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A Comparative Study on Financial Stability of Selected Public Sector Banks through CAMEL Model

Dr Surbhi Shrivastav

Assistant Professor, Swami Sahajanand School of management, Gujarat Technical University

Dr. Ami Pandya

Associate Professor, Swami Sahajanand School of Management (GTU), Bhavnagar

ABSTRACT

The present study examines the financial stability of selected public sector banks in India using the CAMEL model framework. The study focuses on three major public sector banks, namely State Bank of India, Bank of Baroda, and Punjab National Bank, over a period of five years from 2020-21 to 2024-25. The analysis is based on key CAMEL indicators including Capital Adequacy Ratio, Gross NPA to Advances, Interest Income per Employee, Return on Assets, and Liquidity Assets to Total Assets Ratio. The study employs ratio analysis and one-way ANOVA to evaluate performance and identify significant differences among the selected banks. The findings reveal that Bank of Baroda maintained the highest capital adequacy ratio, indicating a strong capital position, while State Bank of India demonstrated superior asset quality with the lowest Gross NPA ratio. In terms of management efficiency, State Bank of India recorded the highest interest income per employee, whereas Bank of Baroda and State Bank of India showed better profitability measured through return on assets. The liquidity position of all three banks remained stable during the study period. ANOVA results indicate significant differences in capital adequacy and asset quality, whereas management efficiency, profitability, and liquidity showed no significant variation. Overall, the study concludes that the selected public sector banks maintained sound financial stability, with variations observed across different CAMEL parameters.

Keywords: CAMEL Model, Public Sector Banks, Financial Stability, Capital Adequacy, Asset Quality, Management Efficiency, Profitability, Liquidity, ANOVA, Banking Performance

1. INTRODUCTION

The CAMEL Model is a widely recognized supervisory and analytical framework used for evaluating the financial performance, operational efficiency, and overall soundness of banks and financial institutions. The model was originally developed by banking regulators in the United States to assess the stability and reliability of commercial banks, and over time it has been adopted by regulatory authorities, researchers, and financial analysts across the world. The term CAMEL is an acronym representing five critical dimensions of bank performance, namely Capital Adequacy, Asset Quality, Management Efficiency, Earnings Ability, and Liquidity. These five components collectively provide a comprehensive evaluation of a bank's financial health and operational effectiveness. The CAMEL model helps in identifying strengths and weaknesses of banks, comparing performance across institutions, and assessing the ability of banks to withstand financial stress and economic fluctuations.

Capital adequacy, the first component of the CAMEL model, measures the financial strength of a bank and its ability to absorb potential losses arising from credit risk, market risk, and operational risk. It reflects the level of protection provided to depositors and investors against unexpected losses. Capital adequacy is generally assessed through ratios such as Capital Adequacy Ratio, Debt-Equity Ratio, Advances to Total Assets, and Government Securities to Total Investments. A bank with strong capital adequacy is considered financially stable and capable of expanding its operations without compromising solvency. Adequate capital also enhances public confidence and enables banks to comply with regulatory norms prescribed by central banks and international banking standards. Therefore, capital adequacy plays a vital role in maintaining the long-term sustainability of banking institutions.

Asset quality, the second component, evaluates the quality of a bank's assets and the level of credit risk associated with its loan portfolio. Since loans and advances constitute a major portion of bank assets, the quality of these assets directly influences the profitability and stability of banks. Poor asset quality leads to higher non-performing assets, reduced income, and increased provisioning requirements. Asset quality is commonly measured using indicators such as Gross Non-Performing Assets to Total Advances, Net Non-Performing Assets to Total Advances, Total Investments to Total Assets,

and Standard Assets Ratio. A lower level of non-performing assets indicates better asset quality and efficient credit risk management. Banks with strong asset quality are better positioned to maintain consistent earnings and reduce financial vulnerability.

Management efficiency, the third component, reflects the capability of bank management to effectively utilize resources, control costs, and implement sound policies for growth and risk management. It assesses the operational competence and decision-making ability of the bank's management. Efficient management ensures optimal allocation of funds, proper monitoring of credit, and effective control over operating expenses. Management efficiency is usually evaluated using ratios such as Advances to Deposits Ratio, Business per Employee, Profit per Employee, and Operating Expenses to Total Assets. Higher productivity and lower operating costs indicate better management performance. This component is considered qualitative in nature, but quantitative indicators are used to measure managerial effectiveness in financial terms.

Earnings ability, the fourth component of the CAMEL model, focuses on the profitability and income-generating capacity of banks. Earnings are essential for maintaining capital adequacy, supporting growth, and ensuring long-term survival. Strong earnings enable banks to absorb losses, expand operations, and provide returns to shareholders. Earnings performance is measured using ratios such as Return on Assets, Return on Equity, Net Profit Margin, Interest Spread Ratio, and Operating Profit to Total Assets. A higher return indicates better operational efficiency and effective utilization of resources. Stable and consistent earnings also indicate sound financial management and lower risk exposure. Thus, earnings ability plays a crucial role in determining the financial sustainability of banks.

Liquidity, the fifth component, measures the ability of banks to meet their short-term obligations and withdrawal demands without affecting profitability. Liquidity management is critical for maintaining depositor confidence and ensuring smooth banking operations. Insufficient liquidity may lead to financial distress, while excess liquidity may reduce profitability due to idle funds. Liquidity is generally assessed through ratios such as Liquid Assets to Total Assets, Liquid Assets to Total Deposits, Credit-Deposit Ratio, and Government Securities to Total Assets. Proper liquidity management ensures that banks maintain an optimal balance between profitability and risk. Banks with strong liquidity positions are better equipped to handle unexpected cash outflows and economic uncertainties.

2. LITERATURE REVIEW

Agarwal and Kumar (2025) evaluated the top six commercial banks in India to understand their financial health using the CAMEL framework. They discovered that private sector banks, specifically HDFC Bank, took the highest position when it came to capital adequacy, management efficiency, asset quality, and earning parameters. On the other hand, public sector banks like Punjab National Bank performed the best only in the liquidity parameter. Their findings clearly showed that overall, private banks managed their financial resources much better than public banks. They concluded that public sector banks need to heavily improve their internal management and loan recovery processes to compete with the top private banks in the country.

Baddalwar et al. (2025) focused entirely on the major public sector banks in India, looking at a ten-year period to see how they handled their money and risks. They found that major banks like State Bank of India and Bank of Baroda have slowly improved their ability to handle financial shocks by keeping better capital reserves. However, their research highlighted that these government-owned banks still struggle a lot with non-performing assets, which are simply loans that customers fail to pay back. The study showed that while these banks are very safe for common people to keep their money in, they make less profit because they have high operating costs and lower earnings compared to private banks.

Dadhania (2024) compared the performance of several top private and public sector banks over five years using the CAMEL model. The study found that private banks like Kotak Mahindra and HDFC continuously scored the highest marks in overall financial performance, especially in making good profits and managing their employees effectively. The findings revealed that some public sector banks showed very poor performance in keeping good quality assets and making strong earnings. The author concluded that the strict business strategies and advanced technology used by private banks allow them to serve customers faster and cheaper, making them more financially successful than government-owned banks.

Parmar (2024) conducted a detailed comparison between specific public and private banks to see which ones are truly more efficient in their daily operations. The findings proved that HDFC Bank easily outperformed its public competitors like Bank of Baroda in almost every area, especially in how much profit they make per employee. The study showed that private

banks are very careful about giving out loans, which keeps their bad loans very low and their asset quality very high. In contrast, the research noted that public banks often have to fulfil government social duties, which sometimes forces them to take on riskier loans that lower their overall financial score.

Tatia (2024) investigated how well public sector banks have performed after the government introduced major banking reforms. She found that while these government banks have definitely become stronger and safer than they were a few years ago, they are still lagging behind private banks in making money. Her findings showed that public banks struggle heavily to get a high return on their assets, meaning they do not make enough profit from the money and resources they have. The study concluded that even with new rules and financial help from the government, these banks need to change their daily working style to improve the quality of their earnings.

Bansal and P (2024) analysed the financial safety of several Indian banks during tough economic times. They discovered that having a strong and efficient management team is the most important factor in keeping a bank safe from failure. Their findings showed that banks with extra capital cushions and quick decision-making leaders were able to reduce big financial risks easily. The research concluded that no matter if a bank is public or private, following the CAMEL model strictly helps managers spot early warning signs of money loss before it becomes a disaster for the whole bank.

Lal and Gupta (2023) measured the direct impact of the CAMEL model factors on the actual profits of Indian commercial banks. They found that a bank's capital adequacy, which means having enough emergency money saved up, and its liquidity, which means having enough cash to pay daily bills, directly increase the bank's total profits. Interestingly, their study showed that simply having good management did not automatically guarantee high profits if the bank was highly sensitive to changing market risks. They concluded that banks must focus equally on keeping enough cash available and protecting themselves from market changes if they want to stay highly profitable.

Sengupta and Patil (2022) studied what happened to the financial performance of Indian public sector banks after many of them were merged together by the government in 2020. They found that right after the mergers, these big banks actually faced a lot of confusion and a slight drop in their management efficiency. However, their findings also showed that after a short time, the newly merged larger banks became much stronger in capital adequacy and had much better liquidity. The authors concluded that while mixing two banks causes temporary problems, it ultimately creates a much safer and financially stable bank for the future.

Mathur and Sharma (2021) examined the financial profits of the State Bank of India before and after it joined together with its smaller associate banks. Using the CAMEL model, they found that the immediate effect of this huge merger was a big drop in overall earnings because the main bank had to take on all the bad loans of the smaller banks. Their research revealed that the asset quality went down sharply at first, making the bank look weaker on paper. Despite this, they concluded that the bank's strong capital and good management eventually helped it recover, proving that big mergers require patience before showing real financial success.

3. RESEARCH OBJECTIVES

1) To analyse the financial performance of selected public sector banks using CAMEL model.
2) To compare the financial performance of selected public sector banks.

4. SAMPLE SIZE

In this study below mentioned 3 public sector banks have been selected.

1. State Bank of India
2. Bank of Baroda
3. Punjab National Bank

5. PERIOD OF DATA COVERAGE.

Financial data of 3 public sector banks for the year 2020-21 to 2024-25 have been taken

6. DATA ANALYSIS

6.1 CAPITAL ADEQUACY RATIO

BANK	2024-25	2023-24	2022-23	2021-22	2020-21
State Bank of India	14.25	14.28	14.68	13.85	13.74
Bank of Baroda	17.19	16.31	16.24	15.84	14.99
Punjab National Bank	17.01	15.97	15.5	14.5	14.32

State Bank of India maintained a stable capital adequacy ratio throughout the study period. The ratio increased from 13.74 percent in 2020-21 to 13.85 percent in 2021-22 and further improved to 14.68 percent in 2022-23, indicating strengthening capital buffers. However, in 2023-24, the ratio slightly declined to 14.28 percent and further marginally decreased to 14.25 percent in 2024-25. Despite this minor decline in the last two years, the capital adequacy ratio of State Bank of India remained above regulatory requirements, demonstrating adequate financial stability. The consistent performance suggests that the bank has maintained a balanced approach towards risk management and capital allocation, although its capital position appears comparatively lower than the other two banks.

Bank of Baroda showed a consistently strong capital adequacy ratio during the study period and maintained the highest ratio in most of the years. The ratio increased steadily from 14.99 percent in 2020-21 to 15.84 percent in 2021-22 and further improved to 16.24 percent in 2022-23. The upward trend continued in 2023-24, reaching 16.31 percent, and further increased significantly to 17.19 percent in 2024-25. This continuous growth indicates a strong capital structure and improved financial resilience. The bank's increasing capital adequacy ratio suggests effective capital management, controlled risk exposure, and the ability to support future business expansion. The strong upward trend also reflects improved asset quality and prudent lending practices.

Punjab National Bank also demonstrated an improving trend in capital adequacy during the period under study. The ratio increased from 14.32 percent in 2020-21 to 14.50 percent in 2021-22, and further rose to 15.50 percent in 2022-23. The improvement continued in 2023-24, reaching 15.97 percent, and increased significantly to 17.01 percent in 2024-25. This consistent growth indicates strengthening capital buffers and improved financial stability. The rising trend may be attributed to better capitalization, reduced risk-weighted assets, and improved operational performance. The capital adequacy ratio of Punjab National Bank in the later years approaches that of Bank of Baroda, indicating significant improvement in its solvency position.

A comparative analysis of the three banks reveals that Bank of Baroda maintained the highest capital adequacy ratio during most of the study period, followed closely by Punjab National Bank, while State Bank of India recorded comparatively lower ratios. Although State Bank of India showed stability, its capital adequacy ratio remained below that of the other two banks, indicating relatively lower capital buffers. On the other hand, both Bank of Baroda and Punjab National Bank exhibited a consistent upward trend, reflecting stronger capital management and improved risk absorption capacity. By 2024-25, Bank of Baroda ranked first with 17.19 percent, followed by Punjab National Bank with 17.01 percent, whereas State Bank of India stood at 14.25 percent.

Anova: Single Factor

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
State Bank of India	5	70.8	14.16	0.14135
Bank of Baroda	5	80.57	16.114	0.63763
Punjab National Bank	5	77.3	15.46	1.22135

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*

Between Groups	9.893053	2	4.946527	7.418566	0.007992	3.885294
Within Groups	8.00132	12	0.666777			
Total	17.89437	14				

Null Hypothesis (H_0): There is no significant difference in the Capital Adequacy Ratio among State Bank of India, Bank of Baroda, and Punjab National Bank.

The ANOVA results indicate that the calculated F value (7.4186) is greater than the critical F value (3.8853), and the p-value (0.00799) is less than the 0.05 level of significance. Therefore, the null hypothesis is rejected. This implies that there is a statistically significant difference in the Capital Adequacy Ratio among the selected public sector banks. The summary statistics show that Bank of Baroda has the highest average capital adequacy ratio (16.114), followed by Punjab National Bank (15.46), while State Bank of India has the lowest average (14.16). Hence, it can be concluded that the capital adequacy position differs significantly among the banks, with Bank of Baroda demonstrating comparatively stronger capital adequacy performance.

6.2 GROSS NPA TO ADVANCES

BANK	2024-25	2023-24	2022-23	2021-22	2020-21
State Bank of India	1.82	2.24	2.78	3.97	5.00
Bank of Baroda	2.26	2.92	3.79	7.00	9.00
Punjab National Bank	3.95	5.73	8.74	12.00	14.00

State Bank of India showed a consistent decline in the Gross NPA to Advances ratio throughout the study period, indicating significant improvement in asset quality. The ratio declined from 5.00 percent in 2020-21 to 3.97 percent in 2021-22, followed by a further reduction to 2.78 percent in 2022-23. The improving trend continued in 2023-24, with the ratio decreasing to 2.24 percent, and further declined to 1.82 percent in 2024-25. This continuous downward movement reflects effective recovery mechanisms, improved credit appraisal systems, and better monitoring of loan portfolios. The declining NPAs suggest that State Bank of India has strengthened its asset quality and reduced credit risk over the years.

Bank of Baroda also demonstrated a notable improvement in asset quality during the study period. The Gross NPA to Advances ratio declined significantly from 9.00 percent in 2020-21 to 7.00 percent in 2021-22. The ratio further decreased to 3.79 percent in 2022-23, indicating substantial recovery and improved credit management. The declining trend continued in 2023-24 with the ratio falling to 2.92 percent and further improving to 2.26 percent in 2024-25. This sharp reduction in Gross NPAs highlights the bank's successful efforts in managing stressed assets, strengthening recovery measures, and maintaining prudent lending practices. The improvement over the years reflects enhanced asset quality and reduced financial risk.

Punjab National Bank recorded the highest Gross NPA to Advances ratio among the three banks throughout the study period, though it also showed significant improvement over time. The ratio was very high at 14.00 percent in 2020-21, which decreased to 12.00 percent in 2021-22. The decline continued to 8.74 percent in 2022-23, followed by a further reduction to 5.73 percent in 2023-24. In 2024-25, the ratio declined substantially to 3.95 percent. Although Punjab National Bank exhibited a consistent downward trend, its Gross NPA ratio remained higher compared to State Bank of India and Bank of Baroda. The improvement indicates better recovery and credit monitoring, but the relatively higher values suggest that the bank still faces challenges in maintaining asset quality.

A comparative analysis of the three banks indicates that State Bank of India maintained the lowest Gross NPA to Advances ratio during most of the study period, reflecting superior asset quality and efficient credit risk management. Bank of Baroda ranked second, showing remarkable improvement with a sharp decline in NPAs over the years. Punjab National Bank, although showing substantial reduction, continued to record the highest Gross NPA ratio, indicating comparatively weaker

asset quality. By 2024-25, State Bank of India recorded the lowest ratio at 1.82 percent, followed by Bank of Baroda at 2.26 percent, while Punjab National Bank stood at 3.95 percent.

Anova: Single Factor

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
State Bank of India	5	15.81	3.162	1.70702
Bank of Baroda	5	24.97	4.994	8.32448
Punjab National Bank	5	44.42	8.884	17.54893

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	85.38268	2	42.69134	4.643656	0.032089	3.885294
Within Groups	110.3217	12	9.193477			
Total	195.7044	14				

Null Hypothesis (H_0): There is no significant difference in Gross NPA to Advances among State Bank of India, Bank of Baroda, and Punjab National Bank.

The ANOVA results reveal that the calculated F value (4.6437) is greater than the critical F value (3.8853), and the p-value (0.0321) is less than the 0.05 level of significance. Therefore, the null hypothesis is rejected. This indicates that there is a statistically significant difference in Gross NPA to Advances among the selected public sector banks. The summary statistics show that Punjab National Bank has the highest average Gross NPA ratio (8.884), followed by Bank of Baroda (4.994), while State Bank of India recorded the lowest average (3.162). Hence, it can be concluded that asset quality differs significantly among the banks, with State Bank of India showing better asset quality and Punjab National Bank reflecting comparatively higher credit risk.

6.3 INTEREST INCOME/ EMPLOYEE (Rs. in Lakh)

BANK	**2024-25**	**2023-24**	**2022-23**	**2021-22**	**2020-21**
State Bank of India	195.78	178.71	140.81	112.78	107.94
Bank of Baroda	164.11	151.70	115.98	88.26	85.97
Punjab National Bank	195.02	104.45	81.77	72.60	79.32

State Bank of India recorded a consistent and significant increase in interest income per employee throughout the study period. The value increased from Rs. 107.94 lakh in 2020-21 to Rs. 112.78 lakh in 2021-22, showing moderate improvement. A substantial rise was observed in 2022-23, where the figure increased to Rs. 140.81 lakh. The upward trend continued in 2023-24 with Rs. 178.71 lakh and further improved to Rs. 195.78 lakh in 2024-25. This steady growth indicates enhanced employee productivity and effective management practices. The rising trend suggests that State Bank of India has efficiently utilized its workforce to generate higher interest income and expand its lending operations over time.

Bank of Baroda also showed a consistent upward trend in interest income per employee during the period under study. The ratio increased from Rs. 85.97 lakh in 2020-21 to Rs. 88.26 lakh in 2021-22, followed by a significant increase to Rs. 115.98 lakh in 2022-23. The improvement continued in 2023-24, reaching Rs. 151.70 lakh, and further increased to Rs. 164.11 lakh in 2024-25. This steady rise indicates improved operational efficiency and better utilization of employees. Although Bank of Baroda maintained a lower value compared to State Bank of India in most years, the continuous growth reflects improved management efficiency and stronger business expansion.

Punjab National Bank exhibited a fluctuating but overall improving trend during the study period. The interest income per employee declined from Rs. 79.32 lakh in 2020-21 to Rs. 72.60 lakh in 2021-22, indicating reduced productivity during that year. However, the bank showed a strong recovery in 2022-23, with the figure increasing to Rs. 81.77 lakh. A sharp rise was observed in 2023-24, where the interest income per employee jumped to Rs. 104.45 lakh, followed by a remarkable increase to Rs. 195.02 lakh in 2024-25. This substantial growth in the final year indicates improved management efficiency and enhanced employee productivity. The sharp increase suggests that Punjab National Bank significantly strengthened its lending operations and income generation capacity.

A comparative analysis of the three banks reveals that State Bank of India maintained the highest interest income per employee for most of the study period, indicating superior employee productivity and management efficiency. Bank of Baroda ranked second, showing steady and consistent improvement over the years. Punjab National Bank recorded the lowest values during the initial years but showed a dramatic increase in the later period, especially in 2024-25. In the final year, State Bank of India recorded the highest interest income per employee at Rs. 195.78 lakh, closely followed by Punjab National Bank at Rs. 195.02 lakh, while Bank of Baroda stood at Rs. 164.11 lakh.

Anova: Single Factor

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
State Bank of India	5	736.02	147.204	1529.953
Bank of Baroda	5	606.02	121.204	1281.241
Punjab National Bank	5	533.16	106.632	2584.86

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	4224.051	2	2112.025	1.174205	0.342188	3.885294
Within Groups	21584.22	12	1798.685			
Total	25808.27	14				

Null Hypothesis (H_0): There is no significant difference in Interest Income per Employee among State Bank of India, Bank of Baroda, and Punjab National Bank.

The ANOVA results show that the calculated F value (1.1742) is less than the critical F value (3.8853), and the p-value (0.3422) is greater than the 0.05 level of significance. Therefore, the null hypothesis is accepted. This indicates that there is no statistically significant difference in Interest Income per Employee among the selected public sector banks. However, the average values reveal that State Bank of India recorded the highest mean interest income per employee (147.204 lakh), followed by Bank of Baroda (121.204 lakh) and Punjab National Bank (106.632 lakh). Although numerical differences

exist, these differences are not statistically significant, implying that employee productivity in generating interest income is relatively similar among the three banks.

6.4 RETURN ON ASSETS

BANK	2024-25	2023-24	2022-23	2021-22	2020-21
State Bank of India	1.06	0.98	0.91	0.63	0.45
Bank of Baroda	1.09	1.12	0.96	0.56	0.07
Punjab National Bank	0.91	0.52	0.17	0.26	0.16

State Bank of India recorded a steady and consistent improvement in return on assets throughout the study period. The ROA increased from 0.45 percent in 2020-21 to 0.63 percent in 2021-22, indicating improved profitability. The upward trend continued in 2022-23, where the ratio increased to 0.91 percent, followed by further growth to 0.98 percent in 2023-24. In 2024-25, the return on assets reached 1.06 percent, reflecting strong earnings performance and efficient asset utilization. This consistent increase suggests that State Bank of India effectively improved its profitability over time through better cost management, improved asset quality, and increased income generation.

Bank of Baroda exhibited significant improvement in return on assets during the study period. The ratio was very low at 0.07 percent in 2020-21, indicating weak profitability. However, a substantial improvement was observed in 2021-22, where the ROA increased to 0.56 percent. The bank further improved its performance in 2022-23 with a ratio of 0.96 percent. In 2023-24, the return on assets increased to 1.12 percent, representing the highest among the three banks. Although the ratio slightly declined to 1.09 percent in 2024-25, it remained strong and above one percent. This trend indicates that Bank of Baroda significantly enhanced its profitability and improved efficiency in utilizing its assets.

Punjab National Bank showed comparatively lower return on assets during the initial years but demonstrated gradual improvement in later periods. The ROA stood at 0.16 percent in 2020-21 and increased slightly to 0.26 percent in 2021-22. However, the ratio declined to 0.17 percent in 2022-23, indicating temporary deterioration in profitability. A notable improvement was observed in 2023-24, where the return on assets increased to 0.52 percent. The upward trend continued in 2024-25, reaching 0.91 percent. Although Punjab National Bank showed improvement, its return on assets remained comparatively lower than State Bank of India and Bank of Baroda, indicating relatively weaker profitability.

A comparative analysis of the three banks reveals that Bank of Baroda performed best in terms of return on assets during the later years of the study period, particularly in 2023-24 and 2024-25. State Bank of India also demonstrated strong and consistent growth, maintaining the second position with steady improvement. Punjab National Bank recorded the lowest ROA during most of the study period, though it showed gradual recovery in recent years. In 2024-25, Bank of Baroda ranked first with 1.09 percent, followed by State Bank of India with 1.06 percent, while Punjab National Bank stood at 0.91 percent.

Anova: Single Factor

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
State Bank of India	5	4.03	0.806	0.06583
Bank of Baroda	5	3.8	0.76	0.19865
Punjab National Bank	5	2.02	0.404	0.10113

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	0.484093	2	0.242047	1.986105	0.179845	3.885294
Within Groups	1.46244	12	0.12187			
Total	1.946533	14				

Null Hypothesis (H_0): There is no significant difference in Return on Assets among State Bank of India, Bank of Baroda, and Punjab National Bank.

The ANOVA results indicate that the calculated F value (1.9861) is less than the critical F value (3.8853), and the p-value (0.1798) is greater than the 0.05 level of significance. Therefore, the null hypothesis is accepted. This implies that there is no statistically significant difference in Return on Assets among the selected public sector banks. However, the average values show that State Bank of India recorded the highest mean ROA (0.806), followed by Bank of Baroda (0.76), while Punjab National Bank reported the lowest average (0.404). Although State Bank of India and Bank of Baroda performed relatively better than Punjab National Bank, the differences in profitability are not statistically significant among the three banks.

6.5 LIQUIDITY ASSETS TO TOTAL ASSETS RATIO

BANK	2024-25	2023-24	2022-23	2021-22	2020-21
State Bank of India	3.40	3.64	4.48	5.17	4.70
Bank of Baroda	3.15	3.46	3.76	4.32	3.36
Punjab National Bank	3.54	4.16	5.35	4.31	3.49

State Bank of India showed a fluctuating but overall declining trend in liquidity assets to total assets ratio during the study period. The ratio stood at 4.70 percent in 2020-21 and increased to 5.17 percent in 2021-22, indicating a stronger liquidity position during that year. However, the ratio declined to 4.48 percent in 2022-23, followed by a further decrease to 3.64 percent in 2023-24. In 2024-25, the ratio slightly declined again to 3.40 percent. This gradual reduction suggests that State Bank of India has been utilizing more of its liquid assets for lending and other income-generating activities. Although the liquidity ratio declined over time, the bank maintained an adequate level of liquidity to meet short-term obligations.

Bank of Baroda also recorded a fluctuating trend in liquidity assets to total assets ratio over the study period. The ratio increased from 3.36 percent in 2020-21 to 4.32 percent in 2021-22, indicating improved liquidity. However, the ratio declined to 3.76 percent in 2022-23 and further decreased to 3.46 percent in 2023-24. In 2024-25, the ratio slightly declined to 3.15 percent. The gradual reduction in liquidity assets suggests that Bank of Baroda has shifted funds from liquid assets to advances and investments for improving profitability. Despite the decline, the bank maintained a stable liquidity position throughout the period.

Punjab National Bank exhibited a fluctuating but comparatively higher liquidity position during the study period. The ratio increased from 3.49 percent in 2020-21 to 4.31 percent in 2021-22 and further improved significantly to 5.35 percent in 2022-23, indicating strong liquidity management. However, the ratio declined to 4.16 percent in 2023-24 and further decreased to 3.54 percent in 2024-25. Although the liquidity ratio declined in the later years, Punjab National Bank maintained relatively higher liquidity compared to the other banks in most of the years. The higher liquidity may reflect cautious lending practices and stronger emphasis on maintaining liquid reserves.

A comparative analysis of the three banks reveals that Punjab National Bank maintained the highest liquidity assets to total assets ratio during most of the study period, particularly in 2022-23 when it recorded 5.35 percent. State Bank of India also maintained relatively high liquidity during the initial years but showed a declining trend in later periods. Bank of Baroda recorded comparatively lower liquidity ratios throughout the study period, indicating relatively lower liquid asset holdings. In 2024-25, Punjab National Bank ranked first with 3.54 percent, followed by State Bank of India with 3.40 percent, while Bank of Baroda stood at 3.15 percent.

Anova: Single Factor

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
State Bank of India	5	21.39	4.278	0.54812
Bank of Baroda	5	18.05	3.61	0.2058
Punjab National Bank	5	20.85	4.17	0.56785

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	1.285813	2	0.642907	1.459195	0.270867	3.885294
Within Groups	5.28708	12	0.44059			
Total	6.572893	14				

Null Hypothesis (H_0): There is no significant difference in Liquidity Assets to Total Assets Ratio among State Bank of India, Bank of Baroda, and Punjab National Bank.

The ANOVA results show that the calculated F value (1.4592) is less than the critical F value (3.8853), and the p-value (0.2709) is greater than the 0.05 level of significance. Therefore, the null hypothesis is accepted. This indicates that there is no statistically significant difference in the Liquidity Assets to Total Assets Ratio among the selected public sector banks. However, the average values reveal that State Bank of India recorded the highest mean liquidity ratio (4.278), followed closely by Punjab National Bank (4.17), while Bank of Baroda reported the lowest average (3.61). Although minor variations exist, the liquidity positions of the three banks are statistically similar during the study period.

7. CONCLUSION

This study evaluated the performance of State Bank of India, Bank of Baroda, and Punjab National Bank using selected indicators such as Capital Adequacy Ratio, Gross NPA to Advances, Interest Income per Employee, Return on Assets, and Liquidity Assets to Total Assets Ratio. The analysis of capital adequacy revealed that all three banks maintained capital levels above regulatory requirements during the study period. Bank of Baroda recorded the highest average capital adequacy ratio, followed by Punjab National Bank, while State Bank of India maintained comparatively lower but stable capital strength. The ANOVA results also indicated a significant difference among the banks in terms of capital adequacy, suggesting variation in their risk-bearing capacity and financial strength.

The asset quality analysis based on Gross NPA to Advances ratio showed a declining trend for all three banks, indicating improvement in credit management and recovery performance. State Bank of India recorded the lowest average gross NPA ratio, reflecting better asset quality, followed by Bank of Baroda, while Punjab National Bank reported comparatively higher NPAs despite substantial improvement over the years. The ANOVA results confirmed that the difference in asset quality among the banks is statistically significant, indicating variations in credit risk and loan portfolio management.

The management efficiency analysis using Interest Income per Employee showed that State Bank of India recorded the highest average value, followed by Bank of Baroda and Punjab National Bank. Although differences existed in employee productivity, the ANOVA results indicated that these variations were not statistically significant. This suggests that all three banks demonstrated relatively similar efficiency in generating interest income through their workforce, despite numerical differences in performance.

The profitability analysis based on Return on Assets revealed that State Bank of India recorded the highest average return, closely followed by Bank of Baroda, while Punjab National Bank reported comparatively lower profitability. All banks showed improvement in return on assets during the study period, indicating enhanced operational performance. However, ANOVA results showed no significant difference among the banks, suggesting that their profitability levels are statistically similar despite minor variations.

The liquidity analysis using Liquidity Assets to Total Assets ratio indicated that State Bank of India maintained slightly higher liquidity, followed by Punjab National Bank, while Bank of Baroda recorded comparatively lower liquidity levels. The ratios for all three banks showed moderate fluctuations but remained within a stable range. The ANOVA results also confirmed that there is no significant difference among the banks in terms of liquidity position, indicating similar short-term financial strength.

Overall, the study concludes that all three public sector banks demonstrated stable financial performance during the study period. Bank of Baroda performed better in terms of capital adequacy, State Bank of India showed superior asset quality and consistent profitability, while Punjab National Bank exhibited significant improvement in asset quality and operational performance. The statistical analysis revealed significant differences only in capital adequacy and asset quality, whereas management efficiency, profitability, and liquidity did not differ significantly among the banks. Therefore, it can be concluded that State Bank of India showed overall consistent performance, Bank of Baroda demonstrated strong capital position, and Punjab National Bank showed improving but comparatively moderate financial stability under the CAMEL framework.

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