



## The Financial Performance and Solvency Status of the Indian Public Sector Banks: A CAMELS Rating and Z Index Approach

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### ABSTRACT

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#### Keywords:

*CAMELS rating approach, Z-index, return on assets, public sector banks, nationalized bank, state bank of India, non-performing assets and efficiency, non-performing assets*

Recently, there has been much discussion about the importance of sound financial regulation and supervision in light of the increasingly integrated financial markets. CAMELS rating is an established method to compare the performance of banks and the performance of financial institutions. This study compares India's working public sector banks based on the CAMELS rating parameters. The solvency position and the probability of bankruptcy are also measured with the help of the Z score. Twelve banks have been selected for the study over 6 years between 2015 and 2021. Hence, this paper determines the performance and degree of insolvency among the working public sector banks. The findings from this study show that the banks' probability of insolvency has been reduced, and the return on assets is also recovered after negative ROA during the study period.

## 1. INTRODUCTION

There is a problem with non-performing assets (NPAs) in the Indian banking sector. The most recent earnings reports show that private banks' stock values have appreciated far more than their public counterparts [1-3]. With the government's recent decision to demonetize the country's currency and adopt international banking recommendations such as those provided by Basel III, banks' profits might be further squeezed. "The well-known CAMELS grading model is used in this study to understand better and evaluate some of India's Public sector banks" [4]. International regulators utilize the CAMELS rating system to assess and rank financial organizations based on the acronym "CAMELS," which stands for six elements [5], refer to Figure 1. After the mega-merger of the public sector banks (PSBs) by the Government of India in 2020, public sector banks were reduced to 12 banks when the oriental bank of commerce and united bank of India merged with Punjab national banks. At the same time, Andhra bank and Corporation Bank of India were acquired by the Union Bank of India. Canara bank has subsumed with the syndicate bank and Allahabad bank became part of the Indian Bank. Hence, all banks were analyzed until their merger in March 2020, while the remaining 12 banks were analyzed up until 31st march 2021, please see Table 1.

#### Objectives of the study:

1. To study the performance of the Indian Public Sector Banks based upon the CAMELS model.
2. To study the solvency position of the Indian Public Sector

Banks through the Z index probability approach.

Public Sector Banks generously are supposed to provide loans to the economically disadvantaged. According to their research, private sector banks in India are more concerned with maximizing their profits than with the well-being of their customers. In contrast, public sector banks are more concerned with expanding the economy and creating new jobs. Kumar [3] used several ratios, such as CASA (Current Account and Savings Account, the ratio of deposits in the current account and savings account to the total deposits of the bank) and financial ratios, to assess bank performance.

**Table 1.** 12 working public sector banks of India

| Independent Banks        | Merged Banks            |
|--------------------------|-------------------------|
| 1. India Overseas Bank   | 1. State Bank of India  |
| 2. UCO Bank              | 2. Bank of Baroda       |
| 3. Bank of Maharashtra   | 3. Punjab National Bank |
| 4. Punjab & Sindh Bank   | 4. Canara Bank          |
| 5. Bank of India         | 5. Union Bank of India  |
| 6. Central Bank of India | 6. Indian Bank          |

Source: Authors' compilation

## 2. LITERATURE REVIEW

#### Revisit intention

*CAMELS ranking-based related studies:* This methodology has been applied in Andhra Pradesh for the past 12 years to break down identical State/District Central Co-operative Banks (DCCB) execution, and since then, a complete ranking

test and factual metrics have been used [6]. The author measured the quality of assets, managerial efficiency, earnings capacity with liquidity, and sensitivities of solvency based on CAMELS parameters [7]. In 1979, the Federal Financial Institutions Examination Board established and used the CAMELS approach to evaluate the safety and soundness of individual banks in the United States [8]. The CAMELS is a ratio-based technique for evaluating and ranking the performance of banks [9]. Commercial banks' financial soundness has been scrutinized using this paradigm for years [10]. The CAMELS technique was used in this research to analyze the financial health of Service Cooperative Bank. Each bank's performance is evaluated from a financial standpoint and then ranked according to an analysis of 10-year data. Despite its shortcomings in asset utilization, liquidity and profitability position had to be strengthened while the bank's overall capital adequacy and management were found efficient [11, 12]. The CAMELS rating reveals that organizations' performance in terms of ranks is based upon economic parameters developed by conventions and international standards. The CAMELS rating technique is crucial to gauge a bank's financial health [13].

Regarding asset quality, managerial efficiency, and earnings quality, HDFC Bank outperformed the competition. The results showed that the private sector bank was ranked first in transaction volume [14]. According to the CAMELS grading methodology, asset quality is the greatest weighting. Asset quality has become more critical to the survival of the UCB industry (a global biopharmaceutical company) [15]. The research was conducted to assess the stability of Saudi Arabia's banking industry, comprising Islamic and conventional banks. Typically, the Z-score is examined using annual data. In this study, the authors have collected quarterly data to illustrate the Z-score index's fluctuation at a lower frequency [12]. Scholars made the analysis to determine the connection between bank risk-taking and financing liquidity. When banks reduce their funding-liquidity risks, they raise their risk-weighted assets, enhance liquidity and decrease their Z-scores [16-19]. Furthermore, banks with lower financing liquidity risk were less risk-averse during the Global Financial Crisis. They have concluded ramifications for Basel III recommendations that advocate for increased liquidity and capital requirements [20, 21].

While numerous models are available in the literature to estimate the degree of bankruptcy risk, the Z -Index model developed by Hannan and Hanweck [22] is one of the most widely used due to its accuracy and simplicity [22]. The approach uses three variables: return on assets (ROA), ROA standard deviation, and capital to total assets ratio (CTA) [23]. Furthermore, Husein and Pambekti [24] stated that financial ratios generated from financial information are an excellent tool for assessing a company's financial performance and forecasting future financial difficulties. Pankaj et al. [25] examined the Z-index model to measure banks' financial health and capacity, including India's private and public sector banks. They concluded that public banks were more financially stable than private banks in India. Murari [26] studied the risk of bankruptcy for 80 banks operating in India from 2005 to 2010. The investigation revealed that public sector banks, followed by foreign banks, had the least risk of insolvency, whereas private banks had the most probability of bankruptcy. According to Cebenoyan and Strahan [27], banks with a reduced chance of insolvency would have had more

flow of credit, providing them with a greater possibility to grow investments and profitability. The author investigated a substantial relationship between risk and profitability of listed Ghanaian banks. While numerous research studies have attempted to investigate the relationship between bankruptcy risk models and stock prices, none have explored the relationship between Mashamba [28] Z-index model score and stock prices.

### 3. METHODOLOGY

In this study, the CAMELS and Z index have been used to evaluate the bank's performance. This approach has calculated individual ranks for particular parameters for each bank. We have chosen 12 working public sector banks over six years from 2016 to 2021. The data has been obtained from the annual reports of the concerned bank and IBA documents. The performance of selected banks was evaluated using capital adequacy, asset quality, management efficiency, earning capacity, and liquidity indicators.

Additionally, to determine the solvency condition of banks, the Z index score approach was utilised to assess return on assets and capital adequacy. The Capital Adequacy Ratio (CAR), commonly referred to as the Capital to Risk-Weighted Assets Ratio (CRAR), is critical when measuring a bank's capital. According to the Central bank of India RBI, all banks must constantly maintain a CAR of 9%. In other words, banks should have sufficient money and a continuous flow of revenue to absorb any losses incurred due to their business. The Altman Z-score, a statistical variant of the standard z-score, is computed from statistics from a financial statement. It analyses a business's revenues, leverage, liquidity, soundness, and operations to assess the degree of risk. Edward Altman, a finance professor at New York University Stern, published the Altman Z-score system in 1967. Altman has revised his Z-score many times over the years.

#### 3.1 Z-score method

$$Z - Score = \frac{Expected\ Value\ of\ ROA + (Equity\ to\ Assets\ Ratio)}{\sigma(ROA)}$$

ROA stands for return on assets

#### 3.2 Camels model

CAMELS MODEL with the following indicators is used for analysis as stated below in Figure 1:



**Figure 1.** Elements of CAMELS model

#### 4. DATA ANALYSIS

*BASEL norms at a glance:* The Bank for International Settlements (BIS) was established in 1930 to ensure financial institutions have enough capital to absorb unexpected losses. BASEL-I focused entirely on credit risk and introduced banks' 8% capital requirement. India adopted it in 1999, while BASEL-II covered operational, market, and capital risk and introduced the same 8% capital requirement in 1999 and was implemented by India in 2006. BASEL-III, introduced in 2010, recommended a 10 to 14% capital requirement and applied it in 2013, but India adopted this in 2019. Tier II capital consists of revaluation reserves, capital reserves, hybrid financial assets, concealed reserves, and accumulated perpetual preference shares on 5-7-year subordinated debt. A higher CAR indicates that a bank is in a better position to face future challenges, but it may also suggest that it is not operating at peak efficiency if the CAR is very high (Sayed, 2013-214). BASEL III increases the CAR limit to 11.9% from 9.0%, and RBI has thus extended the deadline for implementation to March 31, 2019, rather than the previous date of March 31, 2018. Refer to Table 2.

**Table 2.** BASEL III norms for capital requirement

|      | Regulatory for capital requirement   | As % to RWA |
|------|--|-------------|
| I    | Tier I ratio (Minimum common equity)   | 5.5         |
| II   | Conservation buffer of capital which includes common equity                  | 2.5         |
| III  | Tier I plus Conservation buffer of capital ((i)+(ii))                        | 8.0         |
| IV   | Additional capital as Tier I   | 1.5         |
| V    | Capital Ratio Minimum Tier I [(i)+(iv)]                                      | 7.0         |
| VI   | Capital –Tier II   | 2.0         |
| VII  | Minimum capital ratio (Total)  | 9.0         |
| VIII | Minimum capital ratio (Total) PLUS Conservation buffer of capital (vii)+(ii) | 11.5        |

Source: Authors' Compilation

*Capital adequacy:* The CAR is an important ratio of the health and stability of the banking industry in the financial system. Banks with adequate capital requirements (CRAR) find it much easier to sustain unanticipated risks and monetary costs, ultimately boosting their profitability. Table 3 reveals the status of capital adequacy maintained by the 12 Indian public sector banks. Out of 20 Public Sector Undertakings (PSUs), 8 banks were merged in 2020 by the Government of India, and the number of PSUs has come down to 12. Hence ranks are assigned only to current going concern banks. According to ranks based upon six years average of capital adequacy maintained by the 12 PSUs, these range between 13.61 to 10.82. Indian banks enjoy top ranks at 13.61, while Indian overseas banks are at a low level, with a status level of 10.82. According to BASEL-III norms, the minimum limit of CAR is 11.9. Except for the Central bank of India and the Overseas bank, all PSUs have been found to have a minimum requirement of CAR. Hence, most banks fulfil the minimum capital adequacy requirements specified by the BASEL norms.

*Advance to total assets:* Banks that lend more aggressively are more profitable according to this ratio. Receivables are included in total advances. The high ratio is preferable in the banking system. It is a very significant ratio and key indicator

of the CAMELS rating approach by which banks' lending policy can be measured. An aggressive lending approach can boost banks' profitability. Table 4 reveals that Indian banks and Punjab and Sindh bank are lending aggressively as their rank is at the top 1 and 2 with an average of 62 and 60, respectively. These banks are closely followed by the Punjab national bank, Bank of Baroda, State Bank of India, Bank of Maharashtra and Canara banks. It was found that only three banks, Central bank of India, UCO Bank and United Bank of India, have lent less than 50% of their assets. Most banks adopted an aggressive lending policy to utilize their resources for better performance.

*Assets quality:* Assets quality is the crucial parameter that indicates a bank's overall financial health and soundness. Loans, typically, account large volume of the bank's assets and represent a risk to the bank's financial resources. Moreover, the strength of assets is essential, as any potential losses must be mitigated against those that could endanger the bank's future earnings. Non-performing loans/assets (often referred to as NPAs), the provision ratio, and asset distribution are all used to determine asset quality. The research evaluates the bank's performance on this front using statistics such as the percentage of Net NPAs to Net Advances (per cent), Net NPAs to Total Assets (per cent), and Total Investments to Total Assets (per cent).

*Net Non-performing Assets to Net Advances (NPA):* The NPA problem was a severe concern in public sector banks, resulting in decreased performance. An appropriate procedure must be created quickly to avoid jeopardizing certain already weak state-owned banks' ability to operate. Table 5 reveals banks' asset quality in terms of the performance of investments made into assets by the public sector banks. The study reported a portion of non-performing assets in banks and that SBI did better with only 3.16% compared to other PSBs, closely followed by the Indian Bank and Bank of Baroda with an average of 3.70% and 3.81%, respectively. At the same time, Indian overseas banks at 9.55% have the highest per cent of NPA. Four banks' NPA have been between 7.10% to 7.85%, namely PNB, Central bank of India, UCO Bank and united bank of India, showing poor management of assets utilization. Bank of Maharashtra also did not perform better, and its NPA was reported at 6.61%. Canara Bank, Bank of India and Punjab and Sindh bank said the percentage of NPA is 5.18, 5.60, and 5.98, respectively. This is also not better in the context of assets quality.

*NPA to Total Assets:* This is an essential indicator of the absolute quality of assets. However, there is no rule of thumb for an efficient ratio for NPA to total assets, but a balance of less than 3% is manageable.

Table 6 reveals the information regarding the proportion of Net NPA corresponding to total assets. SBI, Indian Bank and Bank of Baroda have reported this ratio less than 3% (1.86 and 2.23, and 2.24) respectively) which is considered favourable to managing non-performing assets. According to the study, this ratio ranges between 3.09 to 3.83 by the seven PSBs, while the remaining two banks, PNB and Indian Bank, reported above 4% (4.14 and 5.05%), respectively. The table shows that the ratio among PSBs ranges between 1.86 to 5.05%, while the majority of banks' ratio is between 3 to 4%, which indicates a need for improvement in their quality of assets. Banks having more than 4% require an effective policy for the utilization of resources so the performance of assets can be enhanced.

**Table 3.** Capital adequacy ratio CAR (BASEL norms)

| S.N. | Banks                     | Capital Adequacy Ratio - Basel III [%] |       |       |       |       |       |       | Ranking |
|------|---------------------------|--|-------|-------|-------|-------|-------|-------|---------|
|      | NATIONALIZED BANKS        | 2015                                   | 2016  | 2017  | 2018  | 2019  | 2020  | 2021  |         |
| 1    | Bank of Baroda            | 12.60                                  | 13.17 | 12.24 | 12.1  | 13.42 | 13.30 | 14.99 | 2       |
| 2    | Bank of India             | 10.73                                  | 12.01 | 12.14 | 12.9  | 14.19 | 13.10 | 14.93 | 4       |
| 3    | Bank of Maharashtra       | 11.94                                  | 11.20 | 11.18 | 11.00 | 11.86 | 13.52 | 14.50 | 6       |
| 4    | Canara Bank               | 10.56                                  | 11.08 | 12.86 | 13.2  | 11.90 | 13.65 | 13.18 | 5       |
| 5    | Central Bank of India     | 10.90                                  | 10.41 | 10.95 | 9.04  | 9.61  | 11.72 | 14.81 | 11      |
| 6    | Indian Bank               | 12.86                                  | 13.20 | 13.64 | 12.6  | 13.21 | 14.12 | 15.71 | 1       |
| 7    | Indian Overseas Bank      | 10.11                                  | 9.66  | 10.50 | 9.25  | 10.21 | 10.72 | 15.32 | 12      |
| 8    | Punjab & Sind Bank        | 11.24                                  | 10.91 | 11.05 | 11.3  | 10.93 | 12.76 | 17.06 | 7       |
| 9    | Punjab National Bank      | 12.21                                  | 11.28 | 11.66 | 9.20  | 9.73  | 14.14 | 14.32 | 8       |
| 10   | UCO Bank                  | 12.17                                  | 9.63  | 10.93 | 10.9  | 10.70 | 11.70 | 13.74 | 10      |
| 11   | Union Bank of India       | 10.22                                  | 10.56 | 11.79 | 11.46 | 11.78 | 12.81 | 12.56 | 9       |
| 12   | State Bank of India (SBI) | 12.00                                  | 13.12 | 13.11 | 12.60 | 12.72 | 13.06 | 13.74 | 3       |

Sources: Data compiled from annual reports of concerned banks IBA and RBI s report

**Table 4.** Advances to total assets ratio

| BANKS                     | 2015  | 2016 | 2017 | 2018 | 2019 | 2020  | 2021 | Average | Ranking |
|---------------------------|-------|------|------|------|------|-------|------|---------|---------|
| Bank of Baroda            | 0.6   | 0.57 | 0.55 | 0.59 | 0.6  | 0.6   | 0.61 | 0.59    | 3       |
| Bank of India             | 0.65  | 0.59 | 0.59 | 0.56 | 0.55 | 0.56  | 0.5  | 0.57    | 5       |
| Bank of Maharashtra       | 0.68  | 0.67 | 0.6  | 0.55 | 0.5  | 0.51  | 0.52 | 0.58    | 4       |
| Canara Bank               | 0.6   | 0.59 | 0.59 | 0.62 | 0.62 | 0.6   | 0.55 | 0.59    | 3       |
| Central Bank of India     | 0.6   | 0.59 | 0.42 | 0.48 | 0.44 | 0.42  | 0.42 | 0.48    | 8       |
| Indian Bank               | 0.65  | 0.63 | 0.59 | 0.62 | 0.65 | 0.64  | 0.58 | 0.62    | 1       |
| Indian Overseas Bank      | 0.6   | 0.59 | 0.48 | 0.53 | 0.53 | 0.47  | 0.47 | 0.52    | 6       |
| Punjab & Sind Bank        | 0.65  | 0.62 | 0.6  | 0.59 | 0.63 | 0.58  | 0.55 | 0.6     | 2       |
| Punjab National Bank      | 0.63  | 0.62 | 0.58 | 0.57 | 0.59 | 0.57  | 0.53 | 0.58    | 4       |
| UCO Bank                  | 0.6   | 0.51 | 0.52 | 0.5  | 0.43 | 0.43  | 0.44 | 0.49    | 7       |
| United Bank of India      | 0.54  | 0.53 | 0.47 | 0.43 | 0.44 | 0.44  | 0    | 0.41    | 9       |
| State Bank of India (SBI) | 0.635 | 0.62 | 0.58 | 0.56 | 0.59 | 0.588 | 0.54 | 0.59    | 3       |

Sources: Data compiled from annual reports of concerned banks IBA and RBI s report

**Table 5.** Net non-performing assets to net advances

| Nationalized Banks        | 2015 | 2016  | 2017  | 2018  | 2019  | 2020 | 2021 | Average | Ranking |
|---------------------------|------|-------|-------|-------|-------|------|------|---------|---------|
| Bank of Baroda            | 1.89 | 5.06  | 4.72  | 5.49  | 3.33  | 3.13 | 3.09 | 3.81    | 3       |
| Bank of India             | 3.36 | 7.79  | 6.90  | 8.28  | 5.61  | 3.88 | 3.35 | 5.60    | 5       |
| Bank of Maharashtra       | 4.19 | 6.35  | 11.76 | 11.24 | 5.52  | 4.77 | 2.48 | 6.61    | 7       |
| Canara Bank               | 2.65 | 6.42  | 6.33  | 7.48  | 5.37  | 4.22 | 3.82 | 5.18    | 4       |
| Central Bank of India     | 3.61 | 7.36  | 10.20 | 11.10 | 7.73  | 7.63 | 5.77 | 7.63    | 9       |
| Indian Bank               | 2.50 | 4.97  | 4.39  | 3.81  | 3.75  | 3.13 | 3.37 | 3.70    | 2       |
| Indian Overseas Bank      | 5.71 | 11.94 | 14.06 | 15.33 | 10.81 | 5.44 | 3.58 | 9.55    | 12      |
| Punjab & Sind Bank        | 3.55 | 4.61  | 7.50  | 6.93  | 7.22  | 8.02 | 4.04 | 5.98    | 6       |
| Punjab National Bank      | 4.05 | 8.59  | 7.80  | 11.24 | 6.56  | 5.77 | 5.72 | 7.10    | 8       |
| UCO Bank                  | 4.30 | 9.09  | 8.94  | 13.10 | 9.72  | 5.45 | 3.94 | 7.79    | 10      |
| United Bank of India      | 6.11 | 8.98  | 9.97  | 16.49 | 8.67  | 4.73 | 0.00 | 7.85    | 11      |
| State Bank of India (SBI) | 2.12 | 3.81  | 3.71  | 5.73  | 3.01  | 2.23 | 1.50 | 3.16    | 1       |

Sources: Data compiled from annual reports of concerned banks IBA and RBI s report

**Table 6.** Net non-performing assets to total assets

| Nationalized Banks        | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | Average | Ranking |
|---------------------------|------|------|------|------|------|------|------|---------|---------|
| Bank of Baroda            | 0.01 | 0.03 | 0.03 | 0.03 | 0.02 | 0.02 | 0.02 | 2.24    | 2       |
| Bank of India             | 0.02 | 0.05 | 0.04 | 0.05 | 0.03 | 0.02 | 0.02 | 3.20    | 4       |
| Bank of Maharashtra       | 0.03 | 0.04 | 0.07 | 0.06 | 0.03 | 0.03 | 0.01 | 3.83    | 9       |
| Canara Bank               | 0.02 | 0.04 | 0.04 | 0.05 | 0.03 | 0.03 | 0.02 | 3.09    | 3       |
| Central Bank of India     | 0.02 | 0.04 | 0.04 | 0.05 | 0.03 | 0.03 | 0.02 | 3.60    | 6       |
| Indian Bank               | 0.02 | 0.03 | 0.03 | 0.02 | 0.02 | 0.02 | 0.02 | 2.23    | 2       |
| Indian Overseas Bank      | 0.03 | 0.07 | 0.07 | 0.08 | 0.06 | 0.03 | 0.02 | 5.05    | 11      |
| Punjab & Sind Bank        | 0.02 | 0.03 | 0.05 | 0.04 | 0.05 | 0.05 | 0.02 | 3.61    | 7       |
| Punjab National Bank      | 0.03 | 0.05 | 0.05 | 0.06 | 0.04 | 0.03 | 0.03 | 4.14    | 10      |
| UCO Bank                  | 0.03 | 0.05 | 0.05 | 0.07 | 0.04 | 0.02 | 0.02 | 3.81    | 8       |
| Union Bank of India       | 0.02 | 0.04 | 0.04 | 0.05 | 0.04 | 0.03 | 0.03 | 3.46    | 5       |
| State Bank of India (SBI) | 0.01 | 0.02 | 0.02 | 0.03 | 0.02 | 0.01 | 0.01 | 1.86    | 1       |

Sources: Data compiled from annual reports of concerned banks IBA and RBI s report

*Investment to assets ratio:* This indicator explains the utilization of resources as an investment. The higher the ratio indicates that the bank is conservative in lending the money or borrowers are not available for credit from the concerned bank. It could also be due to the rising NPA, and banks are likely to protect themselves from NPAs. Table 7 reveals that the investment-to-assets ratio ranges between 63 to 84%. Canara Bank, Bank of Baroda and SBI are reported as the top three banks for investment to assets, whereas six banks' ratios reported below 70%, and three banks have been found with a percentage having less than 75%. Hence, from the interpretation of this ratio, banks must maintain at least 75% and adopt a liberal policy for lending.

*Management efficiency:* The asset-to-deposit ratio, business per employee, and profit per employee ratios provide insight into the bank's efficiency in turning deposits into assets. These

ratios enable managers to evaluate the ability and efficiency of their decisions. The percentage of assets to deposits indicates a bank's ability to utilize available deposits into assets. Table 8 shows that this asset-to-deposit ratio varied between 1.13 and 1.28 times over the study period across public sector banks.

*Assets to Deposits:* The asset-to-deposit ratio, business per employee, and profit per employee ratios provide insight into the bank's efficiency in turning deposits into assets. These ratios enable managers to evaluate the ability and efficiency of their decisions. The percentage of assets to deposits indicates a bank's ability to utilize available deposits into assets. The table shows that this asset-to-deposit ratio varied between 1.13 and 1.28 times over the study period across public sector banks.

**Table 7.** Investment to assets ratio

| Banks/Years               | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | Average | ranking |
|---------------------------|------|------|------|------|------|------|------|---------|---------|
| Bank of Baroda            | 0.16 | 0.18 | 0.19 | 0.23 | 0.23 | 0.24 | 4.42 | 0.81    | 2.00    |
| Bank of India             | 0.19 | 0.20 | 0.20 | 0.22 | 0.24 | 0.24 | 3.88 | 0.74    | 4.00    |
| Bank of Maharashtra       | 0.22 | 0.23 | 0.24 | 0.28 | 0.36 | 0.34 | 2.89 | 0.65    | 10.00   |
| Canara Bank               | 0.26 | 0.26 | 0.26 | 0.23 | 0.22 | 0.24 | 4.41 | 0.84    | 1.00    |
| Central Bank of India     | 0.29 | 0.29 | 0.28 | 0.31 | 0.38 | 0.40 | 2.48 | 0.63    | 12.00   |
| Indian Bank               | 0.24 | 0.26 | 0.31 | 0.28 | 0.23 | 0.26 | 3.55 | 0.73    | 5.00    |
| Indian Overseas Bank      | 0.28 | 0.29 | 0.24 | 0.28 | 0.27 | 0.30 | 2.87 | 0.66    | 11.00   |
| Punjab & Sind Bank        | 0.27 | 0.27 | 0.29 | 0.29 | 0.24 | 0.24 | 3.45 | 0.72    | 6.00    |
| Punjab National Bank      | 0.25 | 0.24 | 0.26 | 0.26 | 0.26 | 0.29 | 3.21 | 0.68    | 7.00    |
| UCO Bank                  | 0.26 | 0.34 | 0.32 | 0.33 | 0.36 | 0.39 | 2.70 | 0.67    | 9.00    |
| Union Bank of India       | 0.22 | 0.22 | 0.25 | 0.25 | 0.26 | 0.28 | 3.23 | 0.67    | 8.00    |
| State Bank of India (SBI) | 0.24 | 0.24 | 0.28 | 0.31 | 0.26 | 0    | 3.35 | 0.78    | 3.00    |

Sources: Data compiled from annual reports of concerned banks IBA and RBI s report

**Table 8.** Assets to deposits ratio

| Banks                     | Average (Deposits) | Average (Assets) | Assets to Deposit | Ranking |
|---------------------------|--------------------|------------------|-------------------|---------|
| Bank of Baroda            | 705,180            | 842,215          | 1.194             | 2       |
| Bank of India             | 544,183            | 638,939          | 1.174             | 6       |
| Bank of Maharashtra       | 143,409            | 164,671          | 1.148             | 10      |
| Canara Bank               | 601,277            | 696,241          | 1.158             | 9       |
| Central Bank of India     | 293,837            | 333,343          | 1.134             | 11      |
| Indian Bank               | 254,098            | 297,576          | 1.171             | 7       |
| Indian Overseas Bank      | 226,359            | 269,550          | 1.191             | 3       |
| Punjab & Sind Bank        | 92,795             | 104,387          | 1.125             | 12      |
| Punjab National Bank      | 686,367            | 803,305          | 1.170             | 8       |
| UCO Bank                  | 200,231            | 236,846          | 1.183             | 5       |
| Union Bank of India       | 462,410            | 548,975          | 1.187             | 4       |
| State Bank of India (SBI) | 2,556,128          | 3,247,593        | 1.271             | 1       |

Sources: Data compiled from annual reports of concerned banks IBA and RBI s report

**Table 9.** Business per employee

| Nationalized Banks        | 2015  | 2016  | 2017  | 2018  | 2019  | 2020  | 2021  | Ranking |
|---------------------------|-------|-------|-------|-------|-------|-------|-------|---------|
| Bank of India             | 20.69 | 17.96 | 19.4  | 18.29 | 18.39 | 19.4  | 19.94 | 1       |
| Bank of Baroda            | 18.89 | 16.8  | 17.49 | 17.66 | 18.88 | 18.77 | 19.57 | 3       |
| Bank of Maharashtra       | 15.6  | 18.02 | 18.4  | 18.07 | 18.13 | 19.55 | 21.45 | 2       |
| Indian Bank               | 14.43 | 15.31 | 14.88 | 18.56 | 19.18 | 22.87 | 22.17 | 4       |
| State Bank of India (SBI) | 12.34 | 14.11 | 16.24 | 16.7  | 18.77 | 21.13 | 23.73 | 5       |
| Punjab & Sind Bank        | 15.95 | 16.2  | 15.34 | 18.18 | 18.87 | 16.98 | 18.49 | 7       |
| Union Bank of India       | 14.46 | 15.51 | 16.43 | 17.83 | 18.79 | 20.06 | 19.23 | 6       |
| Canara Bank               | 14.35 | 14.45 | 14.43 | 14.81 | 17.07 | 17.63 | 18.14 | 8       |
| Punjab National Bank      | 13.19 | 13.59 | 14.17 | 14.74 | 16.8  | 18.14 | 18.85 | 9       |
| UCO Bank                  | 13.77 | 13.81 | 13.48 | 12.74 | 13.69 | 13.7  | 14.7  | 10      |
| Central Bank of India     | 11.38 | 11.95 | 11.81 | 12.71 | 12.78 | 14.06 | 15.6  | 11      |
| Indian Overseas Bank      | 13.24 | 12.41 | 12.28 | 13.1  | 14.21 | 14.38 | 0     | 12      |

Sources: Data compiled from annual reports of concerned banks IBA and RBI s report

**Table 10.** Profit per employee

| Banks                            | 2015        | 2016        | 2017        | 2018   | 2019   | 2020   | 2021  | Rank |
|----------------------------------|-------------|-------------|-------------|--------|--------|--------|-------|------|
| Indian Bank                      | 4.95        | 4.00        | 7.00        | 6.00   | 1.64   | 4.02   | 7.22  | 1    |
| <b>State Bank of India (SBI)</b> | <b>6.02</b> | <b>4.70</b> | <b>5.11</b> | -2.43  | 0.33   | 5.81   | 8.28  | 2    |
| Punjab National Bank             | 5.00        | -6.00       | 2.00        | -17.0  | -15.0  | 53.00  | 2.10  | 3    |
| Bank of Baroda                   | 7.00        | -10.0       | 26.0        | -4.37  | 0.78   | 0.65   | 1.00  | 4    |
| Canara Bank                      | 5.00        | -5.21       | 2.01        | -7.00  | 1.00   | -4.00  | 2.90  | 5    |
| Union Bank of India              | 5.00        | 4.00        | 2.00        | -14.0  | -8.00  | -7.77  | 3.72  | 6    |
| Bank of India                    | 3.70        | -12.20      | -3.2        | -12.3  | -11.3  | -5.90  | 4.20  | 7    |
| Bank of Maharashtra              | 3.00        | 0.73        | -11.0       | -8.86  | -37.1  | 3.10   | 4.19  | 8    |
| Central Bank of India            | 1.53        | -3.76       | -6.50       | -13.90 | -15.6  | -3.27  | NA    | 9    |
| UCO Bank                         | 4.82        | -11.30      | -7.50       | -18.50 | -18.60 | -11.00 | 0.76  | 10   |
| Indian Overseas Bank             | -1.41       | -9.05       | -11.0       | -22.40 | -14.20 | -34.30 | NA    | 11   |
| Punjab & Sind Bank               | 1.00        | 4.00        | 2.00        | -8.00  | -606.0 | -11.10 | -30.9 | 12   |

Sources: Data compiled from annual reports of concerned banks IBA and RBI s report

Employees' productivity is represented by the business per employee (BPE) ratio. It is measured by dividing the bank's overall business by the total number of employees. BPE is a performance indicator that can assess an employee's performance. This indicator measures the revenue per employee generated by banks during the study period. The greater the ratio indicates a better rating of the bank. According to Table 9 the Bank of India is the best in business per employee, followed by Bank of Baroda, Bank of Maharashtra, and Indian Bank. During the study period, this performance ratio varied between 11.37 and 19.15. Indian overseas banks, the Central bank of India, and UCO bank are at the bottom of the rankings based on employee performance.

Profit per employee is shown in Table 10 for selected banks. Only four banks record a positive profit per employee, while eight banks report a negative profit. Employee performance was found best in Indian banks, followed by SBI, Punjab National Bank, and Bank of Baroda, which earned a profit. Punjab and Sind Bank had the worst employee performance, followed by Indian overseas bank, UCO Bank, Central bank of India, Bank of Maharashtra, Bank of India, Union Bank of India, and Canara bank.

**Earning Quality:** The net interest margin ratio to spread is a key indicator of a bank's performance from its operations. NIM (Net Interest Margin) is used to determine the earnings capacity of banks. The net interest margin is the difference between interest earned and interest paid corresponding to assets. A higher ratio indicates that the bank generates more significant interest in its assets through lending. Furthermore, the bank may keep low-interest expenses on deposits, loans from RBI, and other long-term loans.

$$NIM = \frac{(\text{Income from interest} - \text{expenses on interest})}{\text{Interest earning assets}}$$

The term "spread" refers to the percentage of total assets utilized to determine the earning ability of banks. Table 11 examines the NIM or spread to assets of the selected PSBs. State Bank of India is ranked first, followed by the remaining nationalized banks. This ratio is in the range of 1.88 to 2.43. Nine banks had a ratio greater than two, while three banks, Canara Bank, UCO Bank, and Bank of India, had less than two.

**Income from interest to Total Income:** This ratio measures a bank's ability to earn interest on its assets, i.e., its lending activities. All of these items, as well as dividends, are included in a company's interest earnings. Moreover, a high percentage may reflect that the bank lacks diversification in its asset utilization—Table 12. The banks' performance in terms of interest income as a percentage of total revenue ranged

between 0.84 and 0.92 per cent. This shows that banks rely on loans and advances rather than another type of investment.

**Liquidity:** The last component of the CAMELS model is the liquidity status of banks. Liquid assets to total assets are essential for banking institutions. This category includes amounts held in one's checking or savings account and funds held in other financial institutions, such as certificates of deposit (C.D.s). Management's priority is to ensure the right balance between liquidity and profitability.

**Credit-Deposit Ratio** – This ratio indicates a bank's capacity to meet its short-term requirements; credit refers to total loans, while deposits represent total deposits. It shows how much of the bank's deposits have been used to create new loans and loans to other customers. A more significant percentage would be ideal. However, this might also indicate that the bank's resources are being stretched to the limit and placing excessive reliance on deposits as a source of credit. Using a bank's credit-deposit ratio as an indication, one may see how much of its deposits are utilized for lending or how much of its core funds are used for lending. Banks may generate more money if they have a larger ratio of assets to liabilities and vice versa. The liquidity of banks ranked by their credit deposit ratio is shown in Table 13. During the research period, it ranged from 55.13 to 75.00. Other nationalized banks follow SBI at the top of the rankings. Except for UCO and the Central Bank of India, all other banks recorded a higher percentage than 60%.

**Return on Assets (ROA)** (refer to Table 14) evaluates how much money a firm generates using its assets. Another way ROA measures a company's efficiency and profitability is by concerning the assets and resources it owns or controls. More than 5% returns on investments are considered an excellent ROA. Return on assets assessing the performance of Indian bank reported the highest ROA followed by SBI. While the remaining public sector banks had a negative return on assets in the study period. Except for one public sector bank (Indian bank), all PSB s throughout the study period reported negative ROA. Even SBI, for a year, incurred a negative ROA during 2018. Indian overseas banks, the Central bank of India, the Bank of India, and UCO banks have been found with negative ROA continuously for 4-5 years. However, except for the Central bank of India and Punjab and Sindh Bank, all banks showed positive ROA in 2021.

Hannan and Hanweck's risk of bankruptcy is predicated on the possibility of a negative return on assets and a capital-asset ratio greater than one. Even though the Z-index is mainly used for predicting bank failure, big private enterprises with poor asset returns might benefit from its use as an analytical tool. This was examined using the Z-index and applying the same equation to get the Z-index/score for Indian public sector

banks. Table 15 reveals the information regarding the solvency position of Indian public sector banks. With the Z- score, capital adequacy and return on assets have been analyzed to determine the degree of insolvency among the PSB s. According to the Z index score, banks with the highest score are financially sound or vice versa. This index ranges between

8.43 to 74.27 among the PSBs. Indian bank at the top is followed by SBI, Bank of Baroda and Canara bank. However, Z scores of more than five are considered sufficient, and all public sector banks reported more than this rule of thumb during the study period.

**Table 11.** Spread as % of assets

| <b>Nationalized Banks</b> | <b>2015</b> | <b>2016</b> | <b>2017</b> | <b>2018</b> | <b>2019</b> | <b>2020</b> | <b>2021</b> | <b>Ranking</b> |
|---------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|----------------|
| State Bank of India (SBI) | <b>2.69</b> | <b>2.52</b> | <b>2.29</b> | 2.17        | 2.4         | 2.48        | 2.44        | 1              |
| Indian Bank               | 2.31        | 2.18        | 2.36        | 2.48        | 2.51        | 2.46        | 2.5         | 2              |
| .Bank of Maharashtra      | 2.65        | 2.41        | 1.99        | 2.17        | 2.27        | 2.53        | 2.49        | 3              |
| Punjab National Bank      | 2.74        | 2.29        | 2.08        | 1.95        | 2.21        | 2.1         | 2.42        | 4              |
| Bank of Baroda            | 1.84        | 1.9         | 1.94        | 2.16        | 2.39        | 2.37        | 2.49        | 5              |
| Central Bank of India     | 2.32        | 2.31        | 1.97        | 2           | 2.05        | 2.14        | 2.23        | 6              |
| Union Bank of India       | 2.21        | 2.05        | 1.97        | 1.91        | 2.07        | 2.08        | 2.3         | 7              |
| Punjab & Sind Bank        | 1.72        | 2.12        | 2.23        | 1.96        | 2.09        | 2.05        | 2.05        | 8              |
| Indian Overseas Bank      | 1.88        | 1.96        | 1.76        | 2.2         | 2.11        | 2.03        | 2.15        | 9              |
| Bank of India             | 1.84        | 1.92        | 1.89        | 1.72        | 2.18        | 2.32        | 1.97        | 10             |
| UCO Bank                  | 2.26        | 1.98        | 1.65        | 1.45        | 1.87        | 2.16        | 2.16        | 11             |
| Canara Bank               | 1.76        | 1.77        | 1.69        | 1.97        | 2.08        | 1.81        | 2.09        | 12             |

Sources: Data compiled from annual reports of concerned banks IBA and RBI s report

**Table 12.** Interest income to total income

| <b>Banks/Years</b>               | <b>2015</b> | <b>2016</b> | <b>2017</b> | <b>2018</b> | <b>2019</b> | <b>2020</b> | <b>2021</b> | <b>Average</b> | <b>Ranking</b> |
|----------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|----------------|----------------|
| Punjab & Sind Bank               | 0.95        | 0.95        | 0.93        | 0.93        | 0.91        | 0.90        | 0.89        | 0.92           | 1              |
| Central Bank of India            | 0.93        | 0.93        | 0.90        | 0.90        | 0.90        | 0.87        | 0.88        | 0.90           | 2              |
| Indian Bank                      | 0.92        | 0.90        | 0.88        | 0.88        | 0.91        | 0.87        | 0.87        | 0.89           | 3              |
| Bank of Maharashtra              | 0.93        | 0.93        | 0.89        | 0.88        | 0.88        | 0.87        | 0.82        | 0.88           | 4              |
| UCO Bank                         | 0.91        | 0.92        | 0.89        | 0.93        | 0.90        | 0.84        | 0.80        | 0.88           | 5              |
| Bank of India                    | 0.91        | 0.92        | 0.85        | 0.87        | 0.90        | 0.86        | 0.85        | 0.88           | 6              |
| Union Bank of India              | 0.90        | 0.90        | 0.87        | 0.87        | 0.88        | 0.88        | 0.86        | 0.88           | 7              |
| Bank of Baroda                   | 0.91        | 0.90        | 0.86        | 0.87        | 0.89        | 0.88        | 0.85        | 0.88           | 8              |
| Canara Bank                      | 0.91        | 0.90        | 0.85        | 0.86        | 0.88        | 0.86        | 0.82        | 0.87           | 9              |
| Punjab National Bank             | 0.89        | 0.89        | 0.84        | 0.84        | 0.87        | 0.85        | 0.86        | 0.86           | 10             |
| <b>State Bank of India (SBI)</b> | 0.87        | 0.85        | 0.83        | 0.83        | 0.87        | 0.85        | 0.86        | 0.85           | 11             |
| Indian Overseas Bank             | 0.92        | 0.90        | 0.85        | 0.83        | 0.81        | 0.84        | 0.75        | 0.84           | 12             |

Sources: Data compiled from annual reports of concerned banks IBA and RBI s report

**Table 13.** Credit deposit ratio

| <b>Nationalized Banks</b> | <b>2015</b> | <b>2016</b> | <b>2017</b> | <b>2018</b> | <b>2019</b> | <b>2020</b> | <b>2021</b> | <b>Average</b> | <b>Ranking</b> |
|---------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|----------------|----------------|
| State Bank of India (SBI) | 82.45       | 84.1        | 76.8        | 71.5        | 75.1        | 71.7        | 66.5        | <b>75</b>      | 1              |
| Indian Bank               | 74.38       | 72.4        | 70          | 75.2        | 74.9        | 76          | 67.7        | <b>72.92</b>   | 2              |
| Union Bank of India       | 80.68       | 78          | 75.7        | 70.7        | 71.4        | 69.9        | 64          | <b>72.9</b>    | 3              |
| Bank of Baroda            | 69.32       | 66.9        | 63.7        | 72.3        | 73.4        | 73          | 73          | <b>70.22</b>   | 4              |
| Canara Bank               | 69.65       | 67.7        | 69.1        | 72.7        | 71.4        | 69.1        | 63.2        | <b>68.98</b>   | 5              |
| Punjab National Bank      | 75.9        | 74.6        | 67.5        | 67.5        | 67.8        | 67          | 60.9        | <b>68.75</b>   | 6              |
| Punjab & Sind Bank        | 73.66       | 70.1        | 68.2        | 65.4        | 70.2        | 65.1        | 63.4        | <b>68.01</b>   | 7              |
| Bank of India             | 75.58       | 70          | 67.9        | 65.5        | 65.5        | 66.4        | 58.3        | <b>67.03</b>   | 8              |
| Bank of Maharashtra       | 80.74       | 77.4        | 68.7        | 61.7        | 58.8        | 57.9        | 58.9        | <b>66.3</b>    | 9              |
| Indian Overseas Bank      | 69.81       | 71.7        | 66.5        | 61.1        | 59.6        | 54.4        | 53.2        | <b>62.31</b>   | 10             |
| UCO Bank                  | 68.75       | 60.8        | 59.5        | 59.1        | 50.2        | 52.4        | 54.1        | <b>57.82</b>   | 11             |
| Central Bank of India     | 73.75       | 67.6        | 47          | 53.1        | 48.9        | 48.2        | 47.5        | <b>55.13</b>   | 12             |

Sources: Data compiled from annual reports of concerned banks IBA and RBI s report

**Table 14.** Return on assets

| <b>Banks</b>                     | <b>2015</b>  | <b>2016</b>  | <b>2017</b>  | <b>2018</b>  | <b>2019</b>  | <b>2020</b>  | <b>2021</b>  | <b>AVERAGE</b> | <b>Ranks</b> |
|----------------------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|----------------|--------------|
| <b>Bank of Baroda</b>            | 0.49         | <b>-0.78</b> | 0.2          | <b>-0.34</b> | 0.06         | 0.06         | 0.07         | -0.034         | 3            |
| <b>Bank of India</b>             | 0.27         | <b>-0.94</b> | <b>-0.24</b> | <b>-0.91</b> | <b>-0.84</b> | <b>-0.43</b> | 0.28         | -0.401         | 7            |
| <b>Bank of Maharashtra</b>       | 0.33         | 0.07         | <b>-0.86</b> | <b>-0.73</b> | <b>-3.01</b> | 0.23         | 0.3          | -0.524         | 8            |
| <b>Canara Bank</b>               | 0.55         | <b>-0.52</b> | 0.2          | <b>-0.75</b> | 0.06         | <b>-0.32</b> | 0.2          | -0.083         | 4            |
| <b>Central Bank of India</b>     | 0.21         | <b>-0.48</b> | <b>-0.8</b>  | <b>-1.61</b> | <b>-1.7</b>  | <b>-0.35</b> | <b>-0.26</b> | -0.713         | 10           |
| <b>Indian Bank</b>               | 0.54         | 0.36         | 0.67         | 0.53         | 0.12         | 0.26         | 0.5          | 0.426          | 1            |
| <b>Indian Overseas Bank</b>      | <b>-0.16</b> | <b>-0.97</b> | <b>-1.21</b> | <b>-2.33</b> | <b>-1.35</b> | <b>-2.95</b> | 0.31         | -1.237         | 12           |
| <b>Punjab &amp; Sind Bank</b>    | 0.13         | 0.34         | 0.2          | <b>-0.69</b> | <b>-0.47</b> | <b>-0.91</b> | <b>-2.55</b> | -0.564         | 9            |
| <b>Punjab National Bank</b>      | 0.53         | <b>-0.61</b> | 0.19         | <b>-1.6</b>  | <b>-1.25</b> | 0.04         | 0.15         | -0.364         | 6            |
| <b>UCO Bank</b>                  | 0.48         | <b>-1.25</b> | <b>-0.75</b> | <b>-1.88</b> | <b>-1.84</b> | <b>-0.96</b> | 0.06         | -0.877         | 11           |
| <b>Union Bank of India</b>       | 0.49         | 0.35         | 0.13         | <b>-1.07</b> | <b>-0.59</b> | <b>-0.53</b> | 0.27         | -0.136         | 5            |
| <b>State Bank of India (SBI)</b> | 0.68         | 0.46         | 0.41         | <b>-0.19</b> | 0.02         | 0.38         | 0.48         | 0.320          | 2            |

Sources: Data compiled from annual reports of concerned banks IBA and RBI s report



**Table 15.** Solvency position

| <b>Z-Index and Probability of PSB's Insolvency</b> |                |           |                 |                |                |          |                |
|--|----------------|-----------|-----------------|----------------|----------------|----------|----------------|
| <b>Banks</b>                                       | <b>Average</b> | <b>SD</b> | <b>Variance</b> | <b>Average</b> | <b>Z Score</b> | <b>P</b> | <b>Ranking</b> |
| Bank of Baroda                                     | -0.03          | 0.41      | 0.17            | 13.12          | 31.93          | 0.00049  | 3              |
| Bank of India                                      | -0.40          | 0.53      | 0.28            | 12.86          | 23.53          | 0.0009   | 5              |
| Bank of Maharashtra                                | -0.52          | 1.20      | 1.44            | 12.17          | 9.69           | 0.00532  | 11             |
| Canara Bank  | -0.08          | 0.46      | 0.21            | 12.35          | 26.63          | 0.00071  | 4              |
| Central Bank of India                              | -0.71          | 0.71      | 0.51            | 11.06          | 14.57          | 0.00236  | 7              |
| Indian Bank  | 0.43           | 0.19      | 0.04            | 13.61          | 74.27          | 0.00009  | 1              |
| Indian Overseas Bank                               | -1.24          | 1.14      | 1.29            | 10.82          | 8.43           | 0.00704  | 12             |
| Punjab & Sind Bank                                 | -0.56          | 1.00      | 1.00            | 12.17          | 11.64          | 0.00369  | 10             |
| Punjab National Bank                               | -0.36          | 0.81      | 0.65            | 11.79          | 14.16          | 0.00249  | 8              |
| UCO Bank   | -0.88          | 0.90      | 0.80            | 11.4           | 11.75          | 0.00362  | 9              |
| Union Bank of India                                | -0.14          | 0.59      | 0.35            | 11.6           | 19.39          | 0.00133  | 6              |
| State Bank of India                                | -0.14          | 0.30      | 0.09            | 12.91          | 42.71          | 0.00027  | 2              |

Sources: Data compiled from annual reports of concerned banks IBA and RBI's report

## 5. DISCUSSION AND ANALYSIS

In our study, we have used the parameters of the CAMELS model and the Z score model to evaluate the performance and solvency of public sector banks. Saving holders and investors do not have time to monitor the quality of assets and employee performance. Our study found that banks' performance is highly affected by the quality decision regarding the allocation of deposits into fruitful investments. The BASEL norms for a higher capital base approaching RBI relaxed norms with raising capital. RBI monitors the liquidity closely in public sector banks. It is easier for banks equipped with adequate capital requirements to sustain unexpected losses as capital adequacy banks' cost of financing is also decreased, which eventually increases banks' profitability [29]. Only two banks (Indian overseas bank and Central Bank of India) were found with an average of capital adequacy less than specified by the RBI. Hence, most banks fulfil the minimum capital adequacy requirements specified by the BASEL norms, which shows the soundness of banks. Banks prefer a high ratio of lending so more profit can be generated. Banks that lend more aggressively are more profitable according to this ratio. Receivables are included in total advances. A high percentage is preferable in the banking system. Most banks adopted an aggressive lending policy to utilize their resources for better performance. Quality of assets leads to the overall health of banks. Generally, loans comprise the bulk of risk assets, while investment in assets also contains risky securities. Ineffective utilization of assets might threaten bankruptcy. In the case of PSB, the NPA problem was a severe concern, resulting in decreased performance. An appropriate procedure must be created quickly to avoid jeopardizing certain already weaker state-owned banks' ability to operate.

The study reported that some non-performing assets in banks and SBIs performed better than other nationalized PSBs. In contrast, an Indian overseas bank was found to be in a worse position. Hence, proper and effective investment decision management is required among banks with the largest NPAs. Net Non-Performing Assets (NNPA) is an essential indicator for banks to know the absolute quality of assets. SBI, Indian Bank and Bank of Baroda have reported this ratio better, which is considered favourable to managing non-performing assets. In the study, two banks, PNB and Indian Bank were found to have a high proportion of NNPA, which requires governing the asset's quality. Another parameter of the banks' performance is the investment assets ratio. A higher ratio reveals a conservative lending policy among the banks,

meaning banks prefer investment over lending. The non-availability of borrowers and NPA could be the reason for the aggressive investment policy. In the study, it has been found that almost all selected banks adopt a higher investment policy than lending to borrowers. The efficiency of banks can be measured with the help of business and profit per employee than converting deposits into assets. It shows the ability of bank staff to convert deposits into assets. SBI is better among the banks. Where only three banks reported a low-level conversion ratio, and for these banks, it is necessary to train their employee. Employee productivity reflected by the business per employee or BPE reveals higher productivity or vice versa. Findings show that 8 PSBs have a negative profit per employee ratio, showing poor employee performance and needing an orientation or training program in concerned banks. The quality of earnings has been analysed with the help of net interest margin Vs spread which is an essential indicator reflecting the performance of banks.

The Net Interest Margin (NIM) is a gap between interest income and interest expended as a percentage of assets. The higher the NIM ratio, the greater the interest revenue generated by lending. The study found that the NIM ratio was satisfactory among the banks. The interest-to-income ratio measures a bank's capacity to produce interest revenue from assets or lending. Dividends and income as interest are considered part of the income earned by a firm. The results suggest that banks prefer lending policy to other investment possibilities since their percentage is high. Liquidity is the CAMELS model's final component to indicate banks' performance. An optimum balance between profitability and liquidity is required on a priority basis. Liquid assets corresponding to total assets are essential for the banks. Credit to deposits is the ratio by which liquidity can be measured. Credit is the total amount of loans granted by the banks, while deposits mean total savings from the saving holders. This ratio explains how deposits create loans. The study reveals that all other banks recorded a higher percentage than 60 per cent except for UCO and Central Bank of India.

Return on Assets (ROA) evaluates how much money a firm generates using its assets. Another way ROA measures a company's efficiency and profitability is by concerning the assets and resources it owns or controls. After demonetization and GST reforms, ROA was negative in most banks. Except for one public sector bank (Indian bank), all PSB s throughout the study period reported negative ROA. The degree of solvency position was measured in this study with the Z score method. The study revealed that five banks had an excellent Z



score which indicates the proper financial solvency position among the banks, whereas five banks had very low Z scores, and such banks need improvement in their ROA. This method helps predict the possibility of failure of banks.

## 6. CONCLUSIONS

This study assessed the different financial ratios using the CAMELS model. To know the financial soundness of banks, the Z score method has been applied to 12 public sector banks. The study evaluates economic performance and solvency determinants from 2015 to 2021. The literature survey included variables like capital adequacy, NPA, quality of assets, solvency and return on assets. Determinants analyzed in the study present a view of the banks' overall performance. The functional level was assessed through the liquidity and solvency ratios. We have used the CAMELS model for performance while the Z index method to evaluate the solvency position.

This study is useful to saving holders, bankers, investors and bank management to examine the bank's performance in terms of asset quality and performance. Investment quality employees' performance provides helpful information to management to increase their productivity. NPA should be monitored to ascertain the effective utilization of resources. Quality of assets and return on assets are the essential determinants in the banks. Hence, regulators and banks need to use indicators and factors to examine banks' NPA and solvency status.

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