

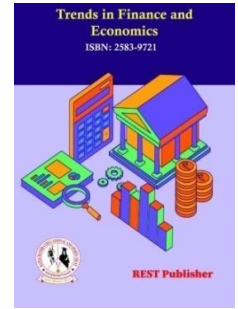


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# Comprehensive Analysis of Indian Public Sector Banks Financial Performance Using the TOPSIS Method

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**Abstract:** The government has recently undertaken the consolidation of multiple public sector banks. The primary motivation for conducting this research is to investigate this consolidation effort. The objective of this article is to identify the factors influencing the performance of public sector banks in India and explore the relationships between these factors and the performance of government-operated banks. Within this article, we will analyze financial data from all public sector commercial banks spanning an 11-year period, from 2009 to 2019. Both the system generalized method of moments (GMM) analysis and canonical correlation analysis (CCA) have been employed to assess the impact of determinants on the evaluation of public sector bank performance. The assessment of performance is carried out using the CAMEL framework, which encompasses Capital Adequacy, Assets Quality, Management Efficiency, Earnings, and Liquidity. It's worth noting that the government has recently undergone the consolidation of several public sector banks, which serves as the impetus for this study. The primary aim of this article is to ascertain the variables that shape the performance of Indian public sector banks and their interconnections. Within this research, we will scrutinize financial data from all public sector commercial banks over an 11-year span, spanning from 2009 to 2019. Both the utilization of the system generalized method of moments (GMM) analysis and canonical correlation analysis (CCA) have been deployed to examine how various determinants influence the evaluation of public sector bank performance. The assessment of performance has been conducted through the utilization of the CAMEL framework, an acronym representing Capital Adequacy, Assets Quality, Management Efficiency, Earnings, and Liquidity. This framework is widely employed for appraising the financial soundness of the Indian banking system. The financial well-being of public sector banks (PSBs) holds paramount importance for several reasons. Primarily, PSBs play a pivotal role in delivering financial services to the general populace, especially in rural and semi-urban regions where private banks may not have a significant presence. Consequently, the accessibility of financial services to a broad segment of the population directly influences their financial stability.

**Keywords:** Public sector, Financial services, capital market, RB

## 1. INTRODUCTION

Numerous studies, including those by Gupta in 2014, Jain and Gupta in 2004, and Koundal in 2012, have collectively underscored the vital importance of a well-functioning financial system for any economy. Furthermore, in their work, Bansal and Mohanty in 2013 illuminate the diverse viewpoints held by economists regarding the role of banking systems in either fostering or facilitating economic development. Compared to various other non-economic institutions, banks exhibit a more immediate and positive correlation with the overall economic health of a nation. Globally, banks are regarded as the linchpin of an economy, serving as the gateway into a country's financial system. They also serve as a barometer of a nation's economic prospects. The expansion of the commercial banking sector's reach in India, as highlighted by Koundal in 2012, was notably catalyzed by the nationalization of banks. Subsequently, the implementation of banking sector reforms during the period spanning from 1922 to 1993 further augmented the scope of commercial banking in India. Commercial banks serve as the primary catalysts for financial resource mobilization and distribution within the Indian financial system. Their role is pivotal in the developmental journey of a nation like India. Following the nationalization of 14 major commercial banks in July 1969, followed by an additional six banks in April 1980, there has been an increasingly recognized significance of banks in propelling economic development in India. The concept of banking underwent a substantial transformation post-nationalization. Another significant stride in modernizing the antiquated banking system was the process of globalization. Up until the early 1990s, the regulatory framework governing commercial banks in India, under the purview of the Reserve Bank of India (RBI), predominantly centered on aspects such as licensing, minimum capital prerequisites, service pricing,

credit management, deposit interest rates, reserve obligations, and the maintenance of liquid assets. In 1995, the Supervision Working Group proposed the implementation of orientation supervision to address deviations in banking practices effectively. This approach aimed to focus frequent and comprehensive statutory examinations on key evaluation areas. The global adoption of CAMEL in 2012, an acronym representing Capital Adequacy, Assets Quality, Management Efficiency, Earnings, and Liquidity, stemmed from the recognition that the financial sector plays a pivotal role in driving economic growth. It facilitates the flow of capital, provides a skilled workforce, and fosters industrialization, making it a critical component of overall economic development. The financial system, when managed with prudence and by optimizing resource utilization (as noted by Raza in 2011), treats investors favorably. In this context, the banking sector in every economy holds paramount importance, as the financial sector plays a crucial role in providing financing for industry and promoting the expansion of both financial and economic systems. India's public sector banks (PSBs) exhibit a noteworthy ability to manage major economic and financial crises when compared to their domestic and international private sector counterparts. The impetus for privatizing PSBs has often been rooted in comparisons drawn during the early stages of India's financial sector reforms, primarily focusing on financial performance indicators. However, these comparisons have often lacked a longer-term perspective. In this study, we aim to conduct a comprehensive comparison between PSBs and private sector banks, employing an efficiency metric that considers both actual output and input quantities. The primary question we seek to answer is whether the performance of India's PSBs has improved since the commencement of financial liberalization in 1992–1993. This inquiry holds significant importance for several reasons. First and foremost, it is essential to evaluate whether the primary objective of financial deregulation, which is to enhance efficiency, has been successfully achieved. This assessment is critical because, in some cases, increased effectiveness goes hand in hand with this goal. One of the most pivotal and strategic decisions in optimizing logistical systems often revolves around the selection of warehouse locations. This decision is of long-term significance, and it involves a combination of both quantitative and qualitative factors. However, certain factors tend to take precedence in this selection process. Factors such as costs, labor quality, infrastructure, and market conditions are among the key considerations explored in this study. Traditional methods for addressing the warehouse location selection problem often struggle with the imprecise or ambiguous nature of qualitative assessments. Qualitative criteria values frequently exhibit inconsistencies across various instances and may be vaguely defined for decision-makers. In response, this study introduces a multi-criteria decision-making approach to warehouse location selection under conditions characterized by uncertainty or fuzziness.

## 2. MATERIALS & METHODS

To conduct a comprehensive analysis of the financial performance of Public Sector Banks (PSBs) in India, a range of financial and non-financial variables can be taken into account. Financial indicators, including but not limited to net interest margin, return on equity, return on assets, asset quality, capital adequacy, and efficiency ratios, offer valuable insights into their performance. These metrics provide information regarding the profitability, asset quality, capitalization, and operational efficiency of PSBs. In addition to financial metrics, non-financial variables can also be essential in assessing PSBs' overall performance. These may encompass factors such as customer satisfaction, market share, employee productivity, and innovation. These non-financial metrics offer valuable perspectives on the ability of PSBs to meet customer demands, maintain competitiveness, manage labor costs, and adapt to evolving market dynamics.

There are several valuable techniques available to analyze the financial performance of public sector banks (PSBs) in India. These methods offer crucial insights into the financial health and competitiveness of these institutions. One fundamental approach is Ratio Analysis, which involves the calculation and evaluation of diverse financial ratios, encompassing liquidity ratios (such as the current ratio), profitability ratios (like return on assets), and solvency ratios (including the debt-to-equity ratio). These ratios offer a comprehensive assessment of the PSBs' financial stability, profitability, and capacity to fulfill their financial commitments. Another insightful technique is Trend Analysis, which delves into the PSBs' financial performance over an extended period, typically spanning multiple years. This examination helps identify consistent trends, be they upward or downward, in financial metrics. For instance, a sustained increase in profitability over recent years signifies positive financial growth, whereas a declining trend might indicate underlying financial challenges. Lastly, Comparative Analysis offers valuable context by comparing the financial performance of PSBs against that of their competitors or industry benchmarks. This method helps pinpoint relative strengths and weaknesses. For example, if a PSB's return on assets significantly lags behind the industry average, it highlights an area requiring improvement. Comparative analysis plays a pivotal role in understanding how PSBs measure up against their peers. These techniques rely on the collection of financial data and information from various sources, including annual reports and financial statements. They are instrumental tools for stakeholders, investors, and policymakers seeking to evaluate the financial robustness and competitive standing of public sector banks in India.

When evaluating the financial performance of public sector banks (PSBs), a comprehensive array of financial measures and indicators plays a pivotal role. Among these, key ratios and indicators serve as critical benchmarks. The Asset Quality Ratio, which assesses the proportion of non-performing assets (NPAs) relative to total loans, offers insights into the quality of a bank's assets and the associated credit risk. Meanwhile, the Capital Adequacy Ratio, derived from capital divided by risk-weighted assets, gauges a bank's resilience to absorb potential losses, signaling its capacity to withstand financial adversity. Liquidity Ratio, determined by dividing liquid assets by short-term liabilities, signifies a bank's ability to meet immediate financial obligations, enhancing its financial stability. The Efficiency Ratio, calculated by comparing net interest income to total assets, measures how effectively a bank generates income from its asset base, indicative of operational efficiency. These critical metrics enable stakeholders, investors, and policymakers to make well-informed assessments regarding the financial strength and competitive positioning of public sector banks in India.

**TOPSIS Method:** The TOPSIS (Technique for Order of Preference by Similarity to Ideal Solution) method is a valuable tool in multi-criteria decision-making (MCDM) that aids in the evaluation and ranking of alternative options based on various criteria. This systematic approach empowers decision-makers to select the most appropriate choice from a set of alternatives by taking into account multiple attributes or criteria relevant to the decision. The process begins with identifying and defining these criteria, ensuring they are quantifiable and directly pertinent to the problem under consideration. To make fair comparisons, normalization of criteria often follows, transforming raw data into a standardized scale typically ranging from 0 to 1. Assigning weights to criteria is a crucial step, allowing decision-makers to express the relative importance of each criterion. This weighting reflects the significance of specific criteria in the final decision. The next stage involves determining the ideal and anti-ideal solutions for each criterion. The ideal solution represents the optimal performance for each criterion, typically achieved by maximizing it, while the anti-ideal solution represents the poorest performance, usually achieved by minimizing the criterion. With these foundations in place, the TOPSIS method calculates similarity scores for each alternative, measuring their proximity to both the ideal and anti-ideal solutions. Common distance measures like Euclidean or Minkowski distances are often used for this purpose. Finally, based on their similarity scores, the alternatives are ranked. Those that closely align with the ideal solution and distance themselves from the anti-ideal solution receive higher rankings, indicating their suitability. The TOPSIS method finds application across diverse fields, including decision analysis, engineering, finance, and environmental management. Its strength lies in its ability to facilitate informed decision-making by considering multiple criteria simultaneously and offering a structured approach to prioritizing alternatives based on their overall performance relative to the ideal solution.

### 3. RESULT AND DISCUSSION

**Table 1.** The financial performance of public sector banks in India is assessed.

Banks	Net profit margin %	Return on net worth %	Interest income to total assets %	Interest expenses to total assets %
SBI	7.66	0.59	9.61	7.88
BOB	12.18	0.73	13.21	5.98
PNB	7.86	0.62	9.39	7.82
BOI	7.16	0.51	9.7	6.59
CANARA	6.54	0.52	10.65	7.89

Table 1 The financial performance metrics of several prominent banks in India reveal important insights into their operations. State Bank of India (SBI) demonstrates a net profit margin of 7.66%, indicating a reasonable level of profitability, while its return on net worth stands at 0.59%. SBI also exhibits a healthy interest income to total assets ratio of 9.61% but faces interest expenses amounting to 7.88% of its total assets. Bank of Baroda (BOB) surpasses in terms of profitability with a net profit margin of 12.18% and boasts a return on net worth of 0.73%. Furthermore, BOB shows strength in generating interest income at 13.21% of total assets, while keeping interest expenses relatively low at 5.98%. Punjab National Bank (PNB) reports a net profit margin of 7.86% and a return on net worth of 0.62%. PNB's interest income to total assets ratio stands at 9.39%, with interest expenses amounting to 7.82% of total assets. Bank of India (BOI) maintains a net profit margin of 7.16% and a return on net worth of 0.51%, reflecting reasonable financial performance. BOI generates interest income at 9.7% of total assets and incurs interest expenses at 6.59% of total assets. Canara Bank (CANARA) exhibits a net profit margin of 6.54% and a return on net worth of 0.52%. CANARA generates interest income at 10.65% of total assets and experiences interest expenses at 7.89% of total assets. These financial metrics offer a snapshot of

the banks' profitability, efficiency, and interest-related performance, providing valuable insights for stakeholders and analysts in assessing their financial health and competitiveness.

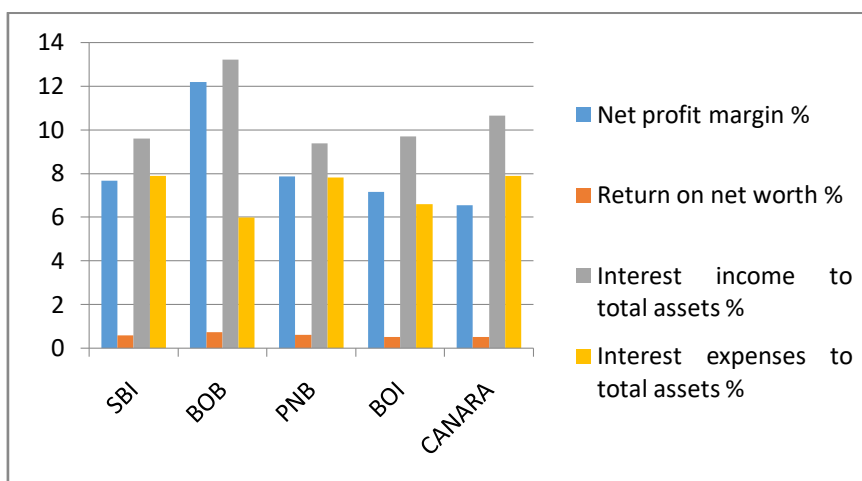


Figure 1. The financial performance of public sector banks in India is assessed.

Figure 1 financial metrics provide insights into the performance of these banks in terms of profitability (net profit margin), efficiency in using shareholders' funds (return on net worth), the proportion of interest income and expenses relative to total assets, and the spread between interest income and expenses. Further analysis and comparison would require considering other factors and industry benchmarks for a comprehensive evaluation

Table 2. Net profit margin %

SBI	0.4021	0.4403	0.4052	0.4844
BOB	0.6394	0.5447	0.5570	0.3676
PNB	0.4126	0.4626	0.3959	0.4807
BOI	0.3759	0.3806	0.4090	0.4051
CANARA	0.3433	0.3880	0.4490	0.4850

This table presents the financial performance of several public sector banks, focusing on key indicators such as net profit, return on net worth, interest revenue as a percentage of total assets, and interest expenses as a percentage of total assets. A notable observation from the data is that Bank of Baroda (BOB) stands out with the highest interest revenue relative to total assets, indicating a strong income generation capability. However, it is important to note that BOB also has the lowest net worth among the listed banks, which suggests that despite its robust interest income, there may be considerations related to capital adequacy and financial stability that need attention. Analyzing such financial metrics is essential for assessing the overall financial health and performance of these public sector banks.

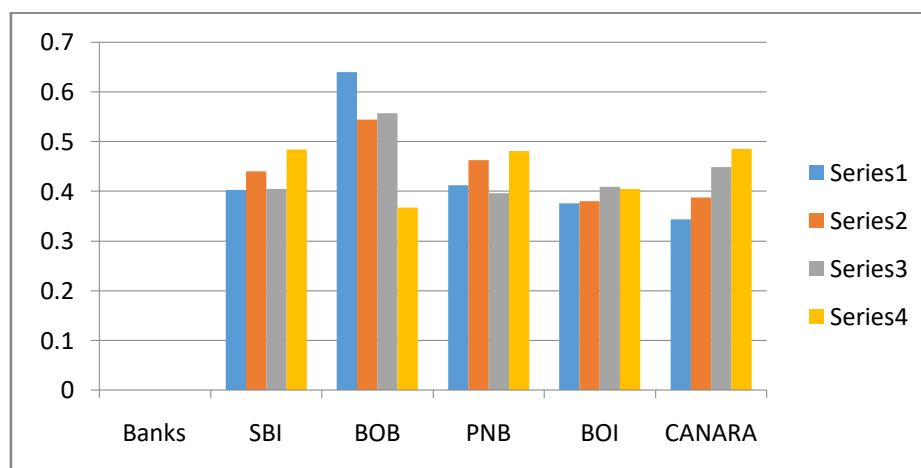


Figure 2. Net profit margin %

The figure illustrates the financial performance of a public sector bank, featuring key metrics including net profit, return on net worth, interest income as a percentage of total assets, and interest expenses as a percentage of total assets. Notably, the data within the table highlights that Bank of Baroda (BOB) stands out with the highest interest income relative to total assets, signifying its strong revenue generation capacity. However, it is essential to observe that BOB also reports the lowest net worth among the banks listed. This suggests that while BOB excels in generating interest income, there may be concerns related to its capital base and overall financial stability that warrant consideration. Evaluating such financial metrics is crucial for gaining insights into the comprehensive financial performance and stability of these public sector banks.

**Table 3.** Weight

SBI	0.25	0.25	0.25	0.25
BOB	0.25	0.25	0.25	0.25
PNB	0.25	0.25	0.25	0.25
BOI	0.25	0.25	0.25	0.25
CANARA	0.25	0.25	0.25	0.25

In this table 3 Equal weighting is a straightforward approach and implies that no single criterion is considered more important than the others in the evaluation process. It provides a balanced perspective when assessing the performance of these banks across the specified criteria. However, in practice, decision-makers may assign different weights to criteria based on their relative importance to the decision or specific goals. Weighting allows for a more customized and nuanced evaluation, reflecting the unique priorities of the decision-maker or the context of the analysis.

**Table 4.** Positive Matrix

SBI	0.1599	0.1362	0.0990	0.0919
BOB	0.1599	0.1362	0.0990	0.0919
PNB	0.1599	0.1362	0.0990	0.0919
BOI	0.1599	0.1362	0.0990	0.0919
CANARA	0.1599	0.1362	0.0990	0.0919

In this table 4 shows The table you've provided appears to be a "Positive Matrix" that contains numerical values associated with the listed banks—SBI, BOB, PNB, BOI, and CANARA. Each numerical value in the matrix corresponds to a specific bank, and they seem to represent some form of positive scores or metrics associated with these banks across various criteria or attributes. These values may be used in decision-making or analysis to assess and compare the performance or suitability of these banks. Without additional context or specific labels for the criteria or attributes being measured, it's challenging to interpret the exact meaning of these values. However, they appear to be standardized or normalized scores, potentially representing the relative performance or ranking of these banks across the specified criteria. Further information about the criteria and the purpose of this matrix would be needed for a more detailed analysis and interpretation.

**Table 5.** Negative matrix

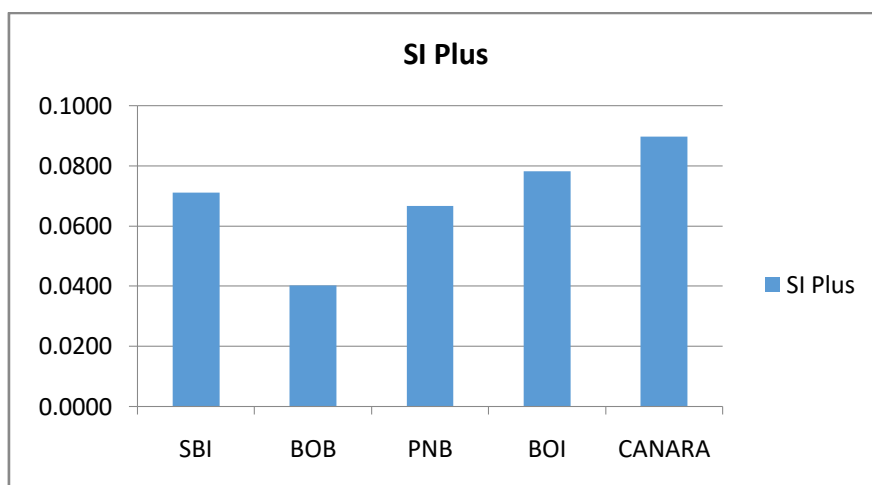
Banks	Negative matrix			
SBI	0.0858	0.0951	0.1392	0.1212
BOB	0.0858	0.0951	0.1392	0.1212
PNB	0.0858	0.0951	0.1392	0.1212
BOI	0.0858	0.0951	0.1392	0.1212
CANARA	0.0858	0.0951	0.1392	0.1212

The table you've provided is labeled as a "Negative Matrix" and contains numerical values associated with the same listed banks—SBI, BOB, PNB, BOI, and CANARA. Each numerical value in the matrix corresponds to a specific bank and appears to represent some form of negative scores or metrics related to these banks across various criteria or attributes. Similar to the positive matrix, these values may also be standardized or normalized scores, potentially indicating the relative performance or ranking of these banks across specific criteria, but in this case, with a negative connotation. These negative scores might reflect areas of weakness or underperformance for the banks across the specified criteria. As with the positive matrix, without additional context or specific labels for the criteria being assessed, it's challenging to provide a detailed interpretation of these values. Further information about the criteria and the purpose of this negative matrix would be necessary for a more comprehensive analysis.

**Table 7.** SI plus

Banks	SI Plus
SBI	0.0711
BOB	0.0403
PNB	0.0666
BOI	0.0783
CANARA	0.0897

In "Table 7 SI Plus," a set of numerical values is provided, each associated with a specific bank, including SBI, BOB, PNB, BOI, and CANARA. These values represent a metric referred to as "SI Plus," which likely serves as a composite score or evaluation of these banks across various criteria or attributes. Among the banks listed, CANARA stands out with the highest SI Plus score of 0.0897, suggesting strong overall performance or a favorable ranking based on the criteria considered. BOI follows closely behind with a score of 0.0783, indicating commendable performance. PNB and SBI have scores of 0.0666 and 0.0711, respectively, positioning them within a similar range. Meanwhile, BOB reports the lowest SI Plus score of 0.0403, which may imply a comparatively weaker performance or ranking across the assessed criteria. To gain a deeper understanding of the SI Plus metric and its implications, additional context regarding the specific criteria and the purpose of this evaluation would be necessary.

**Figure 3.** SI plus

In this figure shows SI plus public sector bank's financial performance

**Table 8.** Rank

Banks	Ci	Rank
SBI	0.3786	3
BOB	0.6899	1
PNB	0.4209	2
BOI	0.3537	4
CANARA	0.2316	5

In "Table 8 Rank," a ranking of the listed banks—SBI, BOB, PNB, BOI, and CANARA—has been provided based on a metric denoted as "Ci." Each bank has been assigned a specific value for Ci, and the corresponding ranks have been determined accordingly. This ranking system offers insights into the relative performance of these banks, with Bank of Baroda (BOB) emerging as the leader, securing the top position with a Ci value of 0.6899. Following closely behind, Punjab National Bank (PNB) takes the second rank with a Ci value of 0.4209, while State Bank of India (SBI) claims the third position with a Ci value of 0.3786. Bank of India (BOI) follows closely behind in the fourth rank, posting a Ci value of 0.3537, and Canara Bank (CANARA) rounds off the ranking in the fifth position, with the lowest Ci value of 0.2316. The significance and implications of these rankings would depend on the specific criteria or attributes represented by the Ci metric and the intended purpose of this ranking system. Additional context would be needed for a more comprehensive understanding of these results.

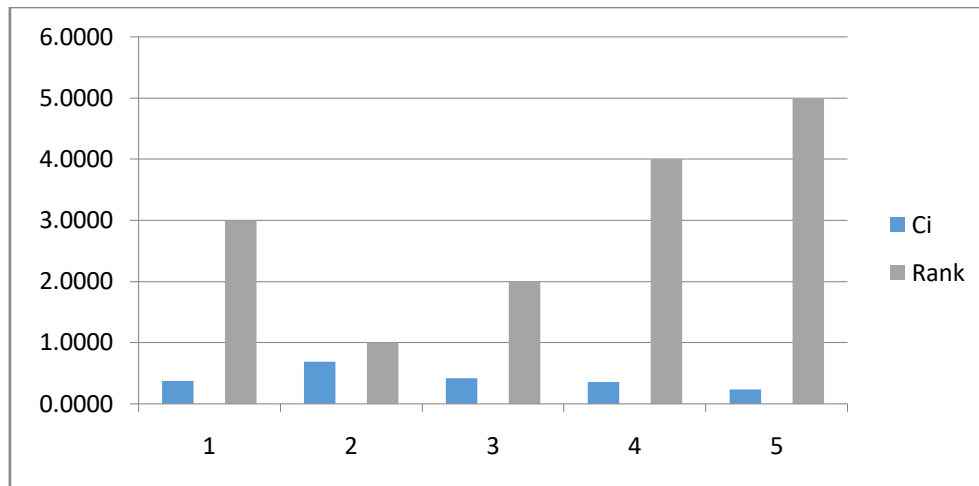


Figure 4. Ranking

The Rank of the banks is depicted in this picture. The information in this table shows that Canara Bank is both first and last in BOB bank.

#### 4. CONCLUSION

Public sector banks (PSBs) play a pivotal role in India's financial landscape as they are government-owned institutions that receive regular infusions of capital, facilitating their expansion. People from all corners of the nation turn to these banks for loans and safe storage of their money, drawn by the extensive network and accessibility they offer. Moreover, public sector banks often provide financial services at more affordable rates compared to their private sector counterparts, making banking accessible to a broader population. Given that PSBs account for over 70% of all lending in India, a strong and stable banking sector is fundamental for the country's long-term economic growth. To ensure the stability of PSBs, regulatory measures mandate that they manage risks effectively to prevent future losses and maintain sufficient capital reserves to cover any potential losses. However, an audit revealed instances where the allocation of Government of India (GOI) capital to various PSBs lacked proper documentation. Some banks received more capital than necessary, while others struggled to secure the required funds to meet their capital adequacy requirements. Interestingly, some banks received funding even if they didn't meet the established criteria. In an effort to address this issue, it was decided that the performance of PSBs in fiscal years 2015–16 and 2016–17 would determine the extent of capital infusion subject to performance benchmarks. Subsequently, the Department of Financial Services (DFS) determined that success against quarterly standards would serve as the benchmark for future fund injections, thereby introducing a performance-based approach to capital allocation in public sector banks. These measures are aimed at promoting efficiency, accountability, and prudent financial management within the PSB sector to ensure the stability and growth of India's banking industry.

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