

COMPARISON OF FINANCIAL PERFORMANCE OF INDIAN BANKS USING MULTI-CRITERIA TOPSIS

Mihir Dash*, Sarita Kumari Singh**, Saqeeb U. Rahaman***, Sajana Nadigadda****, Surbhi Srivastava*****, Ankur Agrawal*****

*Professor & Head of Department, Management Science, Alliance University, School of Business, Karnataka, India.
Email: mihirda@rediffmail.com

**MBA student, Alliance University, School of Business, Karnataka, India. Email: ksaritaMBA15@bus.alliance.edu.in

***MBA student, Alliance University, School of Business, Karnataka, India. Email: usaqeebMBA15@bus.alliance.edu.in

****MBA student, Alliance University, School of Business, Karnataka, India. Email: snadigaddaMBA15@bus.alliance.edu.in

*****MBA student, Alliance University, School of Business, Karnataka, India. Email: ssurbhiMBA15@bus.alliance.edu.in

*****MBA student, Alliance University, School of Business, Karnataka, India. Email: aankurMBA15@bus.alliance.edu.in

Abstract

This study analyses the financial performance of Indian banks from three different points of view, viz. that of regulators, investors, and borrowers, using multi-criteria TOPSIS analysis. In particular, the financial performance of public sector banks is compared with that of private sector banks from these three points of view.

The results of study show that the three different points of view of banking performance are very consistent with each other. Further, the results of the study clearly indicate that, in the Indian context, private sector banks are performing significantly better than public sector banks, and all of the top-performing banks identified from the TOPSIS analysis are private sector banks. The better performance of private sector banks may be attributed to professional, efficient management, and better customer focus and service; while the worse performance of public sector banks may be partially attributed to lack of professional, efficient management and partially to political interference and constraints.

Keywords: *Financial Performance of Indian Banks, Regulators, Investors, Borrowers, TOPSIS, Public Sector Banks, Private Sector Banks*

INTRODUCTION

A country's economic health is critically dependent on the performance of its banking system. The Indian banking sector has rapidly evolved over the last three decades - the way it operates and the services it provides have changed drastically. Studies suggest that the banking sector in India is sufficiently capitalised and well-regulated, and that Indian banks are generally resilient and have withstood the global downturn well (Dash & Charles, 2012; Dash & Das, 2013).

The Banking Regulation Act of India of 1949 had laid down several norms to regulate banking sector in India. The two categories of banks are scheduled banks and non-scheduled banks; scheduled banks are further classified into commercial banks and co-operative banks; and co-operative banks are sub-divided into state-owned and district co-operative banks. The purpose of commercial banks is to accept deposits from and to provide loans to individuals, private

and public organisations. The purpose of co-operative banks is to provide funds to small lenders, start-ups, and so on.

The evolution of the modern banking sector in India began with the introduction of banking sector reforms under the recommendations of the Narasimhan Committee (1991) for the liberalisation of banking practices. The reforms enabled the entry of several new private sector banks and foreign banks, along with the introduction of new technology, including IT and ATMs, as well as the encouragement of FDI in banking sector. Further innovations such as Internet banking and mobile banking have developed in recent years. Banking in India is no longer restricted to metropolitan areas; it has reached even the remote corners of the country.

The banking sector in India is currently on the verge of a major transformation. India's economic growth is likely to improve because of positive business sentiment and greater consumer confidence. Increased spending on infrastructure

and speedy implementation of projects and reforms are expected to further contribute towards the growth of the industry. Also, India's banking sector is expected to grow at a faster rate because of the rapidly growing businesses which would turn to banks for their credit needs.

The major market segments of the banking sector are classified as follows. The largest segment is that of retail banking, which involves loans to individuals, such as auto loans, housing loans, educational loans, and other personal loans, or loans to small businesses. Another very large segment is that of wholesale banking, which involves loans to mid-level and large corporates, including working capital loans, project finance, term loans, lease finance, and so on. A third major segment is that of treasury operations, involving investment in equity, commodities, mutual funds, bonds, and trading and foreign exchange operations. Finally, there are other banking businesses, including merchant banking, leasing business, hire purchase, syndication services, and so on.

The top ten major players in the Indian banking industry are presented in Table 1, along with their total revenues and market shares.

Table 1: Top Ten Indian Banks and their Total Revenue and Market Shares as of Dec 2015 (in Rs. crores)

Bank	Total revenue	Market share
State Bank of India	187,479.31	21.81%
HDFC Bank	67,324.62	7.83%
ICICI Bank	66,296.10	7.71%
Punjab National Bank	53,769.80	6.25%
Canara Bank	48,747.40	5.67%
Axis Bank	48,644.94	5.66%
Bank of Baroda	48,630.89	5.66%
Bank of India	45,992.58	5.35%
Union Bank of India	35,774.51	4.16%
IDBI Bank	31,629.02	3.68%

Source: Capitaline database & author's calculations

Based on the Dec'15 market shares, the Herfindahl-Hirschmann index is $HHI = 0.084369$ and the concentration ratio is $C5 = 49.27\%$, indicating low industry concentration, close to being a perfectly competitive market.

MACRO-ENVIRONMENT ANALYSIS

There are several pertinent political and legal factors affecting the banking industry. The regulatory authority for the banking industry is the Reserve Bank of India (RBI), which sets the rules and regulations for the Indian banking

system. It has set strict norms for banks with respect to their capital and liquidity. Also, RBI has prescribed mandatory levels of priority sector loans. In fact, the banking industry was relatively less affected by the governmental reforms in the Modi regime as compared to other industries. One important policy is that of increased farm credit and debt waiver scheme for farmers who find it difficult to repay agricultural loans. This is reported to have led to a 4% growth in the agricultural sector. The government has also increased the FDI limit from 20% to 49%.

The Modi government has announced in March 2015 a number of structural reforms for the banking sector, focusing on improving the performance of public sector banks, which remain under-capitalised and are burdened with poorer standards of risk management as compared with private sector banks. On the other hand, the RBI plans to lower interest rates in order to control inflation and boost credit growth, which is expected to result in an 18.0% growth in loans in 2015-16.

The banking system plays an intermediary role in the economy. It receives the savings of households in the form of deposits, and in turn lends this money to households and businesses that require it. The major economic factors affecting the banking industry are related to monetary policy. The RBI is the authority that sets base rates, with an objective to stimulate savings and deposits, to stimulate demand in the economy, and to curb inflation and prevent economic crisis.

The Indian banking industry had been adversely affected by the global financial crisis of 2008-09. However, more recently there has been an increasing trend in the growth rates of the major players of Indian banking industry, which indicates that the industry's performance is improving.

The socio-cultural factors that affect the banking industry include the shift in demographics, with a growing young population, changes in lifestyle, and increased literacy and social mobility. In recent years, an important policy shift has been that of promoting financial inclusion, i.e. providing credit to the poorer sections.

Several technological factors also affect the banking industry. The increasing use of IT in banking has dramatically changed the industry, and continues to result in operational innovations, such as automated teller machines (ATMs), Internet banking, mobile banking, and so on. Such innovations have made banking more accessible, and banks can leverage technology to deliver quality service to their clients and enhance the customers' overall experience, thereby gaining a competitive edge. Many banks, including HDFC Bank, ICICI Bank, and Axis Bank are set to launch contact-less debit and credit cards. These cards, which use near field communication (NFC) mechanism, will allow customers to transact without having to insert or swipe.

Banks are also leveraging the current wave of social media to attract and keep in touch with customers.

The Indian banking industry is slowly returning to a position of sound financial health and growth, but it is still lagging behind as compared to the global banking scenario. The use of the latest technology in India is lower as compared to other countries, and this inhibits the potential growth of the Indian banking industry. Also, there have been steep cuts in the interest rates, as higher interest rates had earlier resulted in high inflation, low investments, and low GDP growth. There is scope for much more growth in the Indian banking industry in years to come.

COMPETITIVE ANALYSIS (PORTER'S FIVE FORCE MODEL)

The threat of new entrants is low, as the RBI has very stringent norms for issuing bank licenses, with high capital and liquidity requirements. On the other hand, the availability of substitutes is medium to high. There is an increasing threat from financial services competitors, including non-banking finance companies (NBFCs), small co-operative banks, and alternative borrowing avenues. In particular, NBFCs offer a range of alternative banking services, such as consumption loans for electronics, jewellery, cars, and so on. In fact, two NBFCs have recently been granted universal banking licenses, viz. Bandhan and IDFC, and several other notable NBFCs, including India Post, are in the process of obtaining banking licenses.

The bargaining power of suppliers is high. A major source of funds for banks is customer deposits; other sources include mortgage loans, mortgage securities, loans from other financial institutions (inter-bank transactions), and so on. This is because there is not much differentiation between banks, as interest rates are constrained by RBI policies, and customer switching costs are low. Also, the bargaining power of buyers is quite high. The buyers primarily include individual customers, and customer loyalty plays a critical role in this. Also, there tends to be low switching cost between banks, particularly due to the introduction of technology (viz. Internet and mobile banking).

The competitive rivalry between players in the banking industry is also very intense. As industry concentration is low, there are several players of similar size, and they all employ similar strategies. Further, there is low product differentiation, with most banks offering similar products, and price competition through interest rates. Also, there are high barriers to exit, so banks are forced to be competitive in order to survive. There is, however, a distinction between public sector and private sector banks; public sector banks are government-run, and tend to be less competitive than private sector banks. However, this is improving in recent years.

LITERATURE REVIEW

There is a vast literature on banking performance. Early studies focused on bank profitability as the only aspect of bank performance, but with the bank crises of the 1980s, more comprehensive measures of bank performance became necessary. Several other parameters such as capital adequacy, asset quality, earning capacity, efficiency, and solvency/liquidity were also considered for bank performance measurement. Many studies have subsequently examined different aspects of banking performance measurement in commercial banks, particularly comparing the performance of public sector, private sector, and foreign banks in India. The following is a partial review of the pertinent literature.

Swamy (2001) examined the overall position of the Indian banking industry, including the share of rural branches in the industry, the average size of branches, pattern of trends in bank profitability, share of public sector and private sector banks in terms of assets and liabilities, share of wages in the total expenditure of banks, non-performing assets position, and spread. He suggested that in many respects public sectors banks fared much better than private sector banks and foreign banks.

Shirai (2002) suggested that there has been an increase in competition in the entire banking sector with the entry of new private and foreign banks, because of their superior usage of technology. However, he found that though initially the private sector and foreign banks had performed better than public sector banks in term of profitability, earnings efficiency, and cost efficiency, these differences have reduced considerably, and public sector banks have improved profitability and cost efficiency.

Sathye (2005) studied the impact of privatisation on the performance and efficiency of banks. He suggested that banks which were partially privatised performed better and were more efficient than fully public sector banks, and continued to show improved performance and efficiency after full privatisation.

Pal and Malik (2007) analysed the differences between public, private, and foreign sector banks in terms of profitability, liquidity, risk, and efficiency. They suggested that foreign banks were more efficient at utilising resources and more effective at managing skills and technology, and that private sector banks were more efficient than public sector banks at utilising resources. On the other hand, they suggested that public sector banks performed better than foreign and private banks in terms of a higher return on equity and lower expenses.

Dash and Das (2013) used the CAMELS framework to compare the performance of public sector banks with private sector banks and foreign banks in the period 2003-08.

They suggested that private sector banks and foreign banks performed better than public sector banks on most of the CAMELS factors, and particularly in terms of management soundness, earnings and profitability. These results were reinforced in the study by Dash, Kumari, and Anand (2015).

Several multi-criteria decision methods have been applied widely in banking performance measurement, including TOPSIS, AHP, fuzzy AHP, ELECTRE, PROMETHEE, VIKOR, COPRAS, and DEA. In particular, several studies have applied TOPSIS analysis in the banking industry (Bayyurt, 2013; Önder & Hepşen, 2013; Gündoğdu, 2015; Dash, 2016a).

Bayyurt (2013) compared the performance of the foreign and domestic deposit banks in Turkey using TOPSIS, ELECTRE III, and DEA. He suggested that foreign-owned banks performed better than domestic banks, as they could find cheaper international funds and were able to perform similar banking functions with fewer employees. He suggested that Turkish domestic banks should rationalise their employee base to improve their operational efficiency.

Önder and Hepşen (2013) combined forecasting methods and multi-criteria AHP and TOPSIS methods to propose a financial performance evaluation model for Turkish Banks, using ten groups of financial ratios, including capital ratios, balance sheet ratios, asset quality, liquidity, profitability, income-expenditure structure, share in sector, share in group, branch ratios, and activity ratios.

Dash (2016a) applied the multi-criteria decision methods AHP and TOPSIS to compare the performance of public sector and private sector banks in India using the underlying financial ratios corresponding to the CAMEL parameters, with the weights for different parameters in the CAMEL model being obtained by factor analysis. The rankings from both of the models were quite consistent. The results of the Mann-Whitney tests for the AHP and TOPSIS models indicated that, overall, private sector banks were performing significantly better than public sector banks; on the other hand, the results of the Mann-Whitney test for the CAMEL model indicated no significant difference in performance between public sector and private sector banks.

Most of the studies that compare the performance of bank groups in India tend to suggest that foreign banks and private sector banks perform better than public sector banks. Further, Dash (2016a) showed that the use of multi-criteria decision methods AHP and TOPSIS for measuring bank performance can give more sensitive results than the classical models such as CAMEL. This study analyses bank performance from three different viewpoints using multi-criteria TOPSIS analysis.

METHODOLOGY

The objective of the study is to compare the financial performance of public sector banks and private sector banks in India. The analysis was performed on a sample of 25 banks, of which 15 were public sector banks and 10 were private sector banks. The data for the study pertained to the year 2014-15, and was collected from the Capitaline database. The sample banks are listed in Table 2.

Table 2: Sample Banks Considered for the Study

Public sector banks	Private sector banks
Allahabad Bank	Axis Bank
Andhra Bank	Dhanlaxmi Bank
Bank of Baroda	Federal Bank
Bank of India	HDFC Bank
Canara Bank	ICICI Bank
Corporation Bank	J &K Bank
Dena Bank	Karnataka Bank
IDBI Bank	Kotak Mahindra Bank
Indian Bank	South Indian Bank
Oriental Bank of Commerce	Yes Bank
Punjab National Bank	
State Bank of India	
Syndicate Bank	
Union Bank of India	
Vijaya Bank	

Source: Capitaline database

The performance measures selected for the study were the capital adequacy ratio (CAR), the net non-performing assets to total advances ratio (NNPA/ TAdv), the net profit margin (NPM), and the yield on advances (YoAdv). The capital adequacy ratio, defined as the ratio of a bank's capital to risk-weighted assets, indicates whether a bank can absorb a reasonable amount of loss, in accordance with the statutory requirements. The net non-performing assets to total advances ratio reflects the asset quality of the loans of the bank, i.e. the percentage of total advances that have defaulted. The net profit margin measures the margins available for the bank as profits before payment of taxes and various other obligations. The yield on advances measures the aggregate income generated by the bank.

The study uses TOPSIS analysis to combine the performance measures into a single composite score. TOPSIS (Technique for Order Preference by Similarity to Ideal Solution) is a multi-criteria decision method, based on relative distance to the ideal solution, the point with the best values for all criteria, and the anti-ideal solution, the point with the worst values for all criteria (Hwang & Yoon, 1981; Hwang, Lai, &

Liu, 1993).

The TOPSIS scores are calculated as follows. Let x_{ij} denote the value of the j th parameter for the i th bank and w_j denote the weight for the j th parameter. These values are first normalised so that their sum of squares is unity by taking

$$y_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^m x_{ij}^2}}$$

The ideal point is defined as the point with best values for each of the parameters, and the anti-ideal point is defined as the point with the worst values for each of the parameters. The distance from each point to the ideal point and anti-ideal point are calculated respectively as follows:

$$d_i^* = \sqrt{\sum_{j=1}^n w_j (y_{ij} - y_j^*)^2} \text{ and } d_{i*} = \sqrt{\sum_{j=1}^n w_j (y_{ij} - y_{j*})^2}$$

The TOPSIS score is then calculated as

$$S_i = \frac{d_{i*}}{d_{i*} + d_i^*}$$

The TOPSIS score S_i indicates how close each bank is to the ideal and anti-ideal points. The closer the TOPSIS score is to zero, the closer the bank is to the anti-ideal point, while the closer the TOPSIS score is to one, the closer the bank is to the ideal point. Thus, the TOPSIS score can be used to rank the banks, and the appropriate analytical tools to compare TOPSIS scores are the non-parametric tests. Accordingly, the non-parametric Mann-Whitney test is used to compare the TOPSIS scores of public sector and private sector banks.

The comparison of financial performance of banks was performed from three different points of view. From the point of view of regulators, the most important financial parameters are capital adequacy and asset quality, reflecting sustainability of the bank's operations. Profitability is also relevant, but of less importance. Accordingly, the weightages for the parameters were assigned as 0.4, 0.3, 0.2, and 0.1, respectively. Further, NNPA/ TAdv is considered a negative measure, as higher levels of non-performing assets reflect higher levels of risk.

From the investor's point of view, profitability and returns are much more important than capital adequacy and asset quality. Asset quality reflects the credit risk that the bank is exposed to, and assigned the next priority. Accordingly, the weightages for the parameters are assigned as 0.1, 0.2, 0.4, and 0.3, respectively. Again, NNPA/ TAdv is considered a negative measure.

From the borrower's point of view, banks with higher returns would tend to charge a higher rate of interest, *ceteris paribus*. Thus, YoAdv is considered a negative measure from this point of view. Also, banks with higher non-performing assets would tend to be subject to more restrictions on their loan-giving capacity, *ceteris paribus*, so that NNPA/TAdv is considered a negative measure from this point of view also. On the other hand, banks with higher profitability and banks with better capital adequacy will be in a better position to offer loans. Accordingly, the weightages for the parameters are assigned as 0.1, 0.3, 0.2, and 0.4, respectively.

FINDINGS

The basic data of the performance measures for the sample banks is presented in Table 3.

Private sector banks were found to be significantly better than public sector banks under each of the performance measures. In terms of capital adequacy, the best performing banks were Kotak Mahindra Bank, ICICI Bank, and HDFC Bank. In terms of asset quality, the best performing banks were Yes Bank, HDFC Bank, and Axis Bank. In terms of profitability, the best performing banks were Kotak Mahindra Bank, ICICI Bank, and HDFC Bank. Finally, in terms of asset yield, the best performing banks were Yes Bank, Dhanalaxmi Bank, and Kotak Mahindra Bank. Three of the sample banks, Kotak Mahindra Bank, HDFC Bank, and Axis Bank appear among the top five for at least three of the performance measures.

The worst performing bank was found to be Dhanlaxmi Bank, with the lowest capital adequacy, relatively high non-performing assets, and negative profitability. Paradoxically, however, it had one of the highest yields.

Table 3: Basic Data for the Sample Banks and Results of Mann-Whitney Tests

	CAR	NNPA/TAdv	NPM	YoAdv
Allahabad Bank	10.50	4.00	3.30	10.00
Andhra Bank	11.20	3.10	3.10	10.30
Bank of Baroda	12.60	1.90	8.70	7.30
Bank of India	11.40	3.40	4.60	7.90
Canara Bank	10.60	2.70	6.50	9.70
Corporation Bank	11.10	3.10	2.90	10.20
Dena Bank	10.90	3.80	2.50	10.10
IDBI Bank	11.70	2.50	4.30	10.20
Indian Bank	12.90	2.50	6.60	9.60
Oriental Bank of Commerce	12.30	3.30	2.50	10.40
Punjab National Bank	13.60	4.10	6.70	9.10
State Bank of India	12.80	2.10	8.20	9.00
Syndicate Bank	10.90	2.00	7.10	8.00
Union Bank of India	10.70	2.70	5.50	9.40
Vijaya Bank	11.70	1.90	3.60	9.90
Axis Bank	15.10	0.40	20.80	9.20
Dhanlaxmi Bank	8.70	3.80	-19.50	11.80
Federal Bank	15.50	0.70	14.10	10.70
HDFC Bank	16.80	0.30	21.10	10.30
ICICI Bank	17.03	1.62	22.30	8.70
J & K Bank	12.70	4.80	17.50	10.80
Karnataka Bank	12.70	2.01	9.60	11.10
Kotak Mahindra Bank	17.20	0.90	22.90	11.40
South Indian Bank	12.10	1.02	5.80	11.10
Yes Bank	11.60	0.10	10.60	17.30
<i>mean rank (public sector banks)</i>	10.2	15.3	9.4	9.6
<i>mean rank (private sector banks)</i>	17.2	8.6	18.4	18.2
<i>Mann-Whitney z Stat</i>	-2.331*	-2.471**	-2.996**	-2.858**
<i>p-value</i>	0.010	0.007	0.002	0.002

Source: Capitaline database & authors' computations

The results of the TOPSIS analysis indicated that the best performing bank was HDFC Bank, followed by Axis Bank, Yes Bank, Federal Bank, and Kotak Mahindra Bank. At the other extreme, the worst-performing bank was Dhanlaxmi Bank, followed by Allahabad Bank, Punjab National Bank, J&K Bank, and Dena Bank. Further, the private sector banks were found to perform significantly better than public sector

banks according to all three points of view. Also, the TOPSIS scores for the three viewpoints were found to be highly consistent. The Spearman correlation between regulators and investors was $r = 0.990$, $p = 0.000$; between regulators and borrowers was $r = 0.998$, $p = 0.000$; and between investors and borrowers was $r = 0.986$, $p = 0.000$.

The results of the TOPSIS analysis are presented in Table 4.

Table 4: TOPSIS Scores for the Sample Banks from Different Points of View

	regulators		investors		borrowers	
	TOPSIS score	Rank	TOPSIS score	Rank	TOPSIS score	Rank
Allahabad Bank	0.0892	24	0.1631	24	0.1053	24
Andhra Bank	0.2792	17	0.3308	17	0.2951	17
Bank of Baroda	0.7216	8	0.7162	9	0.7428	8
Bank of India	0.2042	20	0.2748	20	0.2343	20
Canara Bank	0.4305	15	0.4822	15	0.4492	15
Corporation Bank	0.2779	18	0.3278	18	0.2944	18
Dena Bank	0.1139	21	0.1817	23	0.1301	21
IDBI Bank	0.4922	14	0.5119	14	0.5060	14
Indian Bank	0.5069	13	0.5411	13	0.5223	13
Oriental Bank of Commerce	0.2209	19	0.2764	19	0.2352	19
Punjab National Bank	0.0961	23	0.1890	22	0.1139	22
State Bank of India	0.6571	12	0.6691	11	0.6728	12
Syndicate Bank	0.6800	11	0.6760	10	0.7021	10
Union Bank of India	0.4244	16	0.4675	16	0.4449	16
Vijaya Bank	0.6982	9	0.6680	12	0.7100	9
Axis Bank	0.9908	2	0.9803	2	0.9946	2
Dhanlaxmi Bank	0.0569	25	0.0462	25	0.0649	25
Federal Bank	0.9708	4	0.9555	5	0.9711	3
HDFC Bank	0.9949	1	0.9868	1	0.9958	1
ICICI Bank	0.8466	7	0.8734	6	0.8548	7
J &K Bank	0.0999	22	0.2453	21	0.1074	23
Karnataka Bank	0.6965	10	0.7178	8	0.7010	11
Kotak Mahindra Bank	0.9641	5	0.9660	4	0.9617	5
South Indian Bank	0.9124	6	0.8692	7	0.9144	6
Yes Bank	0.9857	3	0.9708	3	0.9638	4
<i>mean rank (public sector banks)</i>	10.0		9.8		10.1	
<i>mean rank (private sector banks)</i>	17.5		17.8		17.3	
<i>Mann-Whitney z Stat</i>	-2.496**		-2.663**		-2.387**	
<i>p-value</i>	0.007		0.004		0.009	

Source: Authors' computations

DISCUSSION

The study has compared the financial performance of public sector banks and private sector banks in India from three different points of view, that of regulators, investors, and borrowers, using multi-criteria TOPSIS. In particular, the financial performance of public sector banks is compared with that of private sector banks from these three points of view.

The results of study show that the three different points

of view of banking performance are very consistent with each other, suggesting uni-dimensionality of banking performance. However, as only four performance measures were considered in the study, it may not be conclusive. In an earlier study, Dash (2016b) suggested five independent dimensions of banking performance. However, this would need to be investigated further.

The results of the study clearly indicate that, in the Indian context, private sector banks are performing significantly better than public sector banks. Further, all of the top-

performing banks identified from the TOPSIS analysis are private sector banks, though two of the worst performing banks, Dhanlaxmi Bank and J&K Bank, are also private sector banks. The better performance of private sector banks may be attributed to professional, efficient management, and better customer focus and service. On the other hand, the worse performance of public sector banks may be partially attributed to lack of professional, efficient management and partially to political interference and constraints. Among the public sector banks, Bank of Baroda and Vijaya Bank were best performers, primarily due to lower non-performing assets.

The best performing bank was HDFC Bank, which is the second-largest bank in terms of total revenue. HDFC Bank has relatively high capital adequacy, asset quality, and profitability. The next best performing bank was Axis Bank, also with relatively high capital adequacy, asset quality, and profitability, though it is ranked sixth in terms of total revenue.

The industry leader, State Bank of India, was ranked 12th according to the TOPSIS analysis. The root causes of this weak performance were high non-performing assets, relatively low capital adequacy, and relatively low profitability. Similarly, ICICI Bank, the third-largest bank in terms of total revenue, ranked seventh according to the TOPSIS analysis, primarily due to relatively high non-performing assets. Punjab National Bank, the fourth-largest bank by total revenue, was ranked 23rd, just ahead of the worst-performing banks, again due to very high non-performing assets, relatively low capital adequacy, and low profitability. Canara Bank, fifth largest by total revenue, was ranked 15th according to TOPSIS analysis for similar reasons.

There are some limitations inherent in the study. The analysis was performed for a relatively small sample of banks, and for a single point in time. Further, the results of the TOPSIS analysis may be sensitive to the choice of weights. Also, only four performance measures were used in the study, viz. the capital adequacy ratio, the net non-performing assets to total advances ratio, the net profit margin, and the yield on advances. Other measures, particularly for bank risk, should also be included to give a broader picture of bank performance. More detailed analysis of the evolution of banking performance, particularly after the global financial crises and the subsequent global slowdown, would provide better insights into the stability of the Indian banking system.

REFERENCES

Arya, N. (2013). The Indian banking sector: Recent developments, growth and prospects. *India Brand Equity Foundation Report*.

Bayyurt, N. (2013). Ownership effect on bank's performance: Multi criteria decision making approaches on foreign and domestic Turkish banks. *Procedia - Social and Behavioral Sciences*, 99, 919-928.

Dash, M. (2016a). Banking performance measurement for Indian banks using AHP and TOPSIS. *The International Journal of Banking and Finance*, 12(2), 63-76.

Dash, M. (2016b). Factor structure of the CAMELS Model - A case study of Indian Banks. *Sixth International Conference of the Financial Engineering & Banking Society*: Retrieved from <http://febs2016malaga.com/wp-content/uploads/2016/06/19FactorStructure.pdf>

Dash, M., & Charles, C. (2012). An analysis of the technical efficiency of banks in India. *IUP Journal of Bank Management*, 11(4), 100-109.

Dash, M., & Das, A. (2013). Performance appraisal of Indian banks using CAMELS rating. *IUP Journal of Bank Management*, 12(2), 31-42.

Dash, M., Kumari, G., & Anand, S. (2015). Comparison of Public and Private Sector Banking Performance using CAMELS Framework. *Management Today - An International Journal of Management Studies*, 5(3), 107-112.

Gündoğdu, A. (2015). Measurement of financial performance using TOPSIS method for foreign banks of established in turkey between 2003-2013 Years. *International Journal of Business and Social Science*, 6(1), 139-151.

Hwang, C. L., Lai, Y. J., & Liu, T. Y. (1993). A new approach for multiple objective decision making. *Computers and Operational Research*, 20, 889-899.

Hwang, C. L., & Yoon, K. (1981). *Multiple attribute decision making: Methods and applications*. New York: Springer-Verlag

Lok Sabha Secretariat. (2013). Financial sector in India: Regulations and reforms," *Parliament Library and Reference, Research, Documentation and Information Service* Retrieved from <http://164.100.47.134/intranet/financialsectorinindia.pdf>

Önder, E., & Hepşen, A. (2013). Combining time series analysis and multi criteria decision making techniques for forecasting financial performance of banks in Turkey. *Proceedings of the International Conference on Applied Business and Economics (ICABE-13)* held at New York, USA.

Pal, V., & Malik, N. S. (2007). A multivariate analysis of the financial characteristics of commercial banks in India. *IUP Journal of Bank Management*, 6(3), 43-60.

Reserve Bank of India. (2015). *Report on Trend and Progress of Banking in India 2014-15*.

Sathye, M. (2005). Privatization, performance, and efficiency: A study of Indian banks. *Vikalpa*, 30(1), 7-16.

Shirai, S. (2002). Road from state to market - Assessing the gradual approach to banking sector reforms in India. *Asian Development Bank Institute Research Paper*, No. 32, 1-73.

Swamy, B. N. A. (2001). New competition, deregulation and emerging changes in Indian banking. *Bank Quest, The Journal of Indian Institute of Bankers*, 729(3), 3-22.