APPLICATION OF MOORA APPROACH TO ANALYSE THE FINANCIAL PERFORMANCE OF SELECTED BANKS IN INDIA

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ABSTRACT

Banking sector contributes more to economic growth and development of economy. This paper attempts to measure the financial performance of the selected banks based on a multi criteria decision-making (MCDM) method called Multi Objective Optimization using Ratio Analysis (MOORA). Totally ten banks out of which five public sector and five private sector banks were selected as sample for the study. The objective of the study is to measure the sustainability of the financial performance of banks using MOORA approach. In the past studies financial ratios or indicators are used individually to analyse the financial performance of any industry, whereas the attempt to club the financial ratios and measuring the overall financial performance was not done. This study aims at taking six financial indicators namely, total assets, total income, profit or loss after tax, gross NPA, overall capital adequacy ratio and return on assets are taken and clubbed together to understand the financial performance of the selected banks. Secondary data for five years from 2015 to 2019 for the selected banks were taken from PROWESS and analysed using MOORA approach. The result shows that private sector banks are having stable financial performance than the public sector banks.

KEYWORDS: MOORA, financial Indicators, Financial Performance and Banks.

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INTRODUCTION

The economy of a country is facing rapid global changes. Economic crisis is striking the economy to face its downturn. This in turn makes the researchers, policy makers and other officials to observe and analyse the financial system and its components from time to time. Banks being the most important part and base of the financial system, it is important to analyse their financial performance. Banking sector contributes more to economic growth and development of economy.

This paper attempts to measure the financial performance of the selected banks based on a multi criteria decision-making method. Financial performance analysis is the measure of identifying the firm's financial strength and weaknesses using the items in balance sheet and profit and loss statement. Evaluating the financial performance based on a single criterion or measure may not give proper understanding about the system. It is tough to make decisions based on a single criterion in a complex environment. Use of multiple criteria or measures to evaluate the performance of complex system makes the method effective, competitive and clear understanding.

Multi Criteria Decision Making (MCDM) is selection or ranking the alternatives based on combining two or more conflicting criteria. The criteria for selection or ranking should have its relevance to the study and it forms the base for MCDM. Multi Objective Optimization using Ratio Analysis (MOORA) is a MCDM technique framed by Brauers and Zavadskas in 2006. MOORA method helps to solve various complex decision making problem. In this method, a decision matrix using set of alternatives and criteria is created, the decision matrix is normalized using the ratio method and then it is optimized to select or rank the best alternative.

REVIEW OF LITERATURE

Many Researchers have employed various tools to study the financial performance and efficiency of private and public sector banks in India.

Multi-objective optimization is the process of simultaneously optimizing two or more conflicting criteria (objectives) subject to certain constraints. Maximizing profit and minimizing the cost of a product; maximizing performance and minimizing fuel consumption of a vehicle; and minimizing weight while maximizing the strength of a particular engineering component are the typical examples of multi-objective optimization problems(WKM, 2004)

Brauers, W. K *et al* (2009) tested for the robustness of MOORA approach with other MCDM technique and they suggested that MOORA model is easy and it is accurate in prediction with the test of facility selection.

Stankevičienė et al (2019) applied the multi MOORA approach to analyse the financial system sustainability of ten countries which joined European Union in 2004.

METHODOLOGY

To analyse the financial performance of banks five public and five private sector banks were selected. Secondary data were collected for five years from 2015 to 2019 from CMIE Prowess dx database.

3.1 Multi-Objective Optimization based on Ratio Analysis (MOORA):

MOORA is multi-criteria optimization technique, where it use two or more conflicting criteria simultaneously and subjecting it to certain restrictions. It is applied to various types of decision making system.

Steps in MOORA

The steps in MOORA approach is as follows,

Step 1: Selection of Criteria and Alternatives

Selecting the criteria for evaluation and alternatives to be evaluated is the most important initial step in MOORA. In this study, criteria for evaluation are the key financial indicators used to analyse the financial performance of banks. Alternatives are the banks to be analysed using the financial indicators.

Step 2: Creation of Decision Matrix

Decision matrix is the combination of criteria and alternative presented in matrix form. Equation 1 is the form of decision matrix to be framed.

$$\text{Decision matrix} = \begin{bmatrix} A_i & C_j & \dots & C_n \\ A_1 & X_{11} & \dots & X_{1n} \\ \vdots & \vdots & \dots & \vdots \\ A_m & X_{m1} & \dots & X_{mn} \end{bmatrix} \dots\dots \text{equation (1)}$$

Step 3: Normalize the Decision Matrix

The decision matrix is normalized based on ratio method. For normalizing the units in the decision matrix the values are divided by the Square root of the sum of squares of each alternative under the particular criteria. That is,

$$NX_{ij} = \frac{X_{ij}}{\sqrt{\sum_{j=1}^n X_{ij}^2}} \dots\dots\dots \text{equation (2)}$$

NX_{ij} is the normalized value

X_i is the set of attributes; $i=1, 2, \dots, m$

X_j is the set of criteria; $j=1, 2, \dots, n$

The normalized responses of the alternatives will fall between zero and one.

Step 4: Optimizing the Decision Matrix

Optimization is the process of selecting the best alternative from the available resources. For optimization the normalized responses are added for maximization (beneficial criteria) and subtracted for minimization (non-beneficial criteria). The value obtained is Y_i , which is called the assessment value.

$$Y_i = \sum_{i=1}^g NX_{ij} - \sum_{g+1}^m NX_{ij}$$

Where, g is the criteria to be maximized and $(m-g)$ is the criteria to be minimized.

Step 5: Ranking the Alternatives

The alternatives which have higher Y_i value are the best alternative and the low Y_i value is the least preferred alternative. As the objective of the study is to rank the financial performance of the banks, banks (alternative) with higher Y_i value is ranked first and with lower Y_i value as tenth.

Selection of Sample

Five public and five private sector banks were selected for the analysis. Banks that tops in market capitalization and NPAs are selected for the study. Table 1 lists out the banks selected for the study. The banks are considered as the alternatives and their representation is given in table 1.

Table 1: List of Banks Selected for Analysis

S. No	Bank	Sector	Alternatives
1	Axis Bank	Private	A1
2	Bank of Baroda	Public	A2
3	Bank of India	Public	A3
4	HDFC	Private	A4
5	ICICI bank	Private	A5
6	IDBI Bank	Public	A6
7	Kotak Mahindra Bank	Private	A7

8	Punjab National Bank	Public	A8
9	State Bank of India	Public	A9
10	Yes Bank	Private	A10

Financial indicators are taken as the criteria to evaluate the financial performance of banks. These indicators were selected because they are used by CRISIL rating agency to rate the performance of Banks. The lists of indicators are listed in table 2.

Table 2: Key Financial Indicators

S. No	Financial Indicator	Unit	Criteria
1	Total assets	INR million	C1
2	Total Income	INR million	C2
3	Profit or Loss after tax	INR million	C3
4	Gross NPA	%	C4
5	Overall Capital adequacy ratio	%	C5
6	Return on assets	%	C6

RESULTS AND DISCUSSION

MOORA approach is applied to the sample banks for five years and the results are presented below.

Selection of criteria and alternative is the initial step in MOORA, which is discussed in detail in selection of sample mentioned above.

Second step is to create decision matrix based on equation 1. In table 3, the decision matrix for the year 2019 is presented. In such a way the decision matrix for five years was constructed.

Table 3: Decision Matrix for 2019

	C1	C2	C3	C4	C5	C6
A1	8010815	681666.3	46766.1	5	16	0.3769
A2	7809874	563429.1	4335.2	10	13	0.035
A3	6271741	470328	-55469	16	14	-1.0868
A4	12445407	1166132	210781.7	1	17	1.7016
A5	9682522	779133.5	33633	7	17	0.316
A6	3207473	256266.2	-151163	27	12	-4.759
A7	3123327	286166.7	48653.3	2	17	1.6162
A8	7754540	647746.5	-99754.9	16	10	-2.0316
A9	36809142	2834413	8622.3	8	13	-0.279
A10	3808262	342148.9	17202.8	3	17	0.4962

To normalize the decision matrix ratio method is followed. By using equation 2, the normalized matrixes for five years were constructed.

For example, to normalize the criteria C4

$$\begin{aligned}
 NX_{i4} &= \sqrt{5^2 + 10^2 + 16^2 + 1^2 + 7^2 + 27^2 + 2^2 + 16^2 + 8^2 + 3^2} \\
 &= \sqrt{1493} \\
 &= 38.64
 \end{aligned}$$

Then,

$$NX_{14} = 5/38.64 = 0.129; NX_{24} = 10/38.64 = 0.258; NX_{34} = 16/38.64 = 0.414$$

$$NX_{44} = 1/38.64 = 0.025; NX_{54} = 7/38.64 = 0.181; NX_{64} = 27/38.64 = 0.698$$

$$NX_{74} = 2/38.64 = 0.051; NX_{84} = 16/38.64 = 0.414; NX_{94} = 8/38.64 = 0.207 \text{ and}$$

$$NX_{104} = 3/38.64 = 0.078$$

Table 4 Represents the Normalized Matrix for the Year 2019 alone

Table 4: Normalized Matrix for 2019

	C1	C2	C3	C4	C5	C6
A1	0.186	0.199	0.159	0.129	0.342	0.065
A2	0.181	0.165	0.015	0.259	0.278	0.006
A3	0.145	0.138	-0.189	0.414	0.299	-0.186
A4	0.288	0.341	0.717	0.026	0.363	0.292
A5	0.224	0.228	0.114	0.181	0.363	0.054
A6	0.074	0.075	-0.514	0.699	0.256	-0.816
A7	0.072	0.084	0.166	0.052	0.363	0.277
A8	0.180	0.189	-0.339	0.414	0.214	-0.348
A9	0.853	0.829	0.029	0.207	0.278	-0.048
A10	0.088	0.100	0.059	0.078	0.363	0.085

Next step is to optimize the normalized matrix. In this study total assets, total income, profit or loss after tax, overall capital adequacy ratio and return on asset are the criteria to be maximized, hence they are added. Only Gross NPA is a minimizing criterion which is subtracted. In table 5 the Y_i value and the ranks for the banks are given from 2015 to 2019

Table 5: Y_i Value and Ranks

	2015		2016		2017		2018		2019	
	Y_i	Rank	Y_i	Rank	Y_i	Rank	Y_i	Rank	Y_i	Rank
A1	1.271	4	1.273	4	0.930	6	0.563	6	0.821	4
A2	0.893	7	-0.074	7	0.533	7	0.118	7	0.385	7
A3	0.358	9	-0.269	9	0.098	9	-0.267	8	-0.207	8
A4	1.687	2	1.793	2	2.000	2	1.892	1	1.976	1
A5	1.498	3	1.390	3	1.440	3	1.047	3	0.803	5
A6	0.215	10	-0.584	10	-0.915	10	-1.108	10	-1.623	10
A7	0.884	6	0.880	6	1.067	5	0.914	4	0.910	3
A8	0.467	8	-0.114	8	0.253	8	-0.872	9	-0.519	9
A9	2.333	1	2.038	1	2.190	1	1.407	2	1.734	2
A10	0.915	5	0.997	5	1.139	4	0.913	5	0.618	6

From table 5, it is observed that attribute nine (A9), which is state bank of India ranks first from 2015 to 2017 and it got down to second position in 2018 and 2019. Attribute four (A4), HDFC bank was in second position from 2015 to 2017 and it raised to first rank in 2018 to 2019, pushing state bank of India down by one position. This might be due to the decrease in the profitability of state bank of India in 2018 and 2019. Attribute six (A6), IDBI bank continues to remain at the last position from 2015 to 2018. IDBI had consistent and increasing negative return on asset from 2016 to 2019; this might be a reason for their low financial performance on comparison with other banks.

Ranking the banks based on the financial performance on a particular year does not give the sustainable financial performance over the years. To understand the sustainable financial performance the ranks are converted into scores from 10 for the first rank and decreased till one for the tenth rank. Figure 1 represents the graphical representation on the sustainable financial performance of the banks from 2015 to 2019.

Figure 1: Sustainable Financial Performance

From figure 1, it is observed that state bank of India is having the highest sustainable financial performance followed by HDFC bank Ltd. And the private sector banks are performing better than the public sector banks. In private sector bank HDFC stands first followed by ICICI bank, Axis bank, Kotak Mahindra bank and Yes bank. In public sector bank State bank of India comes first followed by Bank of Baroda, Punjab national bank, bank of India and IDBI bank. Private sector banks had better capital adequacy ratio, lower gross NPA per cent, consistent and positive profit after tax and good return on asset than public sector banks.

Though private sector banks are financially performing better than the public sector banks, State bank of India is performing better than all other banks. The stability in performance is due to large and well diversified resource base of SBI.

The results of MOORA are compared with CRISIL rating rationale of banks for the year 2018 to 2019 to test the predicting nature of MOORA.

Table 6: Comparison between CRISIL Rating and MOORA Ranks

Bank	CRISIL Rating / Outlook	MOORA
Axis Bank	Stable	Increasing
Bank of Baroda	stable	Stable
Bank of India	Stable	Stable
HDFC	Stable	Stable
ICICI bank	Stable	Decreasing
IDBI Bank	Stable	Stable
Kotak Mahindra Bank	Stable	Increasing
Punjab National Bank	Not mentioned	Stable
State Bank of India	Stable / AA ⁺	Stable
Yes Bank	Not mentioned	Decreasing

Table 6 shows the actual CRISIL rating given to banks (based on their tier II bond issue) for the year 2018 to

2019 and it is compared with the output of MOORA. The ranks that are obtained using MOORA (2018 & 2019) are used to compare with CRISIL rating. From the table it is observed that the predictions using MOORA model is nearly same for most of the banks.

CONCLUSIONS

From the study it is observed that private sector banks are performing better than the public sector banks. Private sector banks had better capital adequacy ratio than the public sector banks, which states that private sector banks have maintained better capital against risk weighted assets. The gross NPA for private sector bank is lesser than the public sector banks, which shows the inefficient recovery of advances and poor credit management policy of public sector bank. Profit or loss after tax for all the private banks are stable but for public sector banks it is highly fluctuating and for some years they have even incurred loss.

As MOORA approach is simple, easy to calculate and it helps in grouping the indicators into one and gain overall view about the financial performance, it is suggested as a suitable model to be used for analysing the financial performance.

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