

Major Research Project

**“APPLICATION OF TOPSIS METHOD FOR
FINANCIAL PERFORMANCE EVALUATION
OF SELECTED INDIAN BANKS”**

Submitted By

Simar Bhatia

23/UMBA/104

Under the Guidance of

Dr. Mohit Beniwal

Associate Professor



**DELHI SCHOOL OF MANAGEMENT
DELHI TECHNOLOGICAL UNIVERSITY**

Bawana Road Delhi 110042

CERTIFICATE

This is to certify that Mr. Simar Bhatia has completed the project titled “**APPLICATION OF TOPSIS METHOD FOR FINANCIAL PERFORMANCE EVALUATION OF SELECTED INDIAN BANKS**” 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. To the best of my knowledge, this is an original piece of work & has not been submitted elsewhere.

Dr. Saurabh Agarwal

Head Of Department

Delhi School of Management

Delhi Technological University

Dr. Mohit Beniwal

Associate Professor

Delhi school of Management

Delhi Technological University

DECLARATION

I, Simar bhatia student of Delhi School of Management, Delhi Technological University hereby declare that the **Project Dissertation Report** on “**APPLICATION OF TOPSIS METHOD FOR FINANCIAL PERFORMANCE EVALUATION OF SELECTED INDIAN BANKS**” submitted in partial fulfillment of the requirements for the award of the degree of Master of Business Administration (MBA) is the original work conducted by me. I also confirm that neither I nor any other person has submitted this project report to any other institution or university for any other degree or diploma. I further declare that the information collected from various sources has been duly acknowledged in this project.

NAME:Simar Bhatia
PLACE:Delhi
DATE:23-0502025

Acknowledgement

The satisfaction that I have completed my **Major Research Project** successfully gives me immense pleasure and happiness. This project would have been incomplete without mentioning the names of the people who have rightly guided. I consider it my privilege to express my gratitude and to all who have helped me in the success of the project.

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**Simar Bhatia
(23/UMBA/104)**

Executive Summary

The main objective of our study is to find the financial performance after comparison with other banks. In this study we used some financial ratios from the annual reports of five banks ICICI, HDFC, Axis, Bank of Baroda, State Bank of India. We have tried to find out which bank were doing better in all the banks and finding the rank on the basis of financial ratios. For finding weights of all the ratios we have used Shannon entropy which basically gives you the weightage of the ratios on the basis of available entropy where the points where highest number of elements were given highest value as compared to lowest numbers of particles.

After that we have used the topsis method to find out the ranking on the basis of weightage we had find out from the Shannon Entropy. Basically, topsis were used where we have multiple decision criteria to decide which one be the best from all the scenarios and this help in giving the ranking to all alternatives.

In India there is no as such method to rank the different banks on the basis of their working so were trying to find the ranking of different banks with the help of TOPSIS. After the topsis we have find out the distance from best possible result and try to take value which were at least distance or far point from worst possible solutions and then try to find out the best possible outcomes one after another. Ranking system helps in chose the best banks for investments or which bank were providing best services or we can say that it also gives you the best bank on the terms of ROI. In this paper we have used the number of branches as this gives feasibility to the customer to use the banks and ROI gives you how much return you were getting after investing in the stocks of banks. Also, we have taken how much casa were maintained by banks in year 2023 annual reports. ROA and net profit were some other ratios we have taken to analyze the data.

This analysis gives you the result that HDFC were doing better than other banks we had taken for this research. Also, private Banks were doing better than the government owned banks which were SBI and BOB. As these banks run on different perspectives as compared to the private banks which works on maximizing profit and providing best services to them

customer and come up with different schemes so that more and more customer join them and enjoy the benefits of different banks.

Whereas state owned banks were trying to focus on security and they had to follow all government norms and they were faced less competition as they were working to meet the demand of the people. At present Bank of Maharashtra giving loans at least interest rates and private bank known for its faster services and more customer oriented. They have to face competition from other banks and works for maximizing the shareholders worth.

Private Banks are doing better as compared to state owned or government owned banks in most of the financial ratios. We have identified ranks of all the banks which we have used on the basis of health, soundness and quality of financial Ratios.

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Chapter-1.

INTRODUCTION

1.1 Background of Indian Banking System

Since the first half of the 19th century, the Indian financial sector has had a lengthy and difficult history. The Bank of Hindustan was founded in 1770 and was India's first bank. On the other hand, it wasn't until the 20th century that the current Indian financial system started to take shape. The British East India Company founded the Bank of Calcutta (now known as the State Bank of India) in 1806 at the beginning of the 19th century, which is when the Indian banking system first gained prominence. Banking has developed over the years. In order to stay current with the changing demands of the Indian economy throughout time, the Indian system has undergone major alterations.

The British East India Company founded the Bank of Calcutta (today known as the State Bank of India) in 1806 and so began the long and fascinating history of the Indian financial sector. The world of finance has changed throughout time. To keep up with the shifting demands of the economy, the Indian system has undergone substantial adjustments.

As a quasi-central bank created in 1921 to serve as a banker to other Indian banks that also served as central banks, the Imperial Bank of India was founded. In order to control the country's monetary policy and banking sector, the Reserve Bank of India (RBI) was created in 1935 and served as the nation's central bank. After becoming a national institution in 1949, the RBI's responsibilities were extended to encompass banking industry regulation and oversight.

The country's banking industry and economy are both under the supervision of the RBI, which also sets monetary policy, manages inflation, and oversees these areas of the economy. In order to encourage financial inclusion and enhance the Indian banking sector after India's independence from British control in 1947, the government of India started nationalising banks. In 1969, 13 important commercial banks were nationalized and in 1980 seven more banks. These banks were known as public sector banks and

were owned by the government. In the decades after independence, India's banking system underwent a series of reforms aimed at promoting financial inclusion, improving access to credit, and improving the efficiency and stability of the industry. In the 1960s, the government nationalized 14 large banks, which together accounted for approximately 86 percent of deposits in the banking sector.

Pre-Independence Banks in India	
Bank Name	Year of Establishment
Allahabad Bank	1865
Punjab National Bank	1894
Bank of India	1906
Central Bank of India	1911
Canara Bank	1906
Bank of Baroda	1908

Table 1.1 Pre Independence Bank in India

To liberalize the sector and boost competition, the banking system underwent more change in the 1980s and 1990s. The formation of new private sector banks, the admission of foreign banks, and the elimination of interest rates were some of these measures. The "universal banking" idea, which permits banks to provide a variety of financial services and products, was introduced by the RBI in 1993. At the moment, the banking system is made up of a variety of organizations, including public sector banks, private sector banks, foreign banks, cooperative banks, and regional rural banks.

There were 43 foreign banks doing business in India as of March 2020, along with 12 public sector banks and 21 private sector banks. The bulk of deposits and the balance sheet of the banking industry are held by public sector banks, which are majority owned by the Indian government. Following the liberalization changes of the 1990s, private sector banks were founded; they are held by both people and institutions, and they have had recent significant growth. Foreign banks conduct business in India

through networked branches and subsidiaries and are governed by the same laws as local banks.

In recent years, the Indian banking industry has encountered a number of difficulties, including an increase in non-performing assets (NPAs), more competition, and the effects of technological disruption. As a result, the government and regulators implemented a number of measures aimed at enhancing the effectiveness and stability of the industry, including the recapitalization of public sector banks, the consolidation of weaker banks, and the introduction of new technologies like digital banking and mobile payments.

Despite these difficulties, the Indian banking sector continues to play a significant role in the development and expansion of the economy of the nation. It is a significant source of funding for infrastructure and other development projects, and it plays a significant role in providing credit and financial services to both consumers and companies.

State Bank of India

The State Bank of India (SBI) has been around since the early 19th century and is the largest public sector bank in India. The Bank of Calcutta, which preceded the Bank of Bombay and the Bank of Madras, was the original name of this institution when it was founded in 1806. The three banks were combined in 1921 to become the Imperial Bank of India, which following statehood in 1955 became the national bank of India.

The growth of the Indian economy in the years after independence has benefited greatly from the efforts of the State Bank of India. In addition to being a significant supplier of credit and financial services to small and medium-sized businesses, the bank increased the reach of its branch network to include distant and underserved regions of the nation. The bank was a key player in the government's 1960s and 1970s initiatives to support rural development and agriculture.

After the banking industry was liberalized and deregulated in the 1990s, the State Bank of India went through a period of reform and modernization. To increase productivity and customer service, the bank increased the scope of its business endeavors, diversified its activities, and implemented new technology.

With operations in over 30 countries and a network of more than 22,000 offices across India, State Bank of India is a major international banking organization today. Commercial banking, retail banking, investment banking, and wealth management are just a few of the many financial services the bank provides.

Increasing non-performing assets, growing competition from private sector banks, and the effects of digital disruption are just a few of the difficulties that the State Bank of India has had to deal with recently. The bank has put in place a variety of initiatives to address these issues, including bettering risk management procedures, optimizing business processes, and investing in cutting-edge technology like mobile banking and electronic payments. Despite these difficulties, State Bank of India continues to play a key role in the Indian banking industry and is still a significant and critical organization.

Despite these difficulties, the Indian banking sector continues to play a significant role in the expansion and advancement of the economy of the nation. It is a significant source of funding for infrastructure and other development projects, and it plays a significant role in providing credit and financial services to consumers and businesses.

HDFC Bank

One of India's major private sector banks, HDFC Bank has been around since 1994. The bank was started as a member of the Housing Development Finance Corporation (HDFC) group, which was started in 1977 as a finance provider for specialized housing.

The Indian government started liberalizing the banking industry at the start of the 1990s, creating doors for private sector firms to enter the market. In August 1994, the Reserve Bank of India (RBI) granted a license to HDFC Bank, one of the first private sector banks, and it commenced operations.

By offering superior service from the beginning, HDFC Bank aimed to set itself apart from its competitors in the public sector. Customer service, cutting-edge goods and services, and an emphasis on technology and online banking. The bank quickly increased the number of its branches across India, and it introduced an online banking platform in 1996, becoming the country's first bank to do so.

The development of a mobile banking app in 2011 and the adoption of contactless payment technology in 2015 are just two examples of how HDFC Bank has evolved and broadened its product and service offerings over the years. The bank has increased the scope of its activities overseas, opening branches in countries including Dubai, Singapore, and the United States.

Today, HDFC Bank is regarded as one of India's most creative and successful banks, with a track record for sound risk management procedures and a dedication to providing excellent customer care. For its activities and accomplishments, the bank has won various honours and commendations, including five years in a row from Euromoney magazine's "India's Best Bank" title.

Even though it has been successful, HDFC Bank has recently experienced a number of difficulties, including regulatory crackdowns on digital banking practices and an increase in non-performing assets (NPAs). The bank has however made efforts to resolve these difficulties, including bolstering its risk management and compliance procedures and investing in new technology to enhance the clientele's experience.

A monument to HDFC Bank's dedication to innovation, client care, and technology-enabled banking is the bank's success and expansion over the last 25 years. The bank is well-positioned to continue fostering innovation and growth in the upcoming years after significantly contributing to the transformation of the Indian banking industry.

ICICI Bank

With a history extending back to 1994, ICICI Bank is one of India's top private sector banks. The Indian Industry and Credit Investment Corporation (ICICI), a joint venture between the World Bank, the Government of India, and Indian industry, served as the parent company for the bank until it was created as a separate entity in 1995.

In the early 1990s, the Indian banking industry underwent liberalization and deregulation, prompting the establishment of ICICI Bank. This has made it possible for firms in the private sector to enter the market.

The bank began operations in 1994 and swiftly became a dominant force in the Indian banking sector. In its early years, ICICI Bank developed a number of cutting-edge

products and services, including India's first online banking platform and the nation's first mobile banking service. ICICI Bank was known from the start for its focus on technology and innovation.

To grow as one of India's largest private banks, ICICI Bank persisted in innovation and service expansion over time. With operations in nations including the US, Canada, and the UK, the bank is also extending its operations overseas. ICICI Bank has contributed significantly to the cause of financial inclusion in India in addition to its work in commercial banking. Banks have started a number of programmes to increase underserved and underbanked customers' access to financial services. Their initiatives Rural Micro Banking and Self-Help Group.

Despite its success, ICICI Bank has had several difficulties lately, including controversy around claims that its former CEO had engaged in fraud as well as a rise in non-performing assets (NPA). Nevertheless, banks are taking action to solve these problems, such as: B. Improve asset quality by strengthening risk management and compliance procedures.

All things considered, ICICI Bank's success and expansion over the past 25 years are a tribute to its emphasis on innovation, technology, and customer service, as well as its dedication to fostering financial inclusion and increasing access to financial services in India. The bank is in a good position to continue promoting innovation and expansion in the Indian banking sector over the coming few years.

Axis Bank

One of the top private sector banks in India, Axis Bank has been around since 1994. The Unit Trust of India, one of the biggest investment firms in India at the time, established the bank as UTI Bank, a subsidiary.

UTI Bank was founded with the intention of offering a variety of financial services to both individual and corporate clients, and it has quickly become a significant participant in the Indian banking sector. The bank has introduced a number of cutting-edge goods and services, including the nation's first gold card for high-net-worth people and India's first online trading platform.

In order to better represent the bank's new character as a cutting-edge and energetic financial organization, UTI Bank was renamed Axis Bank in 2007. With a foothold in nations like Singapore, Hong Kong, and Dubai as well as an expansion of its activities both domestically and abroad, the bank continues to see tremendous growth.

Axis Bank has developed a solid reputation for its cutting-edge, client-focused approach to banking over the years. Additionally, it introduced a number of groundbreaking goods and services, such as the rewards-based Axis Bank Buzz credit card and the online trading platform Axis Direct. on the deals for online purchasing. Axis Bank has contributed significantly to advancing financial inclusion in India in addition to its commercial banking activities.

Banks have started a number of programmes to increase underserved and underbanked people's access to financial services. Their Financial Inclusion Lab helps fintech start-ups in India that are trying to increase financial inclusion. Despite its success, Axis Bank has recently experienced a variety of difficulties, such as an increase in non-performing assets (NPAs) and worries about its corporate governance procedures. But banks are acting to solve these problems, strengthening their risk management and compliance procedures and putting in place measures to raise the caliber of their assets.

Overall, Axis Bank's success and expansion throughout the years are a tribute to its focus on financial inclusion, customer care, and innovation, as well as to its capacity to change with the times and meet the demands of its clients. Over the coming years, the bank is in a good position to continue fostering innovation and expansion in the Indian banking sector.

Bank of Baroda

With roots going back to 1908, the Bank of Baroda (BOB) is the top public sector bank in India. Maharaja Sayajirao Gaekwad III of Baroda formed the bank with the intention of offering financial services to the citizens of Baroda and the surrounding area.

Under the name Baroda Central Bank, the bank first ran as a private institution. But it changed its name to Bank of Baroda in 1913 and became a public business. The bank's operations spread throughout India as it continued to develop quickly, and in 1953 it established its first international office in London.

Bank of Baroda was a leader in several projects and innovations that helped the Indian banking sector grow throughout the years. The bank was the first Indian bank, for instance, to open a branch outside of India, to provide credit cards, and to introduce mobile ATMs.

With operations in more than 20 nations, including the United States, the United Kingdom, and Singapore, Bank of Baroda has recently increased the scope of its worldwide activities. Additionally, banks are taking part in a number of significant projects that support sustainable development and financial inclusion. Consider the Swachh Bharat Abhiyan movement, which seeks to encourage cleanliness and hygienic living throughout India.

Despite having a long and distinguished history, Bank of Baroda has recently encountered a number of difficulties, such as an increase in non-performing assets (NPAs) and worries about its corporate governance procedures. The implementation of a thorough asset quality assessment process and the strengthening of risk management and compliance procedures are only two initiatives that banks are taking to solve these problems.

In general, Bank of Baroda's history demonstrates the organization's dedication to innovation, customer satisfaction, and social responsibility. The bank is in a good position to continue fostering innovation and growth since it has played a significant role in the expansion and development of the Indian banking sector.

The TOPSIS method can be used in any sector and is a very useful process for corporate management decision-making situations. Kazan and Ozdemir (2014) state: H. Create index performance ratings based on various criteria. ” Against this background, the financial performance of selected proposed banks in India will be evaluated using TOPSIS analysis.

Shannon entropy

Prioritization by similarity to ideal (TOPSIS) methodology is a popular strategy in multi-criteria decision making (MCDM) for selecting the best choice from a group of alternatives based on many criteria. In TOPSIS, the criteria weights may be calculated using the Shannon entropy.

Each criterion is given a weight by TOPSIS that represents its relevance in the decision-making process relative to other criteria. These weights are often established using a mathematical formula or the decision maker's preferences. Utilising Shannon entropy is one method for formulating the weights.

To use Shannon entropy with TOPSIS, first normalize the decision matrix. The entropy for each criterion is then calculated using the following formula:

$$E_i = - \sum (P_{ij} * \log_2 P_{ij})$$

where E_i is the entropy of the i -th criterion,

P_{ij} is the normalized value of the j -th alternative of the i -th criterion, and the sum is formed over all alternatives.

In relation to that requirement, the entropy value offers a measurement of the diversity or dispersion of the data. When the distribution of criterion scores for the options is uniform, entropy is large. When the values are centered on one or two options, the entropy is minimal. Then the weight for each criterion is calculated as:

$$w_i = (1 - E_i) / \sum (1 - E_i)$$

where w_i is the weight of the i -th criterion and the sum is taken over all criteria.

The weights obtained from the Shannon entropy method can be used in TOPSIS to rank the alternatives and identify the best one.

1.2 Problem Statements

According on their performance, several Indian banks might be ranked using the following problem statement:

Several governmental, private, and international banks make up the Indian banking system; each has a unique set of operating capabilities, business models, and operational strategies. There is no set method for evaluating these banks, despite the fact that there are several measures and indicators that may be used to assess their performance. Because of this, choosing which banks to work with is tough for clients, investors, and other stakeholders.

Therefore, the problem statement for a research paper on rating various Indian banks according to their performance could be: What are the most suitable and efficient methods for evaluating the performance of various Indian banks, and how can these methods be used to develop a comprehensive and reliable ranking system?

What are the main elements that influence the success or failure of banks in India, and how may these be accounted for in the ranking system?

How might ranking systems be utilized to offer banks useful information and suggestions for enhancing their performance and competitiveness?

Efficiency, customer satisfaction, innovation, and more. Additionally, you may evaluate the advantages and disadvantages of various Indian banks, their market positions, and how they have adapted to the evolving regulatory, technological, and competitive environments. Finally, this study suggests a ranking approach that takes into account the distinct traits and priorities of the Indian banking system and evaluates the method's performance using actual data.

1.3 Objectives of the study

The goal of the study paper is to give a thorough and trustworthy bank that can assist stakeholders in making decisions about which banks to cooperate with by ranking various Indian banks according to their performance. creating a rating scheme. The following goals are the focus of this essay:

1. Considering the special qualities and priorities of the Indian banking system, determine the most appropriate and efficient method of evaluating the performance of various banks in India.
2. Evaluate the market positioning, regulatory, technological, and competitive landscape responses of various Indian banks, as well as their strengths and shortcomings.
3. Create a ranking technique that takes the indicated performance indicators and variables into account in order to give a thorough and reliable evaluation of each bank's performance.

4. Test the ranking process using actual data to judge its usefulness and efficacy and to pinpoint any areas that require adjusting or improving. Five. on the basis of ranking results, offers banks with useful insights and suggestions for enhancing their performance and competitiveness. The overall goal of this study paper is to help India's banking sector become more open, responsible, and competitive so that stakeholders may make better decisions regarding banking services.

1.4 Scope of Study

The unique study questions and goals will determine the breadth of research papers to compare the performance of various Indian banks. However, the following topics might possibly be covered by this study:

Measures of performance: The following performance indicators are examined in this white paper: B. Evaluate profitability, asset quality, capital sufficiency, efficiency, customer happiness, and innovation to determine their applicability and legitimacy for assessing the performance of Indian banks.

2. Data Resources Various data sources, including financial statements, regulatory reports, market data, customer surveys, and expert views, are used in the research to gather and analyze information on the performance of different banks in India.

3. Sample size and makeup: This study can concentrate on a certain subset of banks. A larger variety of banks, including public, private, and international banks, may be included, depending on assets or market share, including significant Indian banks.

4. Timeframe: An investigation may span a certain amount of time. B. To evaluate the development of different banks' financial performance during the previous fiscal year or the previous five years.

5. Ranking Methodology: Using the performance indicators and other criteria outlined in this research, a ranking methodology with a thorough and trustworthy evaluation of each bank's performance may be developed. Methodologies may be based on peer group comparisons, weighted rating systems, or a mix of other techniques.

Recommendations: Based on the findings of the rating, this report may offer banks useful insights and suggestions for enhancing their performance and competitiveness.

Risk management, operational effectiveness, customer experience, innovation, and strategic positioning are some examples of areas on which recommendations could concentrate.

The study's overall goal is to give stakeholders a thorough and unbiased evaluation of the performance of different Indian banks so they can make educated judgements concerning the expansion of banking services. The study could help create best practises for assessing and rating banks in developing economies.

Chapter - 2

Literature Review

The literature review offers us a sense of the topics that have been studied in the past, as well as how much, how aggressively, and how deeply the issue has been studied, as well as when it was studied. Additionally, it aids in examining the gap between the study and the point at which you had to begin your research on a certain issue and also informs you of how you would proceed with that topic. A literature study provides in-depth knowledge and comprehension of the subject. In this survey of the literature, we show how to rank things using a topological analysis. Operations research and decision theory originally employed the Multiple Objective Decision Making (MODM) technique in the 1970s and decision theory in the 1970s and has since been applied to the financial sector. In a MODM environment, TOPSIS can be used to assess the financial performance of each business unit.

So in this literature review we had identified several write-ups on ranking of banks and what steps were used for ranking of the banks on the basis of their financials. Some of them are given below.

1. Demireli (2010) looked at output Counting public sector banks that were active in Turkey between 2001 and 2007 using the TOPSIS technique, there were 10 the most widely applied ratio. Evaluation by Acuse et al. Financial Results of Ceramics Companies with ISE Listed Stocks 19 financial statistics are used during the time frame of 1999 to 2008 utilizing the TOPSIS approach. (2015) Gundogdu Turkish foreign banks' overall financial performance throughout the ten years from 2003 to 2013 TOPSIS multiple decision matrix technique. performance of Deutsche Bank as an author most effective foreign bank operating in Turkey Türkiye and Burgan Bank were the hardest affected by the global financial crisis from 2003 to 2009 artist from Turkey.

2. Renu Arora and Vishal Goyal's 2014 study, "Banking Sector Reform and NPAs: A Study of Commercial Banks in India," B. Bad credit ratings, political meddling, and a decline in the economy. It also evaluates the steps taken by the government and his

RBI to resolve NPA difficulties, including the creation of asset recovery firms and the adoption of Basel III norms.

3. Literature Review of the Indian Banking Industry, published in 2013 by B. Rajasekaran and M. Ravi Kumar This article gives a general overview of the Indian banking sector, including its background, organizational structure, and legal framework. The issues affecting the sector are examined by the writers, including: poor assets, technology advancements, and shifting consumer tastes. A. Basel III Standards and Impact on Industry Performance, for example, are among the most recent advancements evaluated.

4. Renu Arora and Vishal Goyal's study on commercial banks in India, Banking Sector Reform and NPAs, was published in 2014. B. Negative credit ratings, political meddling, and a decline in the economy. Additionally, it evaluates the steps taken by the government and his RBI to resolve the NPA problem, including the creation of asset recovery firms and the adoption of Basel III norms.

5. The study, "A Literature Review of the Indian Banking System," (2017) Ankita Tyagi and Dr. M. S. Thakur This review examines the organizational structure, performance metrics, and legal framework of the Indian banking sector. The macroeconomic environment, competition, and consumer behavior are only a few of the aspects the author examines in her analysis of the success of Indian banks. It evaluates contemporary industry changes including digitization and financial inclusion and their effects on the sector's growth

6. Neha Arora and Dr. Shilpa Jain (2017) This article analyses new developments in Indian banking, including digitalization, financial inclusion, and green banking. The adoption of new technology, the growth of the client base, and the promotion of sustainable development are just a few examples of how the authors analyze how these developments will affect the structure and performance of the banking industry. A. The Need for Cybersecurity, B. Managing Data Protection, and C. Promoting Financial Literacy are some of the issues the sector is experiencing.

7. Review of the Indian Banking Industry by SR Yadav and RK Jha, published in 2018 The evolution, legal system, and performance of the Indian banking sector are all covered in this assessment. The writers review elements including risk management, innovation, and customer service that support the expansion and competitiveness of

Indian banks. Additionally, it evaluates the difficulties the sector is now facing, including Rising NPAs and Low Profitability, and Policy Recommendations to Address Them.

8. Revised version of "India's Banking Sector Reform" 2020 T.R. Bishnoy and R. K. Sharma An study of the nationalization, liberalization, and globalization phases of India's banking sector reform is provided in this summary. The authors evaluate the effects of these reforms on the banking sector, including the appearance of new players, the use of new technology, and the reinforcement of the regulatory framework. It also examines issues facing the sector, namely B. The requirement for consolidation and risk management.

9. M Suresh and K Padmasani's review article, "The Impact of Mergers and Acquisitions on the Indian Banking Sector," was published in 2020. This paper analyses how mergers and acquisitions (M&A) have affected the Indian banking industry. Strategic goals, market circumstances, and the regulatory environment are some of the elements the author examines as they relate to his M&A in the banking industry. Additionally, it evaluates the effects of M&A on the banking industry's performance, including boosted productivity, decreased risk, and enhanced client care. It also examines the difficulties the sector is now experiencing following mergers and acquisitions, including technological integration, human resource management, and cultural integration.

To the best of our knowledge, there exists no study that examined the financial performance of select scheduled banks in India based on TOPSIS. In this paper we have ranked the select scheduled banks in India by using TOPSIS method on the basis of eight ratios during the period 2023.

Chapter 3.

Research Methodology

The introduction of private enterprises and the emergence of digital banking have significantly altered the Indian financial industry during the past several decades. Given their influence on the country's economy as a whole, the performance of the many banks functioning there has become a crucial topic of research. Ranking banks according to their performance can be done using methods like TOPSIS (Technique for Order of Preference by Similarity to Ideal Solution). This research paper describes a research methodology using TOPSIS to rank different banks operating in India based on their performance.

1. Exploratory and descriptive research methods were used in this study's design. To establish the standards for rating banks based on performance, exploratory research was performed. Using TOPSIS, descriptive research is utilized to assess bank performance. In this study, there will be two phases. The criteria for ranking banks are determined in the first step, and TOPSIS is used to analyze the performance of the banks in the second stage.
2. Data Collection: Annual reports and other secondary sources are where data for this study were gathered. The RBI's publications, bank annual reports, and other pertinent sources are used to gather secondary data. For a year, data is gathered. To determine the banks' rating, several ratios were gathered.
3. Sampling: To choose the banks for analysis in the study, stratified random sampling is used. Various governmental, private, and international banks that conduct business in India are included in the sample. Utilizing the ratio sample size calculation formula, the sample size is established.
4. Establishing the Criteria: Ratios that were found in annual reports are used to establish the criteria for categorizing banks according to performance.
5. Analysis of the Data: TOPSIS is used to analyze bank performance. The criteria chosen in the preceding stage are used to assess each bank's performance. Weighted scores for each criterion are computed after normalizing the data. Based on their overall effectiveness, banks are ranked using the TOPSIS methodology. The TOPSIS algorithm includes the following steps:

1. Create a decision matrix using the normalized scores for every criterion for every bank.
2. Searching for the optimal answers in light of topsis's discoveries.
3. Determine the Euclidean separation between each bank and any solution's ideal or negative-ideal.
4. Determine if each bank is somewhat near to the ideal or less-than-perfect answer.
5. Determine which banks are the closest to each other.

Validity and Reliability: Strong research designs, suitable sampling methods, and trustworthy data sources are used to assure the validity of studies. The use of standardized ratios and proper statistical techniques ensures the dependability of research.

Ethics: This study conforms with ethical standards for using human participants in research by getting informed consent and preserving the report's confidentiality. Prior to gathering data, respondents are told of the survey's objectives and given the opportunity to provide their consent. Participants are assured of their confidentiality, and collected information is kept private.

A popular method for ranking and assessing options based on a variety of factors is TOPSIS (Technique for Order of Preference by Similarity to Ideal Solution). This method, which was initially put out by Huang and Yun in 1981, is extensively employed in a variety of disciplines, including business, engineering, social sciences, and environmental management.

The foundation of the TOPSIS approach is the idea of a nearly ideal solution, or the location where all requirements are perfectly satisfied. In other words, the system rated different options according to how close they were to the greatest potential outcome, whether that was the perfect answer or a less-than-ideal one. The choice that maximises the utility criteria while minimizing the cost criterion is considered to be the perfect solution, while the other option that minimizes the utility criterion while increasing the cost criterion is considered to be the ideal solution in reverse.

Using the Euclidean distance formula, the separation between each option and the ideal and non-ideal solutions is determined, and the distance between each option and the ideal solution determines how close each option is to the ideal answer. is calculated using the distances between the Negative ideal solution as a ratio. Compared to other methods of decision-making, the TOPSIS approach provides a number of benefits. It first supports both quantitative and qualitative requirements. Second, it doesn't need intricate mathematical computations and is straightforward and simple to apply. Third, we offer a straightforward rating of potential solutions based on how close they are to the best option.

TOPSIS does, however, have significant drawbacks. First, it is sensitive to how the criteria are weighted, which might have an impact on how alternatives are ultimately ranked. Second, the assumption that the connection between the criteria is linear may not hold true in practise. Third, it may be impacted by the scale of the criteria, which may have an impact on final ranks and distance estimates. To overcome these restrictions, a number of TOPSIS technique expansions and changes have been proposed Fuzzy TOPSIS, hesitating TOPSIS is fuzzy, TOPSIS is grey. In addition to offering more adaptable and reliable decision-making tools, these improved approaches take uncertainties and ambiguities into consideration during the decision-making process.

The TOPSIS technique is applicable to many different disciplines, including business, engineering, social sciences, and environmental management. The TOPSIS technique may be applied to the Indian banking sector to assess and rank individual banks according to how well they perform in relation to several metrics, including profitability, asset quality, liquidity, and efficiency.

Topsis with Shannon entropy

1. Define the decision problem: Applying the TOPSIS technique begins with defining the decision issue, identifying the potential solutions, and selecting the relevant criteria. This is important step as it defines the objective and criteria of the problem. The decision problem refers to the specific decision making like choosing a phone, a supplier from different supplier on the basis of qualities of the alternatives.

Defining the problem contains identifying the features of all available choices and relevance of the features according to the decision problems and their ability to differentiate among all available choices. Once the decision maker appropriately defines the problem then he will be able to rank the different alternatives on the basis of available features.

2. Normalize the decision matrix: Normalize the decision matrix by dividing each element by the sum of all elements. Normalizing the data in Shannon entropy gives you the value which evaluates all the criteria and give equal weights and importance to every criterion.

Normalization involves scaling the data between 0 to 1. This is important as different values have different units so it makes difficult to compare different values so we do normalization.

By doing normalization each criterion is given equal weight and importance without taking its original unit. This help in taking the fair decision among all available alternatives and on the based on information provided.

3. Calculate the entropy of each criterion: Calculate the entropy of each criterion using the formula

$E_i = - \sum (P_{ij} * \log_2 P_{ij})$, where P_{ij} is the normalized value of the j-th alternative for the i-th criterion, and the sum is taken over all alternatives.

This help in finding the elements on the basis of availability of particle in the surrounding basically this gives more importance to the place where more value is associated.

4. Calculate the weight of each criterion: Calculate the weight of each criterion using the formula

$$w_i = (1 - E_i) / \sum (1 - E_i),$$

where w_i is the weight of the i-th criterion, and the sum is taken over all criteria.

Weight of criteria was important parameter in toposis which generally describes the weight of each component in overall criteria. Also, weight of each criteria reflects the decision maker's preference and importance.

The weight of each criterion is determined by a process of comparison with overall criteria, where decision maker compares it with other criteria and defines the importance of each criterion with respect to other criteria.

5. Normalize the matrix by taking the squares and divide it by square sum of all. Normalization involves scaling the data between 0 to 1. This is important as different values have different units so it makes difficult to compare different values so we do normalization.

By doing normalization each criterion is given equal weight and importance without taking its original unit. This help in taking the fair decision among all available alternatives and on the based on information provided.

6. Multiply each element in the normalized decision matrix by its corresponding weight. This help in giving the value according to the weight assigned to the different criterion on the basis of importance in decision making according to the objective decided by the decision maker. This help in giving importance characteristics more value and less to less valued.

7. Establish both positive and negative ideal solutions. The best option is the one that maximizes the utility criteria, is close to the best option, minimizes the cost criterion, or has the lowest possible cost. Contrarily, the alternative solution, or negative ideal solution, maximizes the cost criteria while minimizing the utility criterion. In this scenario, we would choose the opposite of the perfect solution. Calculate the Euclidean distance for each choice from the ideal and negative ideal solutions: The Euclidean distance is calculated using the formula:

$$d = \sqrt{\sum (w_{ij} * (x_{ij} - p_{ij})^2)} \quad (i = 1 \text{ to } n)$$

where w is the weight of the criterion,

x is the alternative normalized score of the criterion, and

p is the ideal or negative ideal score of the criterion.

Calculate the relative closeness of each choice to the ideal solution: Relative closeness is calculated using the following formula:

$C^* = d^- / (d^+ + d^-)$ ($i = 1$ to n) where d is the Euclidean distance of the choice from the ideal solution, d^- is the Euclidean distance of the choice from the negative ideal solution, and n is the number of choices.

8. Rank alternatives based on their relative proximity to the ideal solution: Alternatives are scored according to how close they are to the ideal answer, with higher scores denoting greater performance. Demonstrate your competence.

Run Sensitivity Analysis: You can run a sensitivity analysis to test the robustness of your rankings to changes in criterion weights or normalization method.

The TOPSIS method can be applied to a variety of decision problems such as product selection, project evaluation, supplier selection, and performance evaluation. However, this method is particularly useful when multiple criteria need to be considered or alternatives cannot be easily compared using a single criterion. By considering both benefit and cost criteria, and the relative importance of each criterion, the TOPSIS method provides a comprehensive and objective way to evaluate and rank alternatives.

Chapter – 4

Result and Analysis

4.1 Analysis

The TOPSIS technique is applicable to many different disciplines, including business, engineering, social sciences, and environmental management. The TOPSIS technique may be applied to the Indian banking sector to assess and rank individual banks according to how well they perform in relation to several metrics, including profitability, asset quality, liquidity, and efficiency.

Topsis with Shannon entropy

1. Define the decision problem: Applying the TOPSIS technique begins with defining the decision issue, identifying the potential solutions, and selecting the relevant criteria. This is important step as it defines the objective and criteria of the problem. The decision problem refers to the specific decision making like choosing a phone, a supplier from different supplier on the basis of qualities of the alternatives.

Defining the problem contains identifying the features of all available choices and relevance of the features according to the decision problems and their ability to differentiate among all available choices. Once the decision maker appropriately defines the problem then he will be able to rank the different alternatives on the basis of available features.

	Weights	SBI	Bank of Baroda	Hdfc	Icici bank	Axis Bank
max	Return on assets	0.63	0.56	1.79	1.6	1.1
max	Return on Equity	12.18	9	16.63	14.78	12.73
max	Net Interest Margin (X)	2.42	2.55	3.48	3.36	2.81
max	Net profit margin	12.83	10.8	28.03	27.81	20.64
max	Casa	44.51	41.45	48.13	48.69	44.99
max	Interest Income/Total Assets (%)	5.52	5.46	6.17	6.12	5.73
max	Non-Interest Income/Total Assets (%)	0.81	0.89	1.42	1.31	1.29
max	Net Profit/ Branches (Rs.)	1,42,26,165.68	89,03,381.00	5,82,80,282.56	4,30,77,686.78	2,73,75,952.92

Table- 3.1. Banks and their ratios

k	1.43068
m	5

Table-3.2. K and m Value

2. Normalize the decision matrix: Normalize the decision matrix by dividing each element by the sum of all elements. Normalizing the data in Shannon entropy gives you the value which evaluates all the criteria and give equal weights and importance to every criteria.

Normalization involves scaling the data between 0 to 1. This is important as different values have different units so it makes difficult to compare different values so we do normalization.

By doing normalization each criterion is given equal weight and importance without taking its original unit. This help in taking the fair decision among all available alternatives and on the based on information provided.

Weights	Cij				
Return on assets	0.110915493	0.098591549	0.315140845	0.281690141	0.193661972
Return on Equity	0.186466626	0.137783221	0.254592774	0.226270667	0.194886712
Net Interest Margin (X)	0.165526676	0.174418605	0.238030096	0.229822161	0.192202462
Net profit margin	0.128159025	0.107881331	0.279992009	0.277794426	0.206173209
Casa	0.195416429	0.181981824	0.211309654	0.213768275	0.197523818
Interest Income/Total Assets (%)	0.190344828	0.188275862	0.212758621	0.211034483	0.197586207
Non-Interest Income/Total Assets (%)	0.141608392	0.155594406	0.248251748	0.229020979	0.225524476
Net Profit/ Branches (Rs.)	0.093677339	0.058627536	0.383767623	0.283660627	0.180266875

Table- 3.3 Normalize Matrix

3. Calculate the entropy of each criterion: Calculate the entropy of each criterion using the formula

$E_i = - \sum (P_{ij} * \log_2 P_{ij})$, where P_{ij} is the normalized value of the j-th alternative for the i-th criterion, and the sum is taken over all alternatives.

This help in finding the elements on the basis of availability of particle in the surrounding basically this gives more importance to the place where more value is associated.

						sum
Return on assets	-0.105925159	-0.099198904	-0.158041654	-0.154993902	-0.138072397	-0.656232017
Return on Equity	-0.136008549	-0.118604302	-0.151267296	-0.146028695	-0.138412006	-0.690320849
Net Interest Margin (X)	-0.129298184	-0.132280324	-0.148380375	-0.146766293	-0.137663294	-0.694388471
Net profit margin	-0.114349993	-0.10432704	-0.154794804	-0.154530503	-0.141386942	-0.669389283
Casa	-0.138557855	-0.134661452	-0.142651061	-0.143236875	-0.139131931	-0.698239174
Interest Income/Total Assets (%)	-0.137135629	-0.136538663	-0.142997799	-0.142584726	-0.139148777	-0.698405595
Non-Interest Income/Total Assets (%)	-0.120212923	-0.125721217	-0.150219041	-0.146601993	-0.145870656	-0.688625829
Net Profit/ Branches (Rs.)	-0.096334539	-0.072223165	-0.159621107	-0.155219362	-0.13413371	-0.617531884
SUM	-0.977822833	-0.923555068	-1.207973138	-1.189962349	-1.113819713	

Table – 3.4 Entropy of Each Criteria

4. Calculate the weight of each criterion: Calculate the weight of each criterion using the formula

$$w_i = (1 - E_i) / \sum (1 - E_i),$$

where w_i is the weight of the i -th criterion, and the sum is taken over all criteria.

Weight of criteria was important parameter in topsis which generally describes the weight of each component in overall criteria. Also, weight of each criteria reflects the decision maker's preference and importance.

The weight of each criterion is determined by a process of comparison with overall criteria, where decision maker compares it with other criteria and defines the importance of each criterion with respect to other criteria.

	Eij	1-Eij	Weights
Return on assets	0.938856	0.061144237	0.239
Return on Equity	0.987626	0.012374144	0.048
Net Interest Marg	0.993445	0.006554693	0.026
Net profit margin	0.95768	0.042320445	0.166
Casa	0.998954	0.001045582	0.004
Interest Income/T	0.999193	0.000807487	0.003
Non-Interest Inco	0.985201	0.014799169	0.058
Net Profit/ Branch	0.883488	0.116511609	0.456
SUM		0.255557367	1

Table – 3.5 Weightage of all ratio.

5. Normalize the matrix by taking the squares and divide it by square sum of all. Normalization involves scaling the data between 0 to 1. This is important as

different values have different units so it makes difficult to compare different values so we do normalization.

By doing normalization each criterion is given equal weight and importance without taking its original unit. This help in taking the fair decision among all available alternatives and on the based on information provided.

	SBI	Bank of Baroda	Hdfc	Icici bank	Axis Bank
Return on assets	0.227263618	0.202012105	0.645717264	0.577177442	0.396809492
Return on Equity	0.409100319	0.302290876	0.558566363	0.496428794	0.42757365
Net Interest Margin	0.366267488	0.385943014	0.526698702	0.508536677	0.425294066
Net profit margin	0.269503591	0.226861947	0.588790775	0.584169513	0.433558387
Casa	0.436235132	0.406244579	0.471714152	0.477202619	0.440939532
Interest Income/Total Income	0.42507063	0.420450297	0.475124237	0.471273959	0.441241795
Non-Interest Income/Total Income	0.309602627	0.340180665	0.542760161	0.50071536	0.493070851
Net Profit/ Branch	0.179469794	0.112320353	0.735233271	0.54344535	0.345360566

Table – 3.6 Normalized Matrix

6. Multiply each element in the normalized decision matrix by its corresponding weight. This help in giving the value according to the weight assigned to the different criterion on the basis of importance in decision making according to the objective decided by the decision maker. This help in giving importance characteristics more value and less to less valued.

	SBI	Bank of Baroda	Hdfc	Icici bank	Axis Bank	V+	v-
Return on assets	0.054316	0.048280893	0.154326426	0.137945409	0.09483747	0.1543	0.0483
Return on Equity	0.019637	0.014509962	0.026811185	0.023828582	0.02052354	0.0268	0.0145
Net Interest Margin	0.009523	0.010034518	0.013694166	0.013221954	0.01105765	0.0137	0.0095
Net profit margin	0.044738	0.037659083	0.097739269	0.096972139	0.07197069	0.0977	0.0377
Casa	0.001745	0.001624978	0.001886857	0.00190881	0.00176376	0.0019	0.0016
Interest Income/Total Income	0.001275	0.001261351	0.001425373	0.001413822	0.00132373	0.0014	0.0013
Non-Interest Income/Total Income	0.017957	0.019730479	0.031480089	0.029041491	0.02859811	0.0315	0.018
Net Profit/ Branch	0.081838	0.051218081	0.335266371	0.247811079	0.15748442	0.3353	0.0512

Table – 3.7. V+ and V- values

7. Establish both positive and negative ideal solutions. The best option is the one that maximizes the utility criteria, is close to the best option, minimizes the cost criterion, or has the lowest possible cost. Contrarily, the alternative solution, or negative ideal solution, maximizes the cost criteria while minimizing the utility criterion. In this scenario, we would choose the opposite of the perfect

solution. Calculate the Euclidean distance for each choice from the ideal and negative ideal solutions: The Euclidean distance is calculated using the formula:

$$d = \sqrt{\sum (w_{ij} * (x_{ij} - p_{ij})^2)} \quad (i = 1 \text{ to } n)$$

where w is the weight of the criterion,

x is the alternative normalized score of the criterion, and

p is the ideal or negative ideal score of the criterion.

Calculate the relative closeness of each choice to the ideal solution: Relative closeness is calculated using the following formula:

$C^* = d_- / (d + d_-)$ (i = 1 to n) where d is the Euclidean distance of the choice from the ideal solution, d- is the Euclidean distance of the choice from the negative ideal solution, and n is the number of choices.

	SBI	Bank of Barod	Hdfc	Icici bank	Axis Bank
Si+	0.278009	0.309582927	2.19539E-05	0.089064135	0.18937846
Si-	0.03241	0.001845831	0.309661759	0.224566385	0.12161049
pi	0.104408	0.005926977	0.999929109	0.716022105	0.39104441
Rank	4	5	1	2	3

Table – 3.8. Ranking of banks

8. Rank alternatives based on their relative proximity to the ideal solution: Alternatives are scored according to how close they are to the ideal answer, with higher scores denoting greater performance. Demonstrate your competence.

After analysis the banks performances on the basis of some financial ratios given below and their weights are identified by Shannon Entropy are also given in the table. We have identified that Net Profit / Branches is highest weight and ROE on 2nd and Casa is at lowest weightage.

After identifying weight and applying topsis another table were plotted shown below where the ranking was plotted with the help of S+ and S- values and then on the basis of it PI were identified by taking any of the value i.e. S+, S- and divide it by sum of both and then Ranking was plotted on the basis of PI value.

Ratio Indicator	Weights
Return on assets	0.239
Return on Equity	0.048
Net Interest Margin (X)	0.026
Net profit margin	0.166
Casa	0.004
Interest Income/Total Assets (%)	0.003
Non-Interest Income/Total Assets (%)	0.058
Net Profit/ Branches (Rs.)	0.456

Table- 4.1 Ratio and their weights

In the table after solving through topsis HDFC got rank 1 and they were doing better than other Banks. HDFC bank is followed by ICICI and Axis Bank. Public Banks are not performing well as they had to meet some guidelines and they had to follow the norms and they were not created on account of making profits and don't focus on maximizing the shareholders wealth as compared to the private banks like HDFC and ICICI Bank. On the basis of investments, we had to select HDFC and ICICI as they were doing best as compared to other banks of the country. They were trying to set a benchmark how to work in the banking sector and also, they were using their resources well as compared to others.

Bank Name	Si+	Si-	pi	Rank
ICICI	0.00598357	0.0326516	0.84512636	2
HDFC	2.1517E-07	0.03863005	0.99999443	1
SBI	0.03647	0.00219	0.05662	4
BOB	0.0385	0.0006	0.017	5
AXIS	0.0214996	0.0172979	0.4458505	3

Table – 4.2 Ranking of Banks with Pi value

4.2 Result

After analysing the data we had recommended that Private Banks were doing better as we had taken ratios which were most suitable to investors as in today's world banks which were making maximum profit tends to provide better services than other banks as they were getting maximum returns on the policies they had implemented.

Return on assets and other financial ratios gives the best results for investing purposes. We had taken all the ratios from the yearly annual reports. We had identified the weights with the Shannon Entropy. Shannon entropy is very important method for calculating the weights of the ratios/ indicators under Multi criterion decision approach. The entropy method delivers the weights of the various criteria which is used in the research from the given matrix and is independent from the views of the decision maker.

So, we have used Entropy system to remove the biasedness of individual. This Shannon entropy decides the weight on the basis of normalized matrix.

4.3 Limitations

The limitations of the study were given below.

1. Ratios can be changed which can impact the final results and changed the rankings of the bank as individual have different views over the ratios.
2. In place of Shannon entropy other methods can also be used to identify the weights which can also impact the result of research.
3. Other methods can also be used to find out the ranking of the banking.
4. We can take some other aspects like investing, Security, fame and many other aspects can be used to ranking the banks.
5. Other Methods of Topsis can be used like Fuzzy analytic hierarchy process (FAHP) and FTOPSIS (Fuzzy technique for order preference by similarity to an ideal solution).
6. Analysis can be done using primary data by preparing a questionnaire.

Chapter – 5

5.1 Conclusions

After the major findings from the research work this can be write down from above reports that as per the pi value of the profitability, efficiency and soundness of all private (ICICI Bank, HDFC Bank , HDFC Bank) and public banks(namely BOB, SBI) which were like Return on investments, Casa, Return on assets were some important measures to select any banks for investments and if we choose for deposits or services we have much more focus on the data like number of branches that results in ease of use and interest on deposits for fight against inflation everyone wants that interest they were getting on deposits should be high. Some other aspects that common people wants to lent money at minimum possible interest which cost them less on the borrowed money which gives them benefit. Similarly in qualitative aspects this was also important like who was leading the banks what culture they were following at banks and how they were reacting to government decisions.

Other than this if we think about investors perspectives investors wants maximum Return on Investments were the soul motive of investments. Similarly for deposits scenario they want security in spite of returns as they want a safe deposit without any risk, they can use this fund in future whenever they need without any risk of loss of money. For lenders perspectives they want to raise money at minimum possible interest which costs less to them. Similarly different needs make different perspectives to rank the bank. So this was important to clarify the need before choosing the ratios and other information to rank the bank as it results in different outcomes.

We have taken the best banks in the country on the basis of deposits and number of customers and number of branches from both public and private banks which help in identifying best from the best ones which were the main objectives of the paper. Also, we had taken all banks which were working from more than 2 decades as it also gives confidence to their customers.

Also, in this paper we were trying to identify best possible scenarios from our interest that could make a perfect bank for common people maybe it varies if some other would do the research might take some other ratios. We have used topsis which is operations

tool to rank from the best possible scenarios when we aroused to choices from the similar ones where we were getting best possible features in all but there were some minor changes in all and we rank the different alternatives on the basis of available features and try to find out the best one which gives best return on same investments.

Similarly, we have used Shannon entropy which was generally take more weightage where more particles are available based on the entropy phenomenon like more weightage is given to the value which was more than others less value in quantity to weight in terms of 100. Shannon Entropy used by various researchers to weight the element in topsis so we have used it to weight the different inputs on the basis of their entropy.

Private Banks are performing usually good than the State- owned Banks in India during the study period of 2023. The present study is usable for retail investors who want to invest their money in banking sector. The overall ranking was done with the help of TOPSIS and Shannon Entropy. The study of TOPSIS method on banks provides useful information related to the position of any bank. This research is also helpful for the policy makers who are going adopting certain changes in their strategies. Other than this the TOPSIS method for all categories of banks can be find out with the other methods like fuzzy analytic hierarchy process (FAHP) and FTOPSIS (Fuzzy technique for order preference by similarity to an ideal solution) method and also jury which can give certain weightage on the basis of their understandings and these several methods can be applied to get better results in the banking sector of India.

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