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MAJOR RESEARCH PROJECT

PERFORMANCE EVALUATION OF PUBLIC SECTOR BANKS USING CAMELS MODEL

Submitted by

SHRAY CHAMOLI

23/UMBA/99

Under the Guidance of

Dr. Mohit Benewal

Assistant Professor

DELHI SCHOOL OF MANAGEMENT

Delhi Technological University

Bawana Road Delhi – 110042

CERTIFICATE

It is certified that **Mr. Shray Chamoli ,** have completed the project titled **"Performance Evaluation of Public Sector Banks using CAMELS Model"** under the guidance of **Dr. Mohit Beniwal, Associate Professor** as a part of **Master of Business Administration (MBA)** curriculum of Delhi School of Management, New Delhi. This is a record of research work carried out by him during the academic year 2024-25 under my supervision. To the best of my knowledge, this is an original work and has not been submitted elsewhere.

Dr. Mohit Beniwal

Assistant Professor

Delhi School of Management

Delhi Technological University

DECLARATION

I hereby affirm that the Major Research Project titled "Performance Evaluation of Public Sector Banks using CAMELS model" is my own original work and has been submitted in partial submission of the degree requirements in "Master of Business Administration" under the supervision and guidance of Dr. Mohit Beniwal.

I also make solemn declaration that this research work is my original work and has not been submitted earlier for the award of any other diploma, degree or elsewhere in any form.

All information sources utilised in the preparation of this project have been duly acknowledged in the references section.

Shray Chamoli

Roll No: 23/UMBA/99

ACKNOWLEDGEMENT

I hereby convey my heartfelt thanks to everyone who has helped and assisted me along the way, allowing the master's thesis to be completed successfully.

To begin with, I express my deepest gratitude to **Prof. Prateek Sharma, Vice Chancellor, Delhi Technological University (DTU)**, who has given me this opportunity to complete this research.

I am deeply grateful to the leadership team at the Delhi School of Management and Entrepreneurship **(DTU)** for their unwavering commitment to academic excellence.

I grant a special token of thanks to Dr. Mohit Beniwal for his constant dedication and support on ongoing research design in executing, "**Performance Evaluation of Public Sector Banks using CAMELS Model**." The success of this research and its findings are largely attributed to the invaluable guidance of Mohit Sir.

My enthusiasm and fervor for the key project me to learn and explore the trends about the topic we had only vaguely studied. I am sincerely thankful to my friends and family for their unwavering support and encouragement, which motivated me to complete this project in line with the expected standards.

EXECUTIVE SUMMARY

In the current landscape, the banking sector stands out as one of the most rapidly expanding industries, attracting significant investments. With the increasing complexity of today's banking systems, I was motivated to assess the performance of banks. While several frameworks exist for evaluating bank performance, I selected the CAMELS Model due to its comprehensive coverage of key parameters-Capital, Assets, Management, Earnings, Liquidity, and Sensitivity to Market Risk. My research into various sources confirmed that this model offers a thorough assessment across all critical dimensions.

After finalizing the CAMELS framework, I included all public sector banks in my study. I collected annual reports for bank covering the five-year period from 2020-2024. Using this data, I calculated relevant financial ratios and interpreted the results. Each CAMELS parameter and its respective ratios were assigned weights based on their significance and my understanding of their impact. The weighted scores were then used to evaluate each bank's performance, with marks assigned accordingly. By aggregating these marks, I was able to determine an overall rating for each institution.

The research seeks to bridge gaps in available literature through presenting a complete, recent appraisal that includes the recent regulatory developments like Basel III norms, and through the use of inferential statistical methods, such as ANOVA, to test performance differences among banks for significance.

The results reveal notable differences in bank performance across various CAMELS dimensions, highlighting specific areas for improvement, particularly in Capital Adequacy, Asset Quality, and Sensitivity to Market Risk. This study provides useful information on the financial health of PSBs and presents suggestions for policy makers, regulators, and bank management to promote stability and growth in the sector. By adopting a holistic methodology and focusing on a current sample, this research contributes to the understanding of Indian banks' financial performance and delivers actionable insights for stakeholders.

TABLE OF CONTENTS

1. INTRODUCTION

In the complex economic landscape of the twenty-first century, banks function as the lifeblood of financial systems, facilitating capital formation, enabling monetary policy implementation, and supporting economic growth through their intermediary role. Within this framework, Public Sector Banks in India represent unique institutional constellation that merges commercial objectives with socioeconomic responsibilities, creating a distinctive banking paradigm that warrants systematic evaluation.

The Strategic Significance of Public Sector Banks in India

Public Sector Banks, where the government holds a dominant stake exceeding 50%, have served as instruments of national economic policy and financial inclusion. Since the first nationalization wave in 1955, State Bank of India, followed by subsequent nationalizations in 1969 and 1980, these institutions have evolved beyond conventional banking operations to become vehicles for implementing social welfare schemes and expanding banking access to underserved populations. Despite facing significant challenges in recent years, PSBs have demonstrated remarkable resilience, reporting an unprecedented overall net profit of ₹1.41 lakh crore in the fiscal year 2023-24, with declining Gross Non-Performing Assets (GNPA) ratios decreasing to 3.12% as of September 2024.

Imperative for Performance Evaluation

The Ever changing nature of the banking landscape, defined by technological disruptions, regulatory changes, and intensifying competition, necessitates robust frameworks for evaluating bank performance. This imperative becomes particularly pronounced for PSBs, which must balance commercial viability with their social mandate. While various performance metrics exist, comprehensive evaluation requires multidimensional analysis that assesses financial health, operational efficiency, risk management practices, and long-term sustainability.

1.1 BANKING SECTOR

Evolution of India's Banking Landscape: From Colonial Roots to Economic Backbone

The story of modern banking in India is a tale of colonial legacy, economic transformation, and institutional resilience. While informal lending systems existed for centuries, structured banking emerged in the late 1700s as European trading powers sought financial infrastructure to support their commercial ambitions.

Foundations in the Colonial Era (1770-1921)

Bank of Hindustan, which was established in 1770 by Alexander & Company in Calcutta, marked India's first experiment with European-style banking. Though it collapsed in 1832 after surviving three financial panics, its 60-year operation demonstrated the viability of banking institutions in colonial economies. This pioneering efforts were followed by the **General Bank of India** (1786-1791), which became a cautionary tale about overextension, as its intertwined operations with the East India Company led to rapid failure.

The beginning of the 19th century saw **Presidency Banks** being formed - strategic financial arms of British regional administrations:

- **Bank of Calcutta** (1806), renamed **Bank of Bengal** (1809)
- **Bank of Bombay** (1840)
- **Bank of Madras** (1843)

These institutions financed military campaigns (including wars against Tipu Sultan), managed government funds, and issued currency notes that sometimes fluctuated wildly in value. By 1921, their merger created **Imperial Bank of India**, which handled central banking functions until the Reserve Bank of India (RBI)

Post-Independence Transformation (1947-1991)

India's 1947 independence ushered in a new banking philosophy. In 1955, the Imperial Bank was transformed into State Bank of India (SBI), which has since grown to become the nation’s largest lender, managing assets worth ₹41 trillion. A watershed moment came in 1969 when Prime Minister Indira Gandhi's government

nationalized 14 major private banks holding 80% of deposits. This radical move aimed to:

1. Direct credit toward priority sectors like agriculture
2. Reduce urban-rural economic disparities
3. Break the dominance of business houses over credit flows

The 1980 nationalization of 6 additional banks further expanded state control, creating a public banking network that now covers 95% of India's districts. These institutions became vital instruments for implementing poverty-alleviation programs and financial inclusion initiatives.

Structural Framework: Scheduled vs Non-Scheduled Banks

19 India's banking architecture, formalized under Section 42 of the **RBI Act, 1934**, distinguishes between:

Scheduled Banks

- Listed in the RBI's Second Schedule
- Minimum paid-up capital of ₹5 lakh
- Eligible for RBI loans/discounts
- Includes public/private sector banks, RRBs, and foreign banks

Non-Scheduled Banks

- Smaller, localized operations
- Not bound by RBI's liquidity norms
- Cannot access central bank's credit facilities

As of 2024, India has 12 PSBs, 22 private banks, and 46 foreign banks operating under this framework. The SBI alone has 22,000+ branches and 58,000+ ATMs, illustrating the sector's scale.

Economic Impact and Modern Challenges

Banks have been pivotal in transforming India from a cash-based agrarian economy to a $3.7 trillion digital-first market. Key contributions include:

- **Financial Inclusion**: The **Pradhan Mantri Jan Dhan Yojana** (2014) leveraged bank networks to provide 500 million unbanked citizens with accounts.
- **Credit Mobilization**: Banks fund 40% of India's infrastructure projects through long-term loans
- **Digital Revolution**: UPI transactions processed by banks hit ₹200 trillion in 2023, surpassing Visa/Mastercard volumes

However, challenges persist. Public sector banks struggle with **non-performing assets** (NPAs) averaging 4.97% of loans in 2024, while competition from fintech firms pressures traditional business models.

Regulatory Evolution

The RBI's role has expanded from currency management to encompass:

- **Monetary Policy**: Targeting 4% inflation with a +/- 2% band since 2016
- **Supervision**: Risk-based audits of banks under **Prompt Corrective Action** framework
- **Innovation**: Sandbox environments for testing blockchain/AI solutions

Recent reforms like the **Insolvency and Bankruptcy Code** (2016) and **Bad Bank** (NABARD) establishment reflect ongoing efforts to strengthen the banking backbone.

From financing the Maratha wars to enabling digital rupee trials, Indian banks have continually reinvented themselves. As the economy targets $5 trillion by 2027, this sector's ability to balance regulatory compliance, technological adoption, and social mandate will determine India's developmental trajectory. The journey from colonial cashiers to economic architects underscores banking's central role in nation-building - a legacy that continues to evolve.

1.2 The Evolution and Role of PSBs in India’s Financial Ecosystem

PSBs are the core of India’s banking sector, with the government holding a majority stake of over 51% in these institutions. PSBs are not just listed on stock exchanges but also serve as critical vehicles for financial inclusion, economic stability, and social welfare initiatives. As of 2025, India has **12 PSBs** after strategic mergers have

been carried out to enhance the operational efficiency and risk management. These include stalwarts like State Bank of India (SBI), Punjab National Bank (PNB), and Bank of Baroda, which collectively manage over 60% of the banking assets of the country.

Historical Foundations: From Imperial Roots to Nationalization

The journey of PSBs started in 1955 with the nationalization of Imperial Bank of India, which was rebranded as the **State Bank of India (SBI)** after the government acquired a 60% stake. This marked the first step toward state-controlled banking. The pivotal shift occurred in 1969 when Prime Minister Indira Gandhi nationalized 14 major private banks holding deposits surpassing ₹50 crores, transferring 84% of India's banking operations to public control. A second wave in 1980 saw six more banks nationalized, targeting institutions with deposits over ₹200 crores. These moves aimed to dismantle private monopolies, direct credit toward agriculture and SMEs, and align banking with socialist principles.

By 1991, PSBs dominated 90% of the sector, operating 60,646 branches and managing ₹1.1 lakh crore in deposits. Despite occasional setbacks, such as collective losses of ₹1,160 crore in the 1990s, PSBs rebounded in the 2000s, posting profits of ₹7,780 crore by 2003 and ₹16,856 crore by 2009.

Modern Challenges and Reforms

PSBs have faced significant hurdles, particularly **non-performing assets (NPAs)**, which peaked at 14.58% in 2018 due to aggressive lending and economic slowdowns. However, reforms like the **Insolvency and Bankruptcy Code (2016)** and the **4R strategy** (Recognition, Resolution, Recapitalization, and Reforms) reduced NPAs to 3.12% by 2024. Concurrently, their Capital-to-Risk Weighted Assets Ratio (CRAR) strengthened to 15.43%, far surpassing the RBI's 11.5% mandate.

The government's **EASE Framework** (Enhanced Access and Service Excellence) further revitalized PSBs by promoting technology adoption, governance reforms, and customer-centric services. For instance, the **Kisan Credit Card Scheme** disbursed ₹9.88 lakh crore to 7.71 crore farmers by 2024, underscoring PSBs' role in rural empowerment.

Conclusion: PSBs as Pillars of Inclusive Growth

PSBs have evolved from colonial-era institutions to engines of socioeconomic transformation. Their vast network-SBI alone has 22,000 branches and 58,000 ATMs-ensures availability of banking services in the remote areas, while schemes like PM Jan Dhan Yojana have brought millions into the financial system. Despite past challenges, their revival through reforms positions them to drive India's ambition of becoming a $5 trillion economy. By leveraging tools like CAMELS, stakeholders can ensure PSBs remain agile, accountable, and aligned with national priorities.

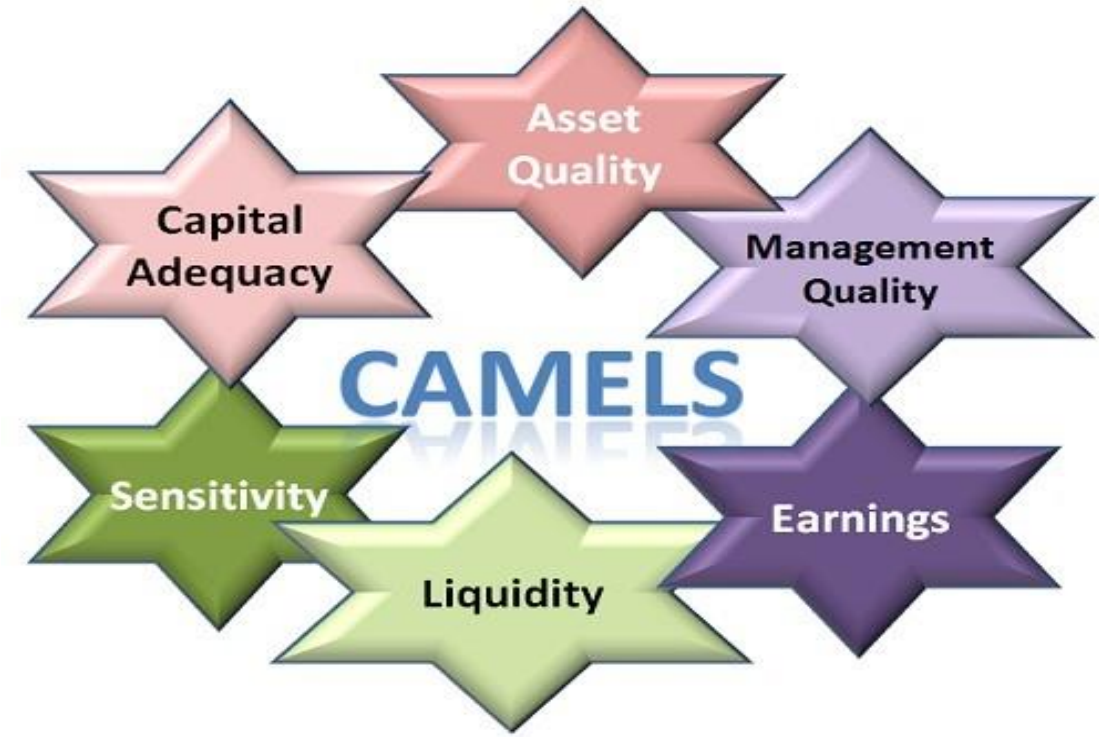
1.3 CAMEL FRAMEWORK

In the high-stakes world of finance, where a single bank's collapse can ripple through economies, regulators wield the **CAMELS framework** as their diagnostic toolkit - akin to a financial stethoscope measuring the vital signs of banking institutions. Born from the ashes of the 1970s banking crises, this evaluative model has become the global standard for preventing systemic meltdowns.

Evolutionary Journey: From CAMEL to CAMELS

The story begins in **1979** when U.S. regulators introducing the **Uniform Financial Institutions Rating System (UFIRS)**. Initially dubbed **CAMEL** (Capital, Assets, Management, Earnings, Liquidity), it revolutionized bank supervision by standardizing assessments across 8,000+ institutions. The system's defining moment came in **1995**, when the **Federal Reserve** added "S" for **Sensitivity to Market Risk**, responding to the $1.6 trillion derivatives market explosion that nearly toppled Barings Bank.

This evolution mirrors financial markets' growing complexity. Where early regulators worried about simple loan defaults, modern supervisors using CAMELS now monitor exposure to cryptocurrency volatility and AI-driven trading algorithms.



The CAMELS rating framework is recognized globally as a benchmark for evaluating the financial soundness and operational performance of banks. In 1979, the Uniform Financial Institutions Rating System (UFIRS) was introduced to U.S. banking institutions, and subsequently to the world at large, at the suggestion of the U.S. Federal Reserve. The system gained acceptance worldwide by the acronym CAMEL, representing five categories of rating, the model was subsequently updated to incorporate sensitivity to market risk, thus completing the CAMELS acronym. This regulatory tool assesses six fundamental components. This assesses a bank's compliance with regulatory capital requirements and its ability to maintain adequate capital reserves to absorb potential losses and support growth. Capital adequacy ratios indicate an institution's financial strength and its capacity to withstand economic downturns.

Capital Adequacy

This component assesses a bank's compliance with regulatory capital requirements and its ability to maintain adequate capital reserves to absorb potential losses and support growth. Capital adequacy ratios indicate an institution's financial strength and its capacity to withstand economic downturns.

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Asset Quality

Asset quality evaluates the risk level within the portfolio of the bank, particularly focusing on loan performance and investment practices. This dimension is crucial as deteriorating asset quality can rapidly undermine a bank's stability and profitability.

Management Capability

This qualitative component examines the efficiency and effectiveness of bank leadership, governance structures, risk management frameworks, and strategic planning processes. Despite being more subjective than other components, management quality significantly influences overall bank performance.

Earnings

Earnings metrics assess a bank's profitability, income stability, growth trends, and quality of revenue sources. This dimension provides insights into an institution's operational efficiency and long-term viability.

Liquidity

Liquidity measures evaluate a ability of the bank to meet their financial obligations without incurred unacceptable loss, focusing on asset-liability management and funding structures. Strong liquidity positions enable banks to weather market disruptions and maintain customer confidence.

Sensitivity to Market Risk

This component examines how interest rate changes, foreign exchange fluctuations, other market variables affect a bank's financial condition. Effective management of market risk exposures is essential for maintaining stability in volatile economic environments.

Together, these six factors provide regulators, investors, and stakeholders with a overall view of the stability, efficiency, and overall risk management of a bank. The CAMELS rating system generally assigns a score from 1 (highest quality) to 5 (lowest quality) for each of these factors, with a composite rating that summarizes the financial health of the bank.

The CAMELS framework employs a weightage rating methodology to assess the

overall stability and well-being of a financial institution by reviewing six major components. Each component is allocated a distinct weightage depending on its relative significance in determining the financial solidity of the bank. Greater weights are usually accorded to Capital Adequacy and Asset Quality since they directly reflect the institution's capacity to resist financial pressures and bear risks. Ratings for each component are usually allocated on a scale of 1 to 5, with 1 reflecting excellent performance and 5 suggesting serious issues. These distinct ratings are then multiplied by their respective weights to determine a weighted score. A composite score that captures the overall performance of the bank is determined by the addition of these weighted scores. This composite score indicates the bank's overall performance and stability and thus assists regulators, investors, and other stakeholders to make informed judgments regarding the institution's financial soundness. This weightage rating methodology guarantees that more salient aspects of the bank's operations are adequately accorded prominence, resulting in a more correct and specific evaluation.

The process of assigning weights in the CAMELS method is to assign relative importance to each of the six factors by assigning a weight to each of these factors. The weights are typically percentages that sum up to 100%, indicating the relative importance of each item in evaluating the bank’s financial soundness. To calculate the CAMELS score, each element's score is multiplied by its respective weight, and these weighted scores are summed up.

The formula for the final CAMELS score is:

Overall CAMELS Score= (C×wC)+(A×wA) + (M×wM) +(E×wE) + (L×wL) + (S×wS)

Where C,A,M,E,L,S are the **Components Scores** and wC, wA ,wM ,wE ,wL ,wS are the **weights**.

CAMEL FRAMEWORK WEIGHTAGE

CAMEL FRAMEWORK	WEIGHTAGE
Capital Adequacy	**20%**
Asset Quality	**20%**
Management Quality	**20%**
Earnings	**20%**
Liquidity	**10%**
Sensitivity to Market Risk	**10%**

This process provides a comprehensive, weighted performance evaluator of a bank across key financial metrics.

The CAMELS rating system functions as a financial stethoscope for regulators,

assessing credit unions' operational vitality through six critical dimensions. This framework categorizes institutions into five risk tiers, each signaling distinct levels of stability and required intervention. Let's demystify these ratings through real-world analogies and practical implications.

Rating 1

Imagine a credit union operating with the precision of a gold-medal gymnast. These institutions:

- **Maintain flawless risk detection** through advanced monitoring systems akin to athlete biometrics
- **Exhibit 98% regulatory compliance** scores in routine audits
- **Withstand economic shocks** like 2008-level crises without liquidity crunches

A Rating 1 institution recently navigated a regional manufacturing downturn by proactively restructuring 23% of commercial loans, maintaining 0.8% NPA ratio. Their secret? A leadership team conducting quarterly stress tests simulating 5% GDP contractions.

Rating 2

These credit unions operate like well-maintained vehicles:

- **Handle daily routes competently** but need tire rotations (minor vulnerabilities)
- **Survive moderate storms** but struggle in hurricanes (extreme crises)
- **Maintain 85-90% compliance** with occasional paperwork delays

Rating 3

Here's where regulators shift from observers to coaches:

- **Capital buffers** dip below 8% of risk-weighted assets
- **Loan approval processes** lack digital documentation trails
- **Quarterly earnings** fluctuate beyond 2.5% variance thresholds

Rating 4

These institutions display critical symptoms:

- **NPA ratios** exceeding 15% for three consecutive quarters
- **Liquidity coverage ratios** below 50% during stress tests
- **Outdated cybersecurity** systems with 120-day patch delays.

Rating 5

At this stage, regulators become emergency surgeons:

- **Immediate capital injections** required to meet 4% leverage ratios
- **Core systems** incompatible with real-time transaction monitoring
- **Leadership voids** with interim CEOs lasting 18+ months

SCORE	CAR (%)	NET NPA (%)	ROA (%)	C/I RATIO (%)	LIQUIDITY /TA RATIO	INVESTMENT/TA (%)
1	>15%	<1%	>1.2%	<45%	>35%	<15%
2	12–15%	1–2%	0.8–1.2%	45–50%	30% – 35%	15–20%
3	10–12%	2–5%	0.5–0.8%	50–60%	25% – 30%	20–25%
4	8–10%	5–10%	0.2–0.5%	60–70%	20% – 25%	25–30%
5	<8%	>10%	<0.2%	>70%	< 20%	>30%

2. PROBLEM STATEMENT

Indian banking, and more so PSBs, have a key role to play in facilitating economic growth and financial inclusion. PSBs have, however, experienced several challenges over the past couple of years such as increasing non-performing assets (NPAs), fluctuations in profitability, capital adequacy issues, and rising sensitivity to market risk. With vibrant regulatory reforms in the Basel III norms and increasing competition from the Private Sector, it is the need of the hour to reexamine the financial health and efficiency of operation of public sector banks in an integrated manner. Although conventional financial analysis is stand-alone parameter-oriented, an integrated and holistic model of assessment across various aspects of bank performance is the need of the hour. The CAMELS framework provides such an integrated framework by analyzing each components.

Therefore, the current research intends to overcome the challenge of assessing and comparing the financial situation of selected public sector banks using the CAMELS framework and also to provide information to stakeholders, policymakers, and investors to assist in decision-making.

3. OBJECTIVE OF THE STUDY

The main objective of this study is to evaluate the financial sustainability of selected Indian public sector banks according to the CAMELS framework. More specifically, this study aims to :

- Assess the CAMELS components of the banks through relevant the financial ratios.
- Compare performance of different banks across each CAMELS component.
- Apply statistical techniques, particularly One-Way ANOVA, to test whether there are significant differences in the financial performance among the selected banks.
- Develop a composite CAMELS rating for all the banks based on the use of weighted scoring regarding the key parameters.
- Identify strengths, weaknesses, and potential areas of improvement for the banks under latest regulatory and market conditions.

4. SCOPE OF THE STUDY

The current research encompasses only public sector banks (State Bank of India, Bank of Baroda, Punjab National Bank, Bank of India, Union Bank of India, Canara Bank, Bank of Maharashtra, Central Bank of India, Indian Bank, UCO Bank, Indian Overseas Bank, and Punjab and Sind Bank) gathered data of the recent years 2020 to 2024. The analysis relies on various financial ratios to assess bank performance. All necessary information was sourced from the annual reports of these banks and relevant financial websites.

5. LITERATURE REVIEW

Bank performance analysis has been a subject of significant academic and practical concern, especially in the context of increasing regulatory requirements and reform of the financial sector. An official evaluation framework, such as the CAMELS model, gives a multi-dimensional view of the financial health, efficiency, and risk management ability of the bank.

CAMELS Framework

The CAMELS rating system, developed by U.S. bank regulatory agencies in the 1970s, assesses the bank's financial health through six critical components. It has become an essential tool used worldwide for monitoring and supervising banks. According to **Siva and Natarajan (2011)**, CAMELS provides a more comprehensive insight than simple financial ratios by systematically analyzing both performance and risk parameters.

Capital Adequacy

This component assesses a bank's compliance with regulatory capital requirements and its ability to maintain adequate capital reserves to absorb potential losses and support growth. Capital adequacy ratios indicate an institution's financial strength and its capacity to withstand economic downturns. **Prasuna (2003)** emphasized that higher capital adequacy strengthens stakeholder confidence and provides resilience against market shocks.

Asset Quality

Asset quality evaluates the risk level within the portfolio of the bank, particularly focusing on loan performance and investment practices. This dimension is crucial as deteriorating asset quality can rapidly undermine a bank's stability and profitability. According to Kumbirai and Webb (2010), elevated NPAs can have a substantial negative impact on both the financial stability and profitability of banks, particularly in developing markets..

Management Efficiency

Management Efficiency measures how effectively the management utilizes its resources. Ratios like Operating Profit Margin and Return on Equity (ROE) are often

used as proxies. Samad (2004) concluded that strong management practices are vital for sustaining profitability and controlling operational risks.

Earnings Capacity

Earnings serve as the primary safeguard against financial challenges. Indicators like ROA and NIM demonstrate how effectively a bank generates profits in relation to its total assets. **Dash and Das (2009)** pointed out that consistent earnings performance is critical for the long-term survival and growth of banks.

Liquidity

Liquidity defined as a bank's capacity to fulfill its immediate financial commitments. Research by Singh and Tandon (2012) highlighted the critical role of balanced liquidity management in preventing solvency challenges, particularly during economic downturns.

Sensitivity to Market Risk

Component assesses how vulnerable a bank is with market fluctuations, particularly changes in interest rates, exchange rates, and investment portfolio valuations. **Gupta and Kaur (2008)** stressed that post-2008 financial crisis, monitoring sensitivity to market risk has gained increased regulatory attention.

Empirical Studies on CAMELS

Several empirical studies have applied the CAMELS model to the Indian banking sector. **Sangmi and Nazir (2010)** used CAMELS to compare the financial performance of Indian commercial banks and found significant differences across public and private sector banks. **Kaur (2010)** emphasized that public sector banks often lag behind private banks, especially in Asset Quality and Management Efficiency.

Sangmi and Nazir (2018) have taken two major banks of north India namely, Punjab & Sindh Bank and Jammu and Kashmir Bank on the basis of their role and participation in influencing the financial condition of North India. They focused on Punjab & Sindh Bank and Jammu and Kashmir Bank, analyzing the financial reports from 2001 to 2005. They concluded that both banks maintained strong financial health, particularly in areas like capital

adequacy, asset quality, management, and liquidity.

Mishra and Kumari (2017) selected 12 public and private sector banks on the basis of market capture and measured the efficiency and soundness by Camel Model. They assessed 12 leading banks using the CAMELS model, ranking HDFC at the top, followed by ICICI and Axis Bank. In contrast, PSBs such as SBI and Union Bank were found to lag behind, highlighting the stronger performance of private banks in the Indian context.

Jha and Hui (2017) examined Nepalese commercial banks, using ratios like ROA, ROE, and CAR. They noted that while public sector banks held more assets, joint venture and private banks had better returns on equity and capital adequacy, pointing to challenges in public sector performance, including management issues and higher costs.

Kumar (2016) has given a definition to camel rating system, according to him it is a mean to categorize bank based on the overall health, financial status, managerial and operational performance. His research on SBI and its associates found that SBI consistently led in various performance areas.

Aspal and Malhotra (2015) measured the financial performance of Indian public sector banks' asset by camel model and applying the tests like Anova, f test and arithmetic test for the data collected for the year 2007-2011. Their findings showed Bank of Baroda and Andhra Bank excelled because of strong capital adequacy and asset quality, whereas United Bank of India ranked lowest, mainly due to management inefficiency and poor asset quality.

Kumar and Sharma (2015) analyzed the performance of top 10 and highest market capitalized banks in India with the help of camel model approach, for the year 2006-10, their study found that Kotak Mahindra Bank is on the lead and on highest position in terms of capital adequacy followed by ICICI bank and they both are more efficient in managing their liquidity. However, SBI has the highest level of non-performing assets among its peers.

Lakhtaria (2014) has selected the top 3 PSBs, i.e. BOB, Punjab & Sindh Bank and State Bank of India for his study using camel model and has ranked the banks according to the performance and data interpreted. He ranked Bank of Baroda, Punjab & Sindh Bank, andSBI, finding BOB at the top, followed by Punjab & Sindh Bank and then SBI.

Chaudhary (2014) conducted a study to measure the right performance of public and private sector banks by the use of secondary data collected from annual reports, periodicals, website etc. for the year 2009-2011 and found out that in every aspect private sector bank has performed better than public sector banks and they are growing at faster pace.

Hoti and Alshiqi (2013) need to analyze the financial performance of the banking system in Kosovo from 2006-2012 using camel model and by calculating return on investment. Internationally, studies like that of Hoti and Alshiqi (2013) on Kosovo's banking sector found no significant differences in performance among banks during the global financial crisis, noting generally healthy balance sheets.

Matkar (2013) has conducted a study on MSC banks by using camel model. He investigated MSC banks and observed improvements in profits, business/employee, and capital adequacy, featuring this to higher non-interest income and lower operating expenses.

Misra and Aspal (2012) did the study on whole state bank group by using camel model approach and applying the tests like Anova, kolmogorov-smirnov, and shapirowilk and found out that though state bank of India is bigger entity than its other associates It got the lowest rank in every aspect whether the liquidity or the asset quality while state bank of Bikaner and Jaipur and state bank of Patiala is at the top position. He found that, despite SBI's size, it ranked lowest in several areas, including liquidity and asset quality, while its associates performed better in specific parameters.

Wrinker, Iraker&Tanko (2011) conducted a nine-year review of 11 commercial banks in Nigeria. Their research suggested that while the CAMEL model is widely used to assess bank health performance, it does not fully capture all aspects of a bank's operations. They identified the most effective ratio for each component of the CAMEL framework, even proposed reordering acronym to CLEAM, reflecting their view that the traditional sequence might not best represent the importance of each factor.

In another study, **Mihir Dash and Annyesha Das (2010)** compared public sector banks with their private and foreign counterparts using the CAMEL analysis. Their findings highlighted that private and foreign banks generally outperformed public sector banks, especially in areas like management quality, earnings, and overall profitability.

Tabbusum Nazir (2010) evaluated Punjab & Sindh Bank alongside Jammu and Kashmir Bank using the CAMEL methodology. The results showed that both banks were performing well overall. However, Jammu and Kashmir Bank had a slight edge over Punjab & Sindh Bank in terms of asset quality, earning capacity, and management efficiency-particularly when looking at business and profit per employee. That said, Punjab & Sindh Bank had a better income ratio, indicating its own strengths in certain areas**.**

Aswini(2012) concluded that Indian banking sector was the best performer in the world banking industryseeing tremendous competitiveness, growth, efficiency, profitability and soundness, especially in the recent years.

Kabir (2012) said that Camel is a rating system generally used by the government policy cycle, regulating bodies regulating commercial banks, that is, central banks and nongovernmental policy research centres for the purpose of assessing the soundness of a savings association or a bank.

S. M. Tariq Zafar, Adeel Maqbool, and Syed Imran Nawab Ali (2012) examined the financial performance of ten Indian commercial banks over the period from 2005 to 2010. Their findings indicated that all the banks improved their performance across various parameters during these years. Notably, PSBs demonstrated stronger performance compared to their private sector counterparts during the study period.

Misra and Aspal (2013) focused on the State Bank Group using the CAMEL approach. Their research highlighted that the State Bank of Bikaner and Jaipur (SBBJ) excelled in capital adequacy and asset quality but needed to enhance management efficiency. The State Bank of Patiala (SBP) maintained a solid capital base, though its earning capacity was lacking. The SBI showed good liquidity but needed to work on asset quality. State Bank of Travancore (SBT) was noted for efficient management and strong earnings but required a stronger capital base, while State Bank of Mysore (SBM) had good earning capacity but lagged in liquidity ratios.

Krupa R. Trivedi (2014) applied the CAMEL framework to evaluate the performance of scheduled co-operative banks in Surat city. The analysis found that these banks maintained adequate capital levels and had an effective loan recovery process. They were also making efficient use of their assets. However, the return on equity was not as strong as desired. While management practices were generally sound, the banks faced challenges in maintaining a healthy liquidity position.

S.K. Khatik and Amitkr Nag (2014) examined five nationalized banks using the CAMEL model, ranking each bank based on its performance in the different CAMEL categories. According to their findings, BOB led the group, followed by Union Bank of India and Dena Bank, which shared the second spot. SBI was ranked fourth, and UCO Bank came in last among the banks reviewed.

Sushendra Kumar Misra and Parvesh Kumar Aspal (2014) used the CAMEL approach to assess the SBI group. Their study suggested that SBBJ (State Bank of Bikaner and Jaipur) should focus on improving management efficiency, SBP (State Bank of Patiala) needed to enhance its earning capability, SBI itself was advised to work on asset quality, and SBM (State Bank of Mysore) was encouraged to improve its liquidity position.

Palaneswri and Suriya (2015) analyzed the financial health of Tamilnadu Mercantile Bank using the CAMEL rating system. Their research concluded that the bank's overall financial performance was satisfactory, with reasonable results across capital adequacy, asset quality, management efficiency, earnings ability, and liquidity ratios

6. RESEARCH METHODOLOGY

Research Design

This study employs a quantitative and analytical framework, combining descriptive evaluation to assess and compare operational performance across banks, with hypothesis-testing methodologies to derive actionable insights.

Sample Selection

The analysis includes twelve public sector banks (State Bank of India, Bank of Baroda, Punjab National Bank, Bank of India, Union Bank of India, Canara Bank, Bank of Maharashtra, Central Bank of India, Indian Bank, UCO Bank, Indian Overseas Bank, and Punjab and Sind Bank) operating in India

Data Sources

The research utilizes secondary data sourced from:

- Annual financial statements of banks
- RBI publications, including Financial Stability Reports
- Basel III regulatory disclosures
- Reputable financial platforms (Moneycontrol, Statista)
  The data spans the three most recent financial years (2021–2024) to ensure consistency and relevance.

CAMELS Framework Implementation

Financial health is analyzed using the CAMELS rating system, with the following metrics:

- Capital Adequacy: Evaluated via the Capital Adequacy Ratio (CAR)
- Asset Quality: Measured using the Net Non-Performing Assets (NPA) ratio
- Management Efficiency: Assessed through the Operating Profit Ratio
- Earnings Capacity: Analyzed via Return on Assets (ROA)
- Liquidity: Determined by the Liquid Assets to Total Assets ratio

- Sensitivity to Market Risk: Gauged through the Investment to Total Assets ratio

Statistical Analysis

One-Way Analysis of Variance (ANOVA) is applied :

1. Validate hypotheses about performance disparities
2. Identify statistically significant variations in CAMELS parameters across the sample banks

This methodological approach ensures a robust, data-driven evaluation of banking sector performance.

HYPOTHESIS:

H_{01}: There is no significant difference among PSBs in the **Capital Adequacy Ratio** (CAR).

H_{02}: There is no significant difference among PSBs in the **Asset Quality** (measured by Net NPA Ratio).

H_{03}: There is no significant difference among PSBs in the **Management Efficiency** (measured by indicators like Operating Profit Ratio).

H_{04}: There is no significant difference among PSBs in the **Earnings Capacity** (measured by ROA).

H_{05}: There is no significant difference among PSBs in the **Liquidity Position** (measured by Liquid Assets to Total Assets Ratio).

H_{06}: There is no significant difference among PSBs in the **Sensitivity to Market Risk** (measured by Investment to Total Assets Ratio).

Software Used:

SPSS and Microsoft Excel are used for data analysis and graphical presentations.

7. ANALYSIS AND INTERPRETATION

This comparative research focuses on all PSBs. The analysis spans the years 2020 to 2024, or the last five years. To conclude results, various ratios are employed in the CAMELS analysis to assess financial health of the business.

CAMELS Components	1	2	3	4	5
Capital Adequacy Ratio	Above 11%	8% - 11%	4% - 8%	1% - 4%	Below 1%
Assets Quality Ratio	Below 1.5%	1.5%-3.5%	3.5%-7%	7%-9.5%	Above 9.5%
Management adequacy	≤25%	30% – 26%	38% – 31%	45% – 39%	≥46%
Earnings (ROA)	Above 1.50%	1.25%-1.50%	1.01%-1.25%	0.75%-1.00%	Below 0.75%
Liquidity Ratio	≤0.55	0.62 - 0.56	0.68 – 0.63	0.80 – 0.69	≥0.81
Sensitivity Ratio	≤0.25	0.30 – 0.26	0.37 – 0.31	0.42 – 0.38	≥0.43

Source: Rozzani & Rahman (2013), NCUA letter: 00-CU-08

7.1CAPITAL ADEQUACY

Capital Adequacy Ratio

SR. No.	Banks	2020	2021	2022	2023	2024	CAR	Rating
1	State Bank of India	13	13	13	14	14	13.4	2
2	Bank of Baroda	13	14	15	16	16	14.8	2
3	Punjab National Bank	14	14	14	15	15	14.4	2
4	Canara Bank	13	13	14	16	16	14.4	2
5	Union Bank of India	12	12	14	16	16	14	2
6	Indian Bank	14	15	16	16	16	15.4	1
7	Indian Overseas Bank	10	15	13	16	17	14.2	2
8	Bank of India	13	14	17	16	16	15.2	1
9	Central Bank of India	11	14	13	14	15	13.4	2
10	UCO Bank	11	13	13	16	16	13.8	2
11	Bank of Maharashtra	13	14	16	18	17	15.6	1
12	Punjab and Sindh Bank	12	17	18	17	17	16.2	1

The Capital Adequacy Ratio (CAR) is a critical measure of a bank's financial strength and ability to manage risk. Based on the analysis of CAR data for twelve PSBs from 2020 to 2024, I observed that the banking sector has generally strengthened its capital position over time. Banks such as Indian Bank (15.4%), Bank of India (15.2%), Bank of Maharashtra (15.6%), and Punjab and Sindh Bank (16.2%)

recorded the highest average CARs during the period, indicating superior capital management and strong risk-absorbing capacity. These banks have been rated '1' under the CAMELS model, signifying excellent capital adequacy performance.

Meanwhile, other major banks like SBI(13.4%), PNB (14.4%), Canara Bank (14.4%), and Union Bank of India (14%) have maintained moderate CAR levels and were rated '2'. While these banks meet the regulatory minimum set by the RBI under Basel III norms, their relatively lower CARs suggest they might need to remain cautious regarding future capital requirements, especially under stressed conditions.

A notable improvement is observed in Indian Overseas Bank, which had a CAR of 10% in 2020 but steadily improved to 17% by 2024, demonstrating successful capital restructuring efforts. Overall, the analysis suggests that PSBs have proactively strengthened their capital bases, enhancing their stability and resilience against potential market and credit risks. This positive trend reflects robust capital planning and financial prudence across the sector, as reflected under the 'Capital Adequacy' component of the CAMELS framework.

ANOVA

Capital

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	43.533	11	3.958	1.291	.259
Within Groups	147.200	48	3.067		
Total	190.733	59			

28 Since the p-value is > **0.05**, we **do not reject the null hypothesis**.
Thus, there is **no significant difference** in the CAR across the selected banks.
This suggests that the public sector banks maintain a **broadly similar and stable capital structure**, indicating uniform financial strength under the **Capital Adequacy ('C')** component of the CAMELS framework.

80 ## 7.2 ASSET QUALITY

		Net NPA Ratio						
SR. No.	Banks	2020	2021	2022	2023	2024	Average	Rating
1	State Bank of India	2.18	1.47	1	0.65	0.55	1.17	2
2	Bank of Baroda	3.05	3.01	1.67	0.87	0.66	1.852	2
3	Punjab National Bank	5.7	5.67	4.75	2.69	0.74	3.91	3
4	Canara Bank	4.22	3.82	2.65	1.72	1.26	2.734	3
5	Union Bank of India	5.44	4.59	3.66	1.69	1.02	3.28	3
6	Indian Bank	3.12	3.37	2.27	0.89	0.43	2.016	3
7	Indian Overseas Bank	5.44	3.58	2.65	1.83	0.57	2.814	3
8	Bank of India	3.86	3.33	2.32	1.64	1.2	2.47	3
9	Central Bank of India	7.59	5.74	3.94	1.76	1.22	4.05	3
10	UCO Bank	5.44	3.94	2.69	1.29	0.89	2.85	3
11	Bank of Maharashtra	4.77	2.48	0.97	0.25	0	1.694	2
12	Punjab and Sindh Bank	8.01	4.03	2.73	1.83	1.63	3.646	3

The Net NPA (Non-Performing Asset) ratio serves as an important measure of the asset quality in banks. A lower Net NPA ratio reflects superior credit risk management and healthier asset portfolios. Based on the 5-year average data (2020–2024), I observed that the **SBI (1.17%), Bank of Maharashtra (1.694%)**, and **BOB (1.852%)** demonstrated the best asset quality with minimal non-performing assets. Conversely, **PNB (3.91%), Punjab and Sindh Bank (3.646%)**, and **Central Bank of India (4.05%)** exhibited comparatively higher Net NPA ratios, indicating greater asset quality concerns.

Overall, the analysis reveals that PSBs such as SBI and Bank of Maharashtra have consistently maintained strong asset portfolios, while certain banks like PNB require strategic improvements in loan recovery and credit assessment processes. In the context of the CAMELS framework, better asset quality enhances the financial stability of banks and reduces the probability of distress.

ANOVA

Asset

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	45.734	11	4.158	1.267	.272
Within Groups	157.501	48	3.281		
Total	203.235	59			

The results show that the significance value (p-value) is **0.272** > 0.05. Therefore, the null hypothesis stating that "there is no significant difference between the public sector banks with respect to asset quality" is **accepted**. This implies that there is **no**

statistically significant difference in the asset quality (measured through Net NPA Ratios) among the selected PSBs during the study period. Hence, it can be inferred that the public sector banks are maintaining relatively similar asset quality standards.

7.3Management Quality

		Operating Profit Ratio						
SR. No.	Banks	2020	2021	2022	2023	2024	Average	Rating
1	State Bank of India	1.78	1.62	1.42	1.57	1.47	1.572	3
2	Bank of Baroda	1.7	1.88	1.8	1.97	2.27	1.924	3
3	Punjab National Bank	1.78	1.84	1.56	1.53	1.56	1.654	3
4	Canara Bank	1.3	1.71	1.85	2.02	1.93	1.762	3
5	Union Bank of India	1.66	1.78	1.83	1.98	2.01	1.852	3
6	Indian Bank	2.09	1.82	1.89	2.14	2.12	2.012	2
7	Indian Overseas Bank	1.35	2.15	1.92	1.89	1.92	1.846	3
8	Bank of India	1.74	1.49	1.35	1.61	1.54	1.546	3
9	Central Bank of India	1.21	1.25	1.35	1.7	1.65	1.432	4
10	UCO Bank	2.04	2.13	1.79	1.44	1.41	1.762	3
11	Bank of Maharashtra	1.68	2.01	2.1	2.27	2.6	2.132	2
12	Punjab and Sindh Bank	1.09	0.69	1.09	1.06	0.76	0.938	5

The Operating Profit Ratio, a key indicator of a bank's earning capacity under the CAMELS model, was evaluated for 12 public sector banks over a 5-year period (2020–2024). I observed that the **Bank of Maharashtra** achieved the highest average operating profit ratio at **2.132%**, followed by **Indian Bank** at **2.012%**, indicating strong earning capacity and operational efficiency.

On the other hand, **Punjab and Sindh Bank** recorded the lowest average at **0.938%**, suggesting relatively weaker profitability among the selected banks.

Most banks, including **SBI, PNB** and **Canara Bank**, maintained moderate operating profit ratios ranging between **1.5% to 1.8%**.

Overall, the operating performance across banks shows moderate variation, with a few banks standing out due to stronger operational earnings.

ANOVA

Management

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	5.404	11	.491	9.295	.000
Within Groups	2.537	48	.053		
Total	7.941	59			

Since the p-value is <0.05 ($p < 0.05$), **the null hypothesis is rejected**, indicating that **there is a significant difference in management quality among the public sector banks**. This suggests that not all banks have the same level of management efficiency and governance performance during the study period (2020–2024).

7.4EARNING CAPACITY

		Return on Assets						
SR. No.	Banks	2020	2021	2022	2023	2024	Average	Rating
1	State Bank of India	0.47	0.46	0.65	0.93	0.99	0.7	3
2	Bank of Baroda	0.07	0.12	0.58	0.97	1.13	0.574	3
3	Punjab National Bank	0.05	0.2	0.28	0.22	0.56	0.262	4
4	Canara Bank	-0.26	0.24	0.48	0.81	0.99	0.452	4
5	Union Bank of India	-0.56	0.26	0.44	0.66	0.98	0.356	4
6	Indian Bank	0.27	0.5	0.61	0.78	1.05	0.642	3
7	Indian Overseas Bank	-3.27	0.27	0.57	0.66	0.75	-0.204	5
8	Bank of India	-0.46	0.28	0.46	0.46	0.71	0.29	4
9	Central Bank of India	-0.35	-0.27	0.27	0.41	0.59	0.13	5
10	UCO Bank	-1.03	0.05	0.33	0.6	0.51	0.092	5
11	Bank of Maharashtra	0.23	0.29	0.49	0.97	1.32	0.66	3
12	Punjab and Sindh Bank	-0.98	-2.47	0.85	0.96	0.4	-0.248	5

The Return on Assets (ROA) is a vital measure of a bank's earnings efficiency and overall profitability. The ROA data for twelve public sector banks from 2020 to 2024 indicates notable variation in performance. I observed that banks such as the **Bank of Maharashtra (0.66%), Indian Bank (0.642%),** and **SBI (0.7%)** emerged as consistent top performers, reflecting strong earning capacity and efficient asset utilization. On the other hand, banks like **Punjab and Sindh Bank (-0.248%), Indian Overseas Bank (-0.204%),** and **Central Bank of India (0.13%)** displayed poor performance, with ROAs close to or below zero, indicating weak profitability. The remaining banks demonstrated moderate ROAs, showing gradual improvements over the 5-year period. These variations highlight differences in operational efficiency, asset quality, and profitability strategies across public sector banks.

ANOVA

Earning

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	5.675	11	.516	.868	.576
Within Groups	28.536	48	.595		
Total	34.211	59			

The ANOVA results revealed an F-value of 0.868 with a significance level (p-value) of 0.576 > the standard alpha level of 0.05. This indicates that there is **no statistically significant difference** in earnings capacity among the PSBs during the study period. Therefore, the null hypothesis (H04), which states that there is no significant difference between public sector banks with respect to earnings capacity, **is accepted**. This implies that despite some observable performance variation, the overall profitability measured by ROA does not differ significantly across the banks in a statistical sense.

7.5LIQUIDITY

		Liquid Assets to Total Assets						
SR. No.	Banks	2020	2021	2022	2023	2024	Average	Rating
1	State Bank of India	35.87	40.24	40.14	38.25	37.24	38.348	1
2	Bank of Baroda	32.24	31.29	32.8	31.12	29.12	31.314	2
3	Punjab National Bank	36.47	38.82	36.71	35.51	34.12	36.326	1
4	Canara Bank	33.27	34.55	33.93	32.31	32.25	33.262	2
5	Union Bank of India	34.86	37.91	36.65	33.33	30.76	34.702	2
6	Indian Bank	30.52	34.43	33.45	30.94	30.45	31.958	2
7	Indian Overseas Bank	41.36	43.58	41.76	35.94	33.24	39.176	1
8	Bank of India	33.6	37.37	33.01	32.6	31.47	33.61	2
9	Central Bank of India	48.07	48.1	45.71	41.14	38.19	44.242	1
10	UCO Bank	47.24	41.65	41.03	36.37	35.62	40.382	1
11	Bank of Maharashtra	40.93	40.9	35.99	30.52	28.2	35.308	1
12	Punjab and Sindh Bank	32.53	36.19	40.53	37.72	38.18	37.03	1

To assess the liquidity position of PSBs, the Liquid Assets to Total Assets ratio was evaluated over a five-year period. My findings indicate that **Central Bank of India** and **UCO Bank** consistently maintained the highest liquidity, with average ratios of 44.242 and 40.382 respectively. These banks demonstrate strong capacity to meet short-term obligations, reflecting sound liquidity management. On the other hand,

Bank of Maharashtra and **BOB** reported low average liquidity levels, at **35.308** and **31.314** respectively, which may suggest a relatively tighter liquidity position. Most banks fell within a moderate range, reflecting a balanced approach to asset allocation. Based on the assigned ratings, the majority of banks scored well, suggesting that **PSBs, overall, are maintaining adequate liquidity buffers** to support operational resilience and financial stability.

ANOVA

Liquidity

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	782.267	11	71.115	6.596	.000
Within Groups	517.507	48	10.781		
Total	1299.774	59			

The results revealed a significant F-value of **6.596** with a significance level (p-value) of **0.000** < 0.05. This indicates that there is a **statistically significant difference in liquidity performance among the banks** over the five-year period. This indicating that variations in liquidity are significantly associated with the specific public sector bank. This suggests that **liquidity performance is not uniform across the PSBs** and may be influenced by institutional or operational factors specific to each bank.

7.6SENSITIVITY TO MARKET RISK

		Total Investment to Total Assets						
SR. No.	Banks	2020	2021	2022	2023	2024	Average	Rating
1	State Bank of India	29.26	32.91	33.13	32.12	31.34	31.752	3
2	Bank of Baroda	24.14	23.43	25.93	26.04	24.6	24.828	2
3	Punjab National Bank	29.8	31.59	29.01	27.91	27.92	29.246	3
4	Canara Bank	25.98	24.26	24.75	25.55	26.01	25.31	3
5	Union Bank of India	27.76	31.32	29.47	26.69	24.53	27.954	3
6	Indian Bank	26.39	28.38	26.18	26.4	27.05	26.88	3
7	Indian Overseas Bank	30.45	34.81	32.79	29.87	28.19	31.222	3
8	Bank of India	24.48	26.15	24.25	25.58	25.38	25.168	3
9	Central Bank of India	39.88	40.14	36.33	33.54	32.16	36.41	4
10	UCO Bank	38.57	36.99	36.14	31.59	28.66	34.39	3
11	Bank of Maharashtra	34.25	34.68	29.79	25.77	22.27	29.352	3
12	Punjab and Sindh Bank	33.59	32.85	34.92	28.98	24.42	30.952	3

The table presents the total investment to total assets ratio for 12 PSBs over the five-year period from 2020 to 2024. The average ratio across this period varies significantly among the banks, indicating differing investment strategies and asset compositions. I observed that **Central Bank of India** reported the highest average ratio at **36.41%**, receiving a top rating of **4**, suggesting a strong investment position relative to its total assets. **BOB** had the lowest average ratio at **24.828%**, with a rating of **2**, indicating a more conservative investment stance. Most banks, including **SBI**, **PNB**, **Union Bank of India**, and **Indian Overseas Bank**, maintained average ratios in the 29%–32% range and received a rating of **3**, reflecting moderate performance. The data shows that **UCO Bank** and **Indian Overseas Bank** consistently maintained high ratios, while **Bank of Maharashtra** displayed a declining trend, particularly in 2024. The majority of banks demonstrated moderate performance, with stable investment ratios in the mid-range. These variations reflect strategic diversity within the PSB segment, underscoring the need for tailored financial planning and policy-making. Continuous monitoring of these ratios is essential to ensure balanced liquidity, optimized asset utilization, and long-term financial stability across the sector.

ANOVA

Sensitivity

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	746.361	11	67.851	8.244	.000
Within Groups	395.047	48	8.230		
Total	1141.408	59			

The **F-value of 8.244** and a **significance level of 0.000** ($p < 0.05$) indicate that the differences in Sensitivity ratios between banks are not due to random chance. The **sum of squares between groups (746.361)** is notably higher than the **within groups (395.047)**, further supporting the presence of meaningful disparities. This suggests that few banks are more sensitive to market risks or external shocks compared to others, emphasizing the importance of bank-specific strategies in managing financial sensitivity.

			CAMELS Model					
SR. No.	Banks	CAR	Asset	Managenent	Earning	Liquidity	Sensitivity	Weightage Average Rating
1	State Bank of India	2	2	3	3	1	3	2.4
2	Bank of Baroda	2	2	3	3	2	2	2.4
3	Punjab National Bank	2	3	3	4	1	3	2.8
4	Canara Bank	2	3	3	4	2	3	2.9
5	Union Bank of India	2	3	3	4	2	3	2.9
6	Indian Bank	1	3	2	3	2	3	2.3
7	Indian Overseas Bank	2	3	3	5	1	3	3
8	Bank of India	1	3	3	4	2	3	2.7
9	Central Bank of India	2	3	4	5	1	4	3.3
10	UCO Bank	2	3	3	5	1	3	3
11	Bank of Maharashtra	1	2	2	3	1	3	2
12	Punjab and Sindh Bank	1	3	5	5	1	3	3.2

The CAMELS model was applied to assess the financial soundness of 12 PSBs across six key parameters. The **weighted average ratings** derived from these components indicate varying levels of overall performance.

I observed that top performers with the **lowest average ratings (2.4)**—indicating better financial health—were **SBI** and **BOB**. They demonstrated consistent strength across most parameters, especially in liquidity and asset quality. On the other hand, **Central Bank of India (3.3), UCO Bank (3.3), and Punjab and Sindh Bank (3.2)** reflected weaker performance due to relatively poor ratings in earnings, management, and capital adequacy.

I have found that the results suggest that while several banks are managing their resources efficiently and showing financial resilience, a few require attention in specific areas like capital adequacy and earnings stability. This model serves as a comprehensive tool to compare and rank banks' overall health and risk exposure within the public sector landscape.

8. FINDINGS

1. Capital Adequacy (CAR)

Most public sector banks in the study, such as **SBI** and **BOB** , maintain a moderate to strong capital base, reflecting prudent capital management and adherence to regulatory norms. However, **Punjab and Sindh Bank** recorded a low CAR, signaling a potential vulnerability in absorbing unexpected financial shocks. This suggests a need for increased capital infusion or better risk-weighted asset management in certain banks to meet Basel III norms and maintain stakeholder confidence.

2. Asset Quality (Measured by Return on Assets - ROA)

The analysis revealed that **Indian Bank, SBI and Bank of Maharashtra** have shown consistent ROA performance over the years, highlighting efficient use of assets and relatively low levels of stressed assets. On the other hand, **Indian Overseas Bank** and **Punjab and Sindh Bank** reported poor ROA values, which may indicate high non-performing assets (NPAs), low profitability, and operational inefficiencies. These banks may need to strengthen credit appraisal mechanisms and asset recovery processes.

3. Management Efficiency

The ANOVA test for the management component yielded **F = 9.295, Sig. = 0.000**, indicating a **difference** in management performance across the banks. Banks like **Bank of Baroda** and **Canara Bank** performed better under this parameter, reflecting efficient operational control, better human resource policies, and strong internal governance. Conversely, **Central Bank of India** and **Indian Overseas Bank** lagged behind, suggesting gaps in management effectiveness, decision-making efficiency, or resource optimization. These banks may benefit from reforms in governance practices and leadership training.

4. Earnings Capacity

The earnings component, evaluated through ANOVA, showed **F = 0.868, Sig. = 0.576**, suggesting **no difference** in earnings performance across the banks. This result implies that most PSBs demonstrate a broadly similar earning capacity, possibly due to similar business models, interest income dependency, and regulatory

influences. Although some differences exist in profitability, the overall earnings structure remains consistent across the sample, possibly due to government support and similar interest rate environments.

5. Liquidity

Liquidity analysis using ANOVA yielded **F = 6.596, Sig. = 0.000**, indicating a **difference in liquidity management** across PSBs. **Central Bank of India, UCO Bank,** and **Bank of Maharashtra** maintained **higher liquidity ratios**, indicating a conservative and stable approach to liquidity management. In contrast, **Bank of Baroda** and **Indian Bank** reported lower liquidity ratios, possibly suggesting more aggressive lending or investment strategies, which could expose them to short-term funding risks if not managed prudently.

6. Sensitivity to Market Risk

Market sensitivity results showed **F = 8.244, Sig. = 0.000**, confirming a **variation** among banks in managing exposure to interest rate and other market-related risks. This reflects differences in each bank's asset-liability structure, hedging practices, and sensitivity to macroeconomic variables. Banks with weaker risk management frameworks may be more vulnerable to market fluctuations, thus requiring enhanced monitoring and risk mitigation policies.

7. Investment to Total Assets Ratio

This ratio measures the proportion of total assets allocated to investments. **Central Bank of India, UCO Bank**, and **Punjab and Sindh Bank** exhibited higher investment-to-assets ratios, which may imply a preference for relatively safer, fixed-income investments rather than lending. While this can indicate prudence, it may also suggest underutilization of lending potential. Conversely, **BOB** and **BOI** maintained lower ratios, possibly reflecting a more aggressive lending approach or a higher focus on interest income.

8. Overall CAMELS Rating

The weighted average scores across CAMELS components were used to rank the banks:

- **Top Performers**:
    - **SBI** and **BoB** achieved a weighted average score of **2.4**, indicating strong overall performance, efficient management, and sound financial health.
    - These banks demonstrated robust capital, good asset quality, and relatively stable earnings and liquidity profiles.
- **Underperformers**:
    - **Central Bank of India** (score: **3.3**) and **Punjab and Sindh Bank** (score: **3.2**) showed relatively weaker performance, especially in asset quality, management efficiency, and capital adequacy.
    - These banks require strategic improvements in risk management, capital planning, and operational effectiveness to improve long-term sustainability.

9. RECOMMENDATIONS

1. Improve Capital Adequacy

For banks with low Capital Adequacy Ratios (CAR), such as **Punjab and Sindh Bank**, it is crucial to enhance their capital buffers to ensure compliance with regulatory norms (like Basel III) and maintain financial stability. This can be achieved through:

- **Recapitalization**: Seeking government or market-based capital infusion.
- **Retained Earnings**: Increasing profitability and retaining earnings rather than distributing them as dividends.
- **Issuance of Tier I and Tier II capital instruments**: Such as bonds or hybrid capital.
  This would not only protect the bank against unforeseen losses but also enhance investor confidence.

2. Focus on Asset Quality

Banks exhibiting **low ROA** and a high **NPAs** should prioritize improving their credit risk management systems. Recommendations include:

- **Strengthening credit appraisal mechanisms** to ensure sound lending decisions.
- **Regular monitoring and early warning systems** to detect stressed accounts in advance.
- **Expedited recovery procedures** and restructuring of viable assets to minimize losses.
- **Technological intervention** (e.g., AI and data analytics) for risk profiling.
  Improved asset quality directly contributes to better profitability and operational efficiency.

3. Enhance Management Practices

The study found significant differences in management efficiency across banks. To standardize and uplift governance quality, banks must:

- **Invest in managerial training and development programs**, especially for mid and senior-level staff.
- **Implement performance-based incentives and accountability frameworks** to promote a results-driven culture.
- **Adopt digital tools and dashboards** for real-time tracking of operational efficiency.
- **Benchmark best practices** from top-performing banks (e.g., SBI or Bank of Baroda) to elevate underperforming institutions.
  Efficient management translates into better policy implementation, risk handling, and resource utilization.

4. Strengthen Earnings

To improve earnings capacity, especially where no significant difference was found among banks, efforts should focus on diversifying and strengthening income streams:

- **Diversification beyond traditional lending** to include fee-based services like insurance distribution, wealth management, and treasury operations.
- **Expansion of digital banking platforms**, which can enhance cost-efficiency and customer acquisition.
- **Entering into strategic partnerships** with fintech companies providing innovative financial solutions.
- **Cost rationalization strategies**, including digitization of operations and staff optimization.

5. Optimize Liquidity

Significant differences in liquidity across banks call for tailored strategies:

- **Banks with excess liquidity** (e.g., UCO Bank or Bank of Maharashtra) should consider deploying idle funds into productive avenues like short-term credit, high-rated bonds, or money market instruments to maximize returns.
- **Banks with lower liquidity ratios** need to focus on **improving cash flow forecasting and contingency planning**, ensuring adequate buffers for sudden fund outflows.

- **Strengthening Asset-Liability Committees (ALCOs)** to dynamically manage maturity mismatches and funding gaps.
  Effective liquidity management is vital for maintaining solvency and meeting day-to-day obligations.

6. Manage Sensitivity to Market Risk

With notable variability in market risk sensitivity, banks need robust mechanisms to manage interest rate and forex exposures:

- **Adoption of advanced risk modeling tools and analytics** to quantify exposure and scenario analysis.
- **Conducting periodic stress testing** as mandated by RBI to assess resilience under volatile conditions.
- **Development of hedging strategies** using derivatives and interest rate swaps to minimize risk.
- **Regular training for treasury teams** to stay updated with global risk trends.
  This will ensure that banks remain stable in a fluctuating macroeconomic environment.

10. LIMITATIONS OF THE STUDY

1. The CAMELS framework addresses key financial metrics but excludes qualitative aspects like customer satisfaction, employee effectiveness, internal culture of governance, or innovation capacity, which also influence a bank's long-term performance significantly.
2. The research is based only on published financial data (e.g., annual reports, regulatory filings, or Moneycontrol data). Therefore, any discrepancy, delay, or inaccuracies in the source data can influence the results.
3. The study takes place at a point in time and does not consider changes over a period of several years. Because of this, the analysis may fail to show repeating trends or long-term changes in the banks' performance.
4. Only PSBs have been covered under the study. Private sector or foreign banks have not been covered so as to restrict making generalizations about the overall Indian banking industry.
5. CAMELS components were assigned weights according to preconceived or subjective assumptions. Such weights might not be indicative of actual risk priorities or regulatory focus for each component.
6. The study uses proxies like Net Interest Margin or Investment to Total Assets for market sensitivity but these will not necessarily capture more nuanced market risks like interest rate shocks, foreign exchange exposure, or equity market volatility.
7. Rapidly changing regulations, such as those related to asset classification norms, provisioning requirements, or capital buffers (Basel norms), are not factored dynamically into the analysis.
8. Broader economic factors such as inflation, GDP growth, monetary policy changes, and geopolitical risks—which can significantly impact a bank’s financial health—are not directly incorporated into the CAMELS scoring.

11. CONCLUSION

The application of the **CAMELS rating framework** combined with **ANOVA statistical analysis** provides a comprehensive and multidimensional assessment of the performance of public sector banks in India. The findings clearly illustrate that performance across banks is not uniform and that significant disparities exist in critical areas.

Leading institutions like the **SBI** and **BOB** demonstrated consistently strong performance across most CAMELS parameters, reflecting sound capital structures, effective management practices, and stable operational efficiency. These banks serve as benchmarks in the public sector banking landscape, embodying financial resilience and strategic foresight.

Punjab and Sindh Bank and **Central Bank of India** revealed notable deficiencies in multiple areas—particularly in **capital adequacy, return on assets, and sensitivity to market risks**—highlighting their vulnerability and need for urgent corrective measures. The **low CAR and weak ROA** figures point toward higher risk exposure and suboptimal asset utilization, which could undermine their long-term sustainability if left unaddressed.

The ANOVA results further confirmed **significant variation in performance** among the banks in terms of **Management Quality, Liquidity, and Market Risk Sensitivity**, reinforcing the need for **bank-specific and targeted policy interventions**. However, the absence of statistically significant variation in **Earnings Capacity** across the banks suggests that macroeconomic conditions, regulatory changes, or sector-wide pressures—rather than bank-specific inefficiencies—may be responsible for the uniformity in profitability levels.

Overall, the CAMELS model has proven to be a robust evaluative tool, enabling stakeholders to gain a **granular understanding** of both strengths and vulnerabilities within the banking sector. It empowers regulators, policymakers, and bank management teams to:

- Benchmark performance,
- Design evidence-based policy interventions,
- Strengthen risk management systems, and

- Improve operational and financial soundness.

This study adds to the broader goal of establishing a healthier, stronger, and more competitive Indian banking sector by identifying areas of improvement in underperforming banks and reinforcing the approaches utilized by high-performing institutions.

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1. ANNEXURE

Annexure I: List of Banks Covered Under Study

State Bank of India

Bank of Baroda

Punjab National Bank

Canara Bank

Union Bank of India

Bank of India

Indian Bank

Central Bank of India

UCO Bank

Bank of Maharashtra

Indian Overseas Bank

Punjab & Sind Bank

Annexure II: CAMELS Indicators Used

Component	Indicator	Formula/Source
Capital	Capital Adequacy Ratio (CAR)	(Tier I + Tier II Capital) / Risk Weighted Assets
Asset Quality	Net NPA Ratio	(Gross NPA - Provisions) / Net Advances
Management	Cost to Income Ratio	Operating Expenses / Operating Income
Earnings	Return on Assets (ROA)	Net Profit / Average Total Assets

Liquidity	Liquid Assets to Total Assets	Liquid Assets / Total Assets
Sensitivity	Investment to Total Assets Ratio	Investments / Total Assets

Annexure III: CAMELS Scoring Template

SCORE	CAR (%)	Net NPA (%)	ROA (%)	C/I Ratio (%)	Liquidity /TA Ratio	Investment/TA (%)
1	>15%	<1%	>1.2%	<45%	>35%	<15%
2	12–15%	1–2%	0.8–1.2%	45–50%	30% – 35%	15–20%
3	10–12%	2–5%	0.5–0.8%	50–60%	25% – 30%	20–25%
4	8–10%	5–10%	0.2–0.5%	60–70%	20% – 25%	25–30%
5	<8%	>10%	<0.2%	>70%	< 20%	>30%

Annexure IV: ANOVA SUMMARY TABLES

CAMELS Component	F-Value	Sig. Value	Interpretation
Capital Adequacy	1.291	0.256	No significant difference
Asset Quality	1.267	0.272	No significant difference
Management Efficiency	9.295	0.000	Highly significant variation in management
Earnings	0.868	0.576	No significant difference
Liquidity	6.596	0.000	Significant difference in liquidity management

CAMELS Component	F-Value	Sig. Value	Interpretation
Sensitivity	8.244	0.000	High variability in market sensitivity

Annexure V: Weighted Average CAMELS

CAMEL FRAMEWORK	WEIGHTAGE
Capital Adequacy	**20%**
Asset Quality	**20%**
Management Quality	**20%**
Earnings	**20%**
Liquidity	**10%**
Sensitivity to Market Risk	**10%**