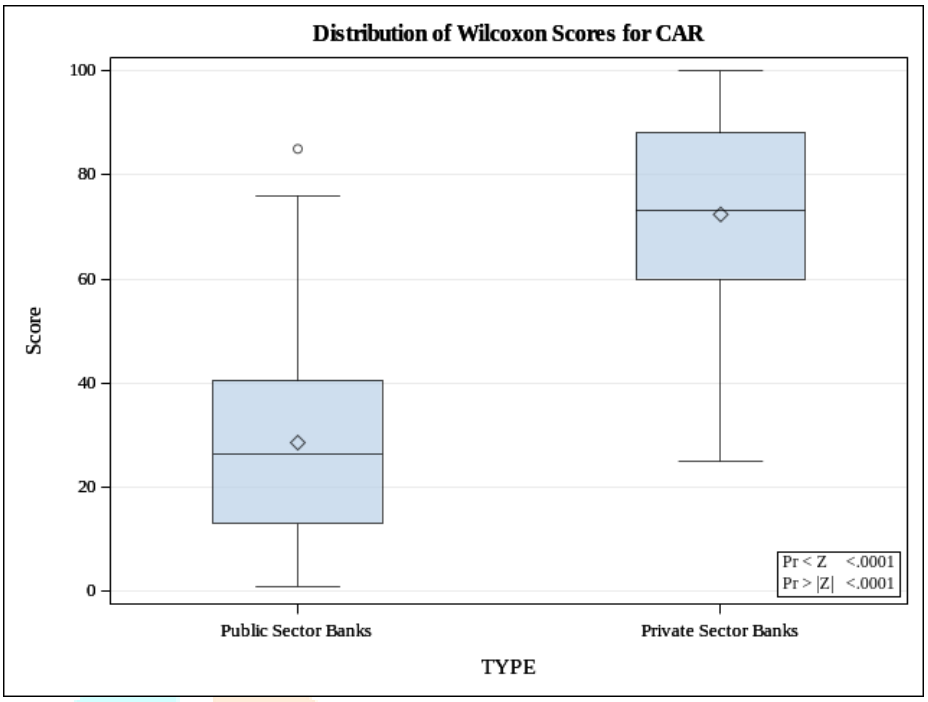
Table 2: Sector-wise Summary of Capital Adequacy Ratio (CAR)

Type	N Obs	Mean	Std Dev	Median	Minimum	Maximum
Private Sector Banks	50	16.15	1.78	16.09	12.39	19.16
Public Sector Banks	50	12.48	1.61	12.58	9.2	17.04

From the above table it can be observed that the average Capital Adequacy Ratio (CAR) for private sector banks is 16.15, with a minimum value of 12.39 and a maximum value of 19.16. In the case of public sector banks, the mean CAR value is 12.48, with a minimum value of 9.20 and a maximum value of 17.04. The standard deviation values further indicate that the variation in CAR is not markedly different between the two groups, though private sector banks show a marginally higher spread.

Table 3: Wilcoxon-Mann-Whitney Test for CAR Values

Statistic	Z	Pr < Z	Pr > |Z|	t Approx. Pr < Z	t Approx. Pr > |Z|
1429.500	-7.5489	<.0001	<.0001	<.0001	<.0001
Note: Z includes a continuity correction of 0.5.					



Graph 2: Sector-wise Summary of Capital Adequacy Ratio

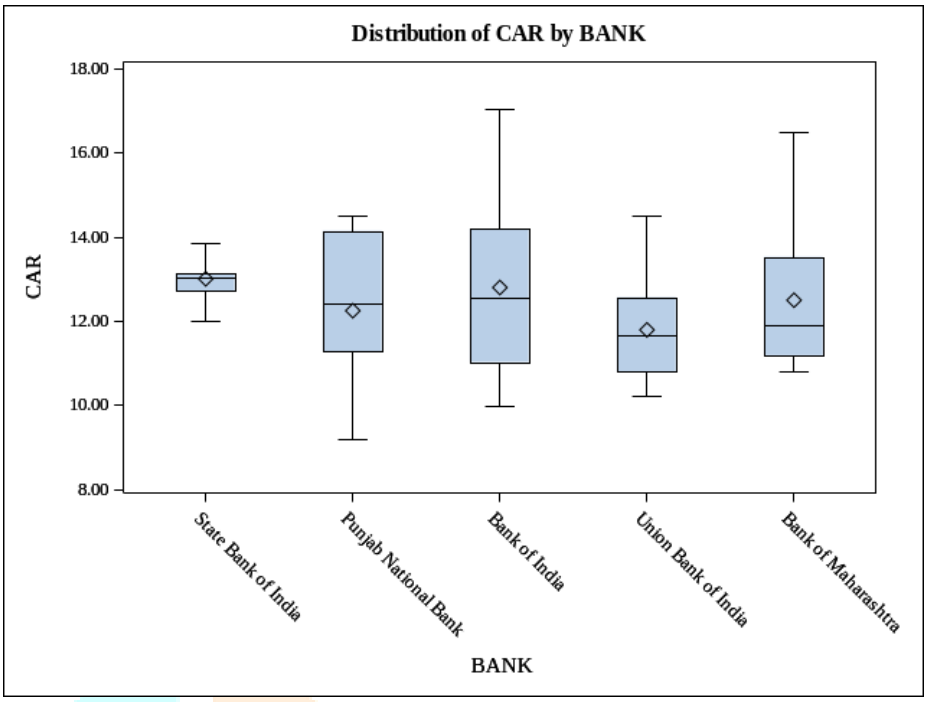
The above results show that the p-value (< 0.0001) for the Wilcoxon-Mann-Whitney test is less than the 5% level of significance; hence the null hypothesis (H0) is rejected, and it is concluded that there is a statistically significant difference between the CAR of public and private sector banks. It is therefore evident that private sector banks performed better, in terms of capital adequacy, than public sector banks during the study period.

3.3 Capital Adequacy Ratio Analysis – Public Sector Banks

Table 4: Summary of Capital Adequacy Ratio Values among Public Sector Banks

Bank	N	Mean	Std Dev	Median	Minimum	Maximum
Bank of Maharashtra	10	12.51	1.83	11.9	10.79	16.48
Bank of India	10	12.81	2.14	12.54	9.97	17.04
Punjab National Bank	10	12.26	1.84	12.42	9.2	14.5
State Bank of India	10	13.02	0.53	13.04	12	13.85
Union Bank of India	10	11.8	1.26	11.64	10.22	14.52

The above table presents the summary of CAR values for the period 2013 to 2022. The highest average CAR value, 13.02, belongs to State Bank of India, while the lowest average value, 11.80, belongs to Union Bank of India. Bank of India recorded the second highest average CAR value at 12.81. During the period under study, the maximum CAR value recorded was 17.04 (Bank of India) and the minimum was 9.20 (Punjab National Bank).



Graph 3: Summary of Capital Adequacy Ratio among Public Sector Banks

The box plot above shows that there is considerable fluctuation in CAR values among public sector banks. State Bank of India shows comparatively low fluctuation with a tight, stable range, whereas Bank of Maharashtra and Bank of India show wider fluctuation, indicating that State Bank of India has been the most consistent among public sector banks with respect to its CAR over the study period.

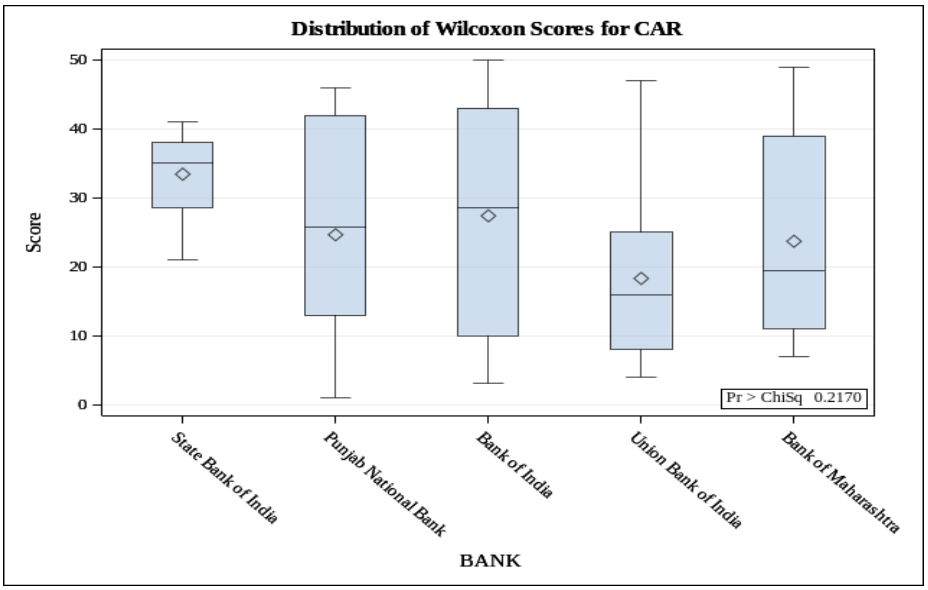
H_0: There is no significant difference in the CAR values among public sector banks during the last ten years.

H_1: There is a significant difference in the CAR values among public sector banks during the last ten years.

Table 5: Summary of Kruskal-Wallis Test for CAR – Public Sector Banks

Bank	N	Sum of Scores	Expected Under H0	Std Dev Under H0	Mean Score
State Bank of India	10	334.50	255.0	41.230066	33.450
Punjab National Bank	10	246.50	255.0	41.230066	24.650
Bank of India	10	274.00	255.0	41.230066	27.400
Union Bank of India	10	183.00	255.0	41.230066	18.300
Bank of Maharashtra	10	237.00	255.0	41.230066	23.700
Note: Average scores were used for ties.					

Chi-Square	DF	Pr > ChiSq
5.7704	4	0.2170



Graph 4: Summary of CAR Share Values among Public Sector Banks

The p-value for the Kruskal-Wallis test is 0.2170. Given $\alpha = 0.05$, the null hypothesis is accepted, and it is concluded that there is no statistically significant difference in the average CAR values among public sector banks during the study period.

Although the overall Kruskal-Wallis test did not indicate a significant difference, a more informative pairwise comparison of average CAR values among public sector banks was carried out, and the results are presented below.

Table 6: Pairwise Comparison of CAR among Public Sector Banks (Dwass, Steel, Critchlow-Fligner Method)

Comparison	Wilcoxon Z	DSCF Value	Pr > DSCF
State Bank of India vs. Punjab National Bank	1.0209	1.4438	0.8459
State Bank of India vs. Bank of India	0.6803	0.9621	0.9607
State Bank of India vs. Union Bank of India	2.7213	3.8486	0.0509
State Bank of India vs. Bank of Maharashtra	1.5875	2.2450	0.5054
Punjab National Bank vs. Bank of India	-0.5292	0.7483	0.9844
Punjab National Bank vs. Union Bank of India	0.6803	0.9621	0.9607
Punjab National Bank vs. Bank of Maharashtra	0.2268	0.3207	0.9994
Bank of India vs. Union Bank of India	1.2095	1.7105	0.7459
Bank of India vs. Bank of Maharashtra	0.3780	0.5345	0.9957
Union Bank of India vs. Bank of Maharashtra	-0.8315	1.1759	0.9209

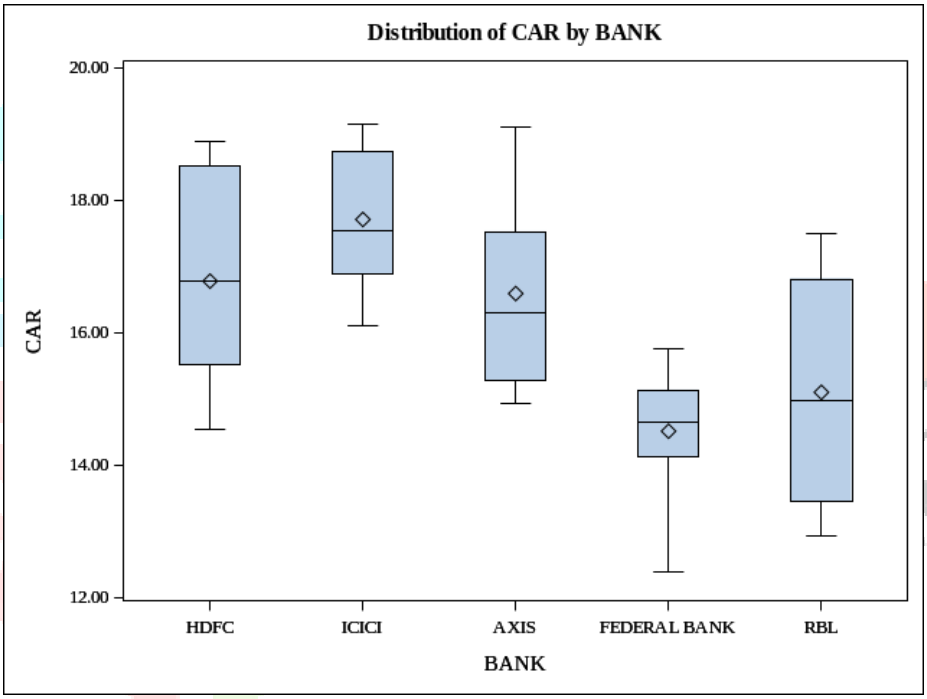
The above table indicates a significant difference in average CAR values between State Bank of India and Union Bank of India, whereas no significant difference is observed among the other pairs of public sector banks.

3.4 Capital Adequacy Ratio Analysis – Private Sector Banks

Table 7: Summary of Capital Adequacy Ratio Values among Private Sector Banks

Bank	N	Mean	Std Dev	Median	Minimum	Maximum
Axis Bank	10	16.6	1.44	16.32	14.95	19.12
Federal Bank	10	14.52	0.94	14.66	12.39	15.77
HDFC Bank	10	16.79	1.58	16.8	14.55	18.9
ICICI Bank	10	17.72	1.09	17.55	16.11	19.16
RBL Bank	10	15.11	1.76	14.99	12.94	17.5

The above table presents the summary of CAR values from 2013 to 2022. The highest average CAR value, 17.72, belongs to ICICI Bank, while the lowest average value, 14.52, belongs to Federal Bank. HDFC Bank recorded the second highest average CAR value at 16.79. During the period under study, the maximum CAR value recorded was 19.16 (ICICI Bank) and the minimum was 12.39 (Federal Bank).



Graph 5: Summary of Capital Adequacy Ratio among Private Sector Banks

The box plot above shows that there is considerable fluctuation in CAR values among private sector banks. Federal Bank shows the largest fluctuation, while RBL Bank shows the lowest fluctuation, indicating that RBL Bank has been comparatively more stable with respect to its CAR among private sector banks over the study period.

H_0: There is no significant difference in the average CAR values among private sector banks during the last ten years.

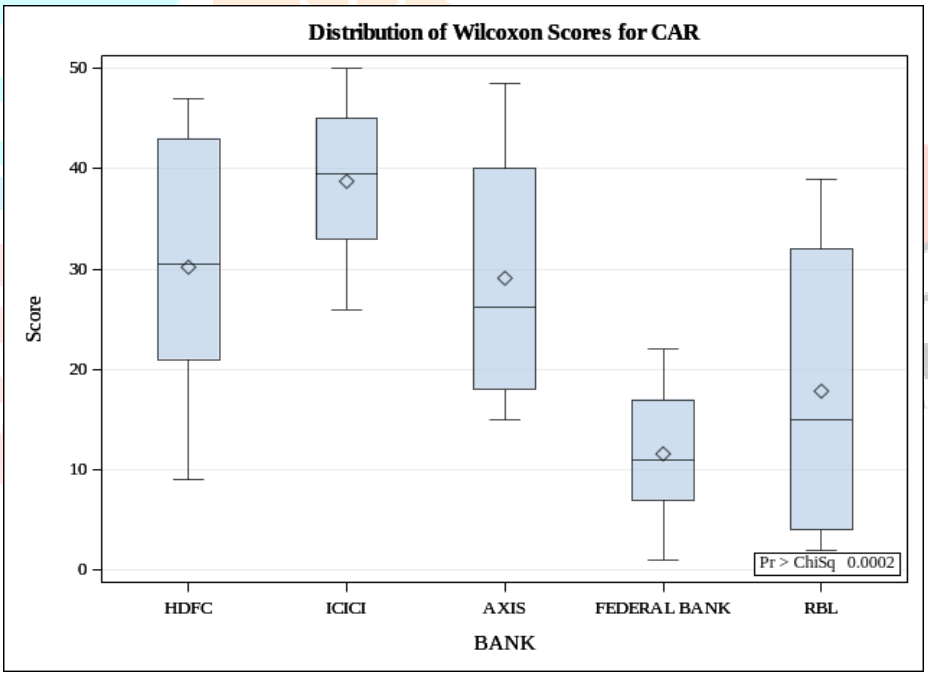
H_1: There is a significant difference in the average CAR values among private sector banks during the last ten years.

Table 8: Summary of Kruskal-Wallis Test for CAR – Private Sector Banks

Bank	N	Sum of Scores	Expected Under H0	Std Dev Under H0	Mean Score
HDFC Bank	10	302.00	255.0	41.228086	30.200
ICICI Bank	10	387.50	255.0	41.228086	38.750
Axis Bank	10	291.00	255.0	41.228086	29.100
Federal Bank	10	116.00	255.0	41.228086	11.600
RBL Bank	10	178.50	255.0	41.228086	17.850
Note: Average scores were used for ties.					

Chi-Square	DF	Pr > ChiSq
21.7605	4	0.0002

The p-value for the Kruskal-Wallis test is 0.0002. Given $\alpha = 0.05$, the null hypothesis is rejected, and it is concluded that there is a statistically significant difference in the average CAR values among private sector banks during the study period.



Graph 6: Summary of Capital Adequacy Ratio Values among Private Sector Banks

Since a significant difference is observed in the average CAR values among private sector banks, a more informative pairwise comparison of average CAR values was carried out, and the results are presented below.

Table 9: Pairwise Comparison of CAR among Private Sector Banks (Dwass, Steel, Critchlow-Fligner Method)

Comparison	Wilcoxon Z	DSCF Value	Pr > DSCF
HDFC Bank vs. ICICI Bank	-1.4363	2.0312	0.6041
HDFC Bank vs. Axis Bank	0.1891	0.2674	0.9997
HDFC Bank vs. Federal Bank	3.0237	4.2762	0.0211
HDFC Bank vs. RBL Bank	1.7771	2.5132	0.3870
ICICI Bank vs. Axis Bank	1.9283	2.7271	0.3021
ICICI Bank vs. Federal Bank	3.7796	5.3452	0.0015
ICICI Bank vs. RBL Bank	2.8725	4.0624	0.0332
Axis Bank vs. Federal Bank	3.1749	4.4900	0.0130
Axis Bank vs. RBL Bank	1.6630	2.3519	0.4570
Federal Bank vs. RBL Bank	-0.5292	0.7483	0.9844

The above table indicates a significant difference in average CAR values between ICICI Bank and Federal Bank, and between Axis Bank and Federal Bank, whereas no significant difference is observed among the other pairs of private sector banks.

4. Findings

Sector-wise difference: Private sector banks recorded a markedly higher average CAR (16.15%) than public sector banks (12.48%) during 2013–2022, and this difference is statistically significant (Wilcoxon-Mann-Whitney test, $p < 0.0001$).

Public sector banks: No statistically significant overall difference in CAR was found among public sector banks (Kruskal-Wallis, $\chi^2 = 5.7704$, $p = 0.2170$); a pairwise comparison, however, indicates a difference between State Bank of India and Union Bank of India close to the 5% level of significance ($p = 0.0509$).

Private sector banks: CAR differed significantly among private sector banks (Kruskal-Wallis, $\chi^2 = 21.7605$, $p = 0.0002$), with ICICI Bank vs. Federal Bank and Axis Bank vs. Federal Bank showing statistically significant pairwise differences.

Best-performing banks: State Bank of India (mean CAR 13.02%) recorded the highest and most stable CAR among public sector banks; ICICI Bank (mean CAR 17.72%) recorded the highest CAR among private sector banks.

Lowest CAR / greatest fluctuation: Union Bank of India recorded the lowest mean CAR (11.80%) among public sector banks, while Federal Bank recorded both the lowest mean CAR (14.52%) and the greatest fluctuation among private sector banks.

5. Conclusion

The study concludes that private sector banks in India maintained a significantly higher Capital Adequacy Ratio compared to public sector banks during the period 2013 to 2022, indicating relatively stronger capital buffers among private sector players. While CAR among public sector banks remained fairly uniform across banks, it varied significantly among private sector banks, largely on account of Federal Bank's comparatively lower ratio. These findings are relevant to the ongoing discourse on the capital strength, resilience, and governance of public sector banks in India. The present analysis is confined to the Capital

Adequacy Ratio alone; incorporating additional solvency and profitability ratios over a longer time horizon could further strengthen the robustness of the conclusions drawn here.

6. References

Reserve Bank of India. (2013–2022). Statistical Tables Relating to Banks in India. Reserve Bank of India, Mumbai.