## Financial Performance Evaluation of Commercial Banks by AHP: An Evidence from India

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#### Abstract

In present transforming phase of the Indian banks, the study has evaluated the financial health of ten commercial banks working in India by employing Analytical Hierarchy Process" (AHP). For assessment, six financial criteria such as Assets Quality, Capital Adequacy ratio, Liquidity, Earning, Management Efficiency, and Profitability has been utilized for a period from 2009 to 2018. For in depth analysis, these criteria are further categorized into twenty-four sub-criteria. A paired comparison methodology is employed to rationalize relative weights of identified criteria and sub-criteria and AHP is used to rank the banks accordingly. The results of the study shows that capital adequacy ratio is most significant criteria among six criteria opted for the analysis. Besides, the ranking of banks shows that the weightage of the financial ratios plays a critical role rather than size of bank in their financial performance. The study would provide valuable inputs to policy makers, academicians and researchers to evaluate the ongoing strategies of bank management. It would also suggest some useful strategies to inefficient banks to improve their business performance.

**Keywords:** AHP, Financial Performance, Indian Commercial Bank, Criteria, Sub-criteria.

#### Introduction

Presently Indian banking sector is witnessing a wide range of structural changes in policies and regulation which affects every facet of Indian banking system ranging from financial position to customer reliance (Gayval and Bajaj, 2016). As banks are imperative for industrial development, economic growth and prosperity of a country, an assessment of bank financial performance is the key concern for all the stakeholders including the regulator, bank management, and the general public (Tran, 2019). It is essential to introduce the precise and useful modern method for evaluating financial performance of various commercial banks working in India (Sharma, 2014).

The financial performance of banks is evaluated by various researchers. Various traditional techniques based on ROE, ROA, CAMEL approach was utilized to determine the financial performance of banking sector. Dhanabhakyam, and Kavitha (2012), evaluated the financial performance of Indian public sector banks by Ratio Analysis, Correlation, and Regression. Kumar and Sharma (2014) utilized rating based on CAMEL approach to rank the Indian Banks Subsequently, approach of data envelopment analysis (DEA) analyzed the relative efficiency of banks by financial ratios as multiple inputs and outputs

(Vegesna and Dash ,2014). Mishra and Sahoo (2012) used the Panel data regression to evaluate the financial performance of Indian banks. Although, existing studies did not provide weightage to the financial parameters based on their relative importance (Frei and Harker, 1999). Moreover, the bank managers were unable to prioritize their operational strategies on the basis of the findings of existing studies. Therefore, evaluation of financial performance based on the weightage of the financial ratios of different aspects such as asset quality, capital adequacy ratio, liquidity, earning, management efficiency, and profitability is required to differentiate the efficient banks from inefficient ones.

The present study is an effort to analyze the financial performance of ten banks by using multi criteria for a period from 2009 to 2018. The ten banks were selected on the basis of branch offices present in India. Further, the AHP model (Saaty, 1988) is used to assign relative weightage to selected criteria and rank the banks. The study would highlight the indicators of efficient performance and contribute to existing literature by providing a new approach for comprehensive assessment of commercial banks working in India.

Further, section 2 has reviewed the existing literature of methodologies used to assess financial performance of

banking system. Section 3 describes the research objectives. Section 4 outlines the research methodology of present study. Section 5 discussed data analysis and model synthesis. Section 6 deals with results and discussion. Section 7 includes the conclusion and scope of future studies.

#### **Review of Literature**

#### **Evaluation of Indian Banks financial performance**

There are numerous techniques used by various researchers to assess the banks' financial performance; conventionally, bank financial performance was evaluated by some financial return ratios likewise Returns on assets (ROA) and Returns on Equity (ROE). Eventually, other methodologies were introduced to analyze the financial performance of banks in comprehensive manner, such as econometric models, CAMEL approach and DEA methodology(Kumar et al. ,2012; Bansal and Mohanty, 2013; and Kaur et al., 2015; Dash and Gosh, 2009; Sharma et al. 2012). Therefore, a multi-criteria decision-making technique such as AHP is proposed to evaluate the bank performance based on the weightage of every criterion used in the analysis of the performance. Table 2.1 shows the existing studies and different methodologies used for performance evaluation of Indian banks.

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Author	Method
Kumar and Gulati (2008)	DEA CCR model was employed to evaluate the technical efficiency of public sector banks in India.
Debnath and Shankar(2008)	DEA-BCC model was employed for financial analysis of Indian banks.
Kumar and Gulati (2008) Ketkar and Ketkar (2008, May) Karimzadeh (2012) Vegesna and Dash (2014)	DEA technique was applied for the assessment of the efficiencies of the Indian banks using different financial ratios.
Das and Ghosh (2009).	DEA methodology was utilized for evaluating the cost and profit efficiency of banks working in India
Das (2010, January).	The Stochastic Frontier Approach was employed for the analysis and compar ison of cost efficiency of different Indian banking groups.
Malhotra et al. (2011)	A Panel data approach has been employed on various financial ratios for the evaluation of Indian Banks.

# Table: 2.1. An overview of existing literature on Indian banks' financial performance evaluation

Dhanabhakyam and Kavitha(2012).	Ratio Analysis, Correlation , and Regression were used for the financial performance evaluation of
Kaur (2012).	selected public sector banks.
Sharma et al. (2012).	DEA technique was utilized for evaluating relative efficiency of Indian banks, in which expenses and deposits have taken as input variable s, whereas income, loans, and advances have taken as output variables, further TOBIT regression is used to identify the association of bank -specific factors in their performance.
Mishra and Sahoo (2012).	The panel data regression method has been applied to selected financial ratios to evaluate the financial performance of Indian banks.
Bapat (2012).	DEA technique applied for evaluating the efficiency of Indian Publ ic and private sector banks by taking expenses as an input variable and income as outputs variable.
Mishra and Sahoo(2012).	"Two-stage least squares (2SLS) " method of estimation has been app lied t o the panel dataset of Indian banks to determine the interrelationship among the financial performance, banks' conduct , and the structure of the market.
Kumar et al. (2012). Bansal and Mohanty (2013). Kumar and Sharma (2014). Kaur et al. (2015). Shukla (2015).	Banks were ranked on the basis of different ratios used in CAMEL rating methodology.
Goyal (2013).	Multiple regression was utilized to study the impact of the capital structure on the profitability of Indian banks.
Rao and Kumar (2013).	Linear regression model was applied on various financial ratios to evaluate the performance of the Indian banks before and after the merger.
Haque (2014).	ANOVA was used to analyze variance in the performance of different banking groups in terms of financial ratios such as ROA, ROE, and NIM.
Aspal and Dhawan(2014).	CAMELS model was used for rating old private sector banks in India.

Jayaraman and Srinivasan (2014).	Evaluated financial performance of banks using different DEA model s, i.e. cost, revenue, and profit model, and a combined efficiency index was developed from the efficiencies of cost, revenue, and profit model of DEA using Shannon entropy method to rank the banks in a more meaningful way.
Paul and Das (2015).	DEA- CCR output -oriented model was adopted for analyzing relative efficiency of the Indian banks' wherein, Non-interest income, interest spread, net worth, borrowings of the banks, operating exp ense and number of employees was considered as input variables, while deposits, net profits , and advances were considered as an output variable.
Goncharuk(2016).	Highlighted the key area of research in banking including performance efficiency, ranking of banks based on efficiency, etc.

#### **Bank Performance Evaluation using AHP**

AHP proposed by Saaty (1980) is a fundamental multicriteria decision-making (MCDM) method widely used across the industry wherein the decision is of multicriterion nature (Stankeviciene and Mencaite, 2012; Onder et al.,2013; Tran,2019). When the problem is complex, and decision-making is complicated, this method organize the problem into a hierarchical structure which consists of goal at the top of the hierarchy and the criteria, sub-criteria, and the alternatives at the subsequent level (Akhisar and Karpak, 2010; Bhandari and Nakarmi, 2014). The other important aspect of the AHP method is the weightage of criteria and sub-criteria positioned on the same hierarchy structure level (Frei and Harker, 1999; Cehulic et al., 2011). Despite the extensive use of AHP methodology in business and industry, the application of this method was scarce in banking system. Globally, several studies have used MCDM tools for performance evaluation of different entities (Bhattarai and Yadav, 2009; Sipahi and Timor, 2010). However, in Indian banking context, very limited studies have used AHP for decision making and ranking various commercial banks working in India.

In literature, the application of AHP in bank performance evaluation appeared in the nineties, and the most substantial use of AHP found after 1998. Frei and Harker (1999). described that all the parameters do not have equal importance for an institution's efficiency. Some parameters have more weightage than others. The study used AHP to weigh the various performance parameters based on their relative importance and synthesis was done to rank the selected institution. Hunjak et al.(2001) applied a combined approach of DEA and AHP on selected financial ratio to evaluate Croatian bank's performance. Bhattarai and Yadav (2009) reviewed the number of articles on the application of AHP in the finance sector and concluded that the use of the AHP specifically in the banking sector is scarce and requires in-depth academic research for decision making. Bhattarai et al.(2009) emphasized on holistic decision-making approach by putting the qualitative and quantitative information in a single framework using the AHP for Nepalese financial institutions. Rakocevic and Dragasevic (2009) introduced MCDM method for comparing and ranking of Montenegrin banks based on several criteria. They used AHP methodology for evaluating the quantitative and qualitative parameters related to the performance and supervision of Montenegrin banks. Akhisar and Karpak (2010) employed AHP to place the selected financial ratio of Turkish banks in a hierarchy structure for determining the financial performance score and established the relationship between bank failure and their financial performance. Cehulic et al. (2011)proposed AHP model to compare and analyze the financial ratios categorized into four groups, namely Income Statement Ratios, Market Ratios, Balance Sheet Ratios, and Profitability Ratios and several subgroups for evaluating the performance of Croatian banks. The study of Stankeviciene and Mencaite (2012) suggested AHP model for assessment of Lithuanian banks and ranked them based on their performance

score.Lu et al.(2013) identified various bank's operation risk items and prioritized these risk items using AHP. Bhandari and Nakarmi (2014) recommended AHP model to evaluate the financial performance of Nepalese commercial banks by employing several financial ratios. Sharma (2014) developed an Analytic Hierarchy Process model that comprised of both financial and human aspects and the relative importance of both aspects was measured by experts' opinion. The analysis revealed that the human aspect is more important than the financial aspect. Dinner, (2015) developed a hybrid model based on the Fuzzy Analytic Hierarchy Process (FAHP) and DEA to assess overall efficiency level of banks quoted in BIST 100 Index with the interest and non-interest based income parameters. Gayval and Bajaj (2016) employed a combined approach of DEA and AHP to determine efficiency scores of Indian banks. Ghasempour and Salami (2016) developed a decision model with six criteria selected based on the CAMELS approach to evaluate the performance of the Iranian banks. Tran (2019) explored the utility of the AHP in selecting and calculating the relative weight of the important criteria for proposing a suitable model for partner evaluation and choosing strategic banking alliances in Vietnam.

#### **Objectives of the study**

The study has formulated following objectives:

To identify the criteria and sub-criteria for financial performance evaluation of Indian banks.

• To establish the priorities of the six criteria's including Assets Quality, Capital Adequacy, Liquidity, Earning, Management Efficiency, and Profitability, which further categorized into 24 sub-criteria measured in terms of financial ratios.

To propose a hierarchy structure of the AHP model for the comparison of the bank's financial ratios.

To use the AHP application for the comparison of selected Criteria and sub-criteria measured by financial ratios and its validation.

To analyze the results of banks comparison supported by the proposed model and to give them ranking.

#### **Research Methodology**

#### Proposed Hierarchy model for the study

In this study, a MCDM technique popularly known as AHP is utilized to assess the financial performance of 10 largest Indian commercial banks (Annexure-1)based on their number of branch offices. An average of financial ratios for ten years from 2009 to 2018 is employed for the evaluation.

The selection of main criteria and sub-criteria is based on available past literature. A set of AHP questionnaire is constructed and based on opinion of bank experts, the pairwise comparison of the criteria and sub-criteria are done at a given level of hierarchy to determine their relative weights. Further the weights of all the sub-criteria are used to determine the ranking of the banks using AHP.

# Proposed AHP Model for Indian Bank's Financial Performance Evaluation

# The proposed AHP model is explained in the following steps:

Step 1: The hierarchical model for bank's financial performance evaluation developed in such a way that the goal positioned at the top (1st level), (i.e., Evaluation of financial performance) with criteria (6 criteria) at 2nd level and sub-criteria (24 sub-criteria) at 3rd levels and finally the alternatives (10 largest Commercial Banks) at the bottom (4th level) of the model. Figure 4.1 has depicted the proposed AHP model.

Step 2: For determining the relative importance of criteria and sub-criteria, pairwise comparisons of each of the six criteria and 24 sub-criteria has been done at all possible pairs of criteria and sub-criteria. Table 4.1 has shown all the opted criteria and sub-criteria. The squared pairwise comparison matrixes are constructed in which all the sets of elements are compared with each other. The expert's opinion regarding preference of criteria are expressed in terms of verbally described scale of importance and corresponding numeric values based on the fundamental pair-wise comparison scale of AHP preferences depicted in Table 4.2 are filled in the matrices. The total number of comparisons at each hierarchy level is N(N-1)/2. There are seven pairwise comparison matrix constructed, one pairwise comparison matrix is formed for criteria level, and six pairwise comparison matrix is created for the subcriteria level. These pairwise comparison matrixes described how one attribute (i.e., criteria and sub-criteria measured in terms of financial ratio) preferred over others. The pairwise comparison matrixes are obtained by keeping one criterion as a reference and pairing it with all other criteria. A typical pairwise comparison matrix for criteria level filled by one respondent is demonstrated for reference in Table 4.3.



**Figure 4.1: Proposed AHP Model** 

Criteria	Sub- Criteria
	Ratio of Gross NPA to Gross advance = Gross NPA/ Gross Advance*100
	Ratio of Net NPA to Net advance = Net NPA/Net Advance*100
Asset Quality	Provision coverage ratio = Provisions held for NPA/GNPAs*100
	Ratio of secured advance to total advances = Secured Advance/Total
	Advances*100
	Capital Adequacy(Teir-I) = Eligible Tier 1 capital funds/ (Credit Risk RWA* +
	Market Risk RWA + Operational Risk RWA)*100
Capital Adequacy	Capital Adequacy( Teir-II) (W <sub>C2</sub> )
	CRAR =Eligible total capital funds/ (Credit Risk RWA + Market Risk RWA +
	Operational Risk RWA)*100
	Cash to Deposit Ratio = Cash in hand and balance with RBI / Deposits*100
Lonidity	Credit to Deposit Ratio = Advances/ Deposits*100
Liquidity	Invest. To Deposit Ratio = Investment/ Deposits*100
-	Deposit to Total liability = Deposits/Total liability*100
	Net Interest Margin = (Interest Earned - Interest Expended)/ Total Assets*100
Farning	Ratio of interest Income to Total Assets = Interest Earned/Total Assets*100
rannig	Ratio of Non- interest Income to Total Assets = Other Income/Total Assets*100
-	Operating Cost to Operating Income = Operating cost/ Operating Income*100
	Profit per employee (in million) = Total profit/ Total no. of employee
	Business per employee (in million) = Total business/ Total no. of employee
Management	Ratio of wage bill to total expenses = Payments to and provisions for
Efficiency	employees/(Interest Expended + Operating Expenses)*100
	Ratio of wage bill to total income = Payments to and provisions for
21	employees)/(Interest Earned + Other Income)*100
	Return on Assets(ROA) =
	Return on Equity(ROE) = Net Profit for the year/average (Capital + Reserves and
Droftshilts	Surplus) for Current and Previous Years*100
	Ratio of operating profit to total assets = Operating profit/ Total Asset*100
riolitability	Return on Advances = Interest/Discount on advances/bills / average (Advances) for
	Current and Previous Years*100
	Return on Investment = Income on Investments /average (Investments) for Current
	and Previous Years*100

Table 4.1: Selected criteria and sub-criteria of the model

Source: https://dbie.rbi.org.in

Note: - RWA - Risk-weighted Asset.

NPA - Non-performing Asset.

CRAR Capital to Risk-weighted Asset Ratio.

Intensity of importance on Numeric Scale	Scale of Importance	Explanation
1	Equal importance	Two activities have equal contribute to the objective
3	Moderate importance	Experience and judgment slightly favor one activity over another
5	Strong importance	Experience and judgment strongly favor one activity
7	Very strong on demonstrated importance	An activity is favored very strongly over another
9	Extreme importance	The evidence favoring one activity over another is of the highest possible order of affirmation
2,4,6,8	For compromise between the above values	Sometimes one needs to interpolate a compromise judgment numerically
1/2, 1/3, 1	/4, 1/5, 1/6, 1/7, 18, 19	Values for Inverse Comparision

Table 4.2: Fundamental Pair-wise comparison scale for AHP preferences

source : Saaty (1988).

A similar response is obtained for each sub-criteria level as well. Table 4.3 demonstrates a pairwise comparison matrix of criteria for reference; where the respondent believes that asset quality is slightly more important than capital adequacy ratio, which means a rating of 2 from table 4.2, so the numeric value 2 is mentioned in the cell where asset quality criterion in row and capital adequacy ratio criterion in column and simultaneously the numeric value 1/2 (The

reciprocal response) is mentioned in the cell where capital adequacy ratio in row and asset quality criterion in column. Similarly, all the paired comparison has been made for the remaining criteria in the matrix. The diagonal value of the matrix is one as every criterion compared with itself would have equal importance. This process would be repeated for all the criteria and sub-criteria. Further, all fractional values are converted to a decimal value.

			E	xpert 1			
	Criteria	Asset Quality	Capital Adequacy	Liquidity	Earning	Management Efficiency	Profitability
Preferred over	Asset Quality	1	2	3	2	4	3
Preferred over	Capital Adequacy	1/2	1	2	4	5	5
Preferred over	Liquidity	1/3	1/2	1	3	3	3
Preferred over	Earning	1/2	1/4	1/3	1	2	3
Preferred over	Management Efficiency	1/4	1/5	1/3	1/2	1	2
Preferred over	Profitability	1/3	1/5	1/3	1/3	1/2	1

Table 4.3: The Pairwise Comparison Matrix for the selected Criteria

Step 3: To make selected criteria and sub-criteria comparable, normalized pairwise comparison matrixes are calculated using the vector normalization technique. Firstly, the beneficial and non- beneficial criteria are identified then the vector distance is calculated by adding squared value and taking the square root of the values filled by the respondent in each column of the pairwise comparison matrixes. Secondly, for beneficial criteria, each response value divided by vector distance and for non-beneficial criteria one minus the response value is divided by vector distance. Weight of each criterion and sub-criteria is then calculated by taking the average of the normalized value of each row of the respective criteria.

Step 4: This step deals with the calculation of eigen value  $(\lambda)$  and maximum eigen value  $(\lambda max)$ . For that the weight of every criterion is multiplied with each value in the column of pairwise comparison matrixes to calculate weighted pairwise comparison matrixes. To obtain weighted sum value of all the criteria and sub-criteria, the addition of all the elements in each row of the corresponding criteria and sub-criteria is done. Then the

weighted sum value of corresponding criteria and subcriteria is divided with each value in the row of weighted pairwise comparison matrixes. On taking the sum of all values in each of row of the corresponding criteria and sub criteria, the value of  $\lambda$  (lambda) is determined. The average value of  $\lambda$  (lambda) represents  $\lambda$  max.

Step 5: In this step, consistency index (CI) is determined for every paired comparison matrix of criteria and sub-criteria by the formula given below,

 $CI = (\lambda max - n)/n - 1$ 

Where n presents the number of criteria used in each paired comparison matrix.

Step 6: To check the consistent behavior of responses filled by the respondent's consistency ratio (CR) is determined by dividing the consistency index (CI) value of corresponding criteria and sub-criteria with the random index (RI) value depicted in table 4.4

CR = CI/RI

			Table 4.4	l: The Ra	ndom In	dex table				
No of Criteria	1	2	3	4	5	6	7	8	9	10
Random Index	0	0	0.56	0.9	1.12	1.24	1.32	1.41	1.45	1.45
source: Saaty (1980)	)									

Step 7: Saaty (1980), suggested that the value of CR is considered acceptable up to 0.10 or 10%. Value higher than 10% shows that response obtained from the respondent is inconsistent, and it needs to reviewed and improved to get the consistent matrixes. In present case, the value of consistency ratio for all the criteria and sub-criteria is less than 0.01. For the reference result of the pairwise comparison matrix for criteria level filled by one respondent is depicted in table 4.5.Similarly consistency results have been obtained for each sub-criteria level as well.

Table 4. 5: Consistency result of the pairwise comparison matrix for	selected
criteria	

Criteria	Weight	λ max, CI, RI	CR
Asset Quality	0.136429646		
Capital Adequacy	0.192055012	$\lambda \max = 6.074$	CR = 0.012
Liquidity	0.170434783	CI = 0.014	
Earning	0.156895566	RI = 1.24	
Management Efficiency	0.167098233		
Profitability			
	0.177086759		

Step 8: The steps from 3-7is repeated for all the criteria and sub-criteria in the hierarchical levels to calculate local weights of each criterion and sub-criteria. Subsequently, the global weightis determined by multiplying the criteria weight with the sub-criteria weight.

#### **Data Analysis and Model Synthesis**

To apply the proposed model for evaluating financial performance of commercial banks working in India, data of 6 criteria, measured by 24 sub-criteria in terms of financial ratio of 10 largest commercial bank's is collected from the RBI statistical reports. The average time-series data for the period of 2009 to 2018 is taken for the analysis. The average of these ratios is used in the form of the decision matrix depicted in table 5.1.

In all the selected sub-criteria (Financial ratios), some subcriteria are beneficial, of which higher value is desired, and some sub-criteria are non-beneficial of which lower value is desired. So to make all the sub-criteria comparable and to bring uniformity, the normalized decision matrix is calculated using linear normalization technique. For normalization, first of all, the beneficial and non-beneficial sub-criteria are identified. Then the maximum performance value of beneficial sub-criteria is taken, and then all the performance value of corresponding beneficial sub-criteria is divided by maximum performance value of that sub-criteria and for nonbeneficial criteria the minimum performance value of corresponding non-beneficial sub-criteria is divided by performance value in each cell of that sub-criteria, as described below

For Beneficial Criteria = Xij/Xj Max

For Non-Beneficial Criteria = XjMin/Xij

Where Xij, represent the values in each cell, Xj Max, represents the maximum value, and XjMin represents the minimum value.

On solving normalized decision matrix is obtained, and based on the response given by the experts the global weight of all the sub-criteria has been calculated as described earlier in the paper (Table 5.3). Then the global weight of each sub-criterion is multiplied with the corresponding value of the financial ratio in each cell of corresponding sub-criteria of the normalized decision matrix to get the weighted normalized decision matrix. From the weighted normalized decision matrix, the preference score is obtained by summing up the performance value of all the sub-criteria in the weighted normalized decision matrix correspond to each bank. Based on the preference score, the ranking of banks is obtained. As illustrated in table 5.4

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<b>Decision Matrix</b>																								
Alternative's /		Asset	Quality		Cap	ttal Adequ	Sacy		Liq	uidity			Earn	â		M	anagement	Efficiency			£,	ofitability		
(Bank Name)			CI			3			1	3			S				3					93		
Criteria's Financial Ratios	Ratio of Gross NPA to Gross advance	Ratio of Net NPA to Net advance	Provision coverage ratio	Ratio of secured advance to total advances	Capital Adequac y Ratio( Teir-I)	Capital Adequac y Ratio (Teir- II)	Capital to risk wreghted asset ratio(CR, AR)	Cash to Deposit Ratio	Credit to Deposit Ratio	Invest. To Deposit Ratio	Deposit to Total fiability Ratio	Ratio of net interest income to total assets (Net Interest Margin)	Ratio of interest income to Total Assets	Astio of a Non- Non- nterest c ncome n o Total	perati E Cost R perati tr perati tr foome in atio	atio of F age built v total t total e come e	atio of 1 age bill e o total e penses 1	Profit Def Taploys ((in Cupess (Alilion)	Business Der mployee in Rupees Million)	Return 1 on Assets 1 Ratio(R 1 OA)	Return on Equity Ratio(RO	Ratio of operatin operatin to total assets	Return on Advances Ratio	Return on Investin Ratio
/	Ål	A2	Å3	A4	CI	3	8	LI	12	13	Lå	EI	E	141	4	11	0	VB 1	M4	P1	6	P3	志	PS
STATE BANK OF INDIA	5.28941	2.70000	27.52849	80.63791	9.58300	3.38400	12.96700	6.86184	80.48931	33.37879	76.66154	2.73864	7.39139	1.29986	.96210 1	3.69597	17.83498	0.43057	106.41710	0.64900	10.66619	2.06919	8.87337	7,51245
PUNIAB NATIONAL																								
BANK	6.83021	3.99900	29.80276	90.11965	8.81800	3.36500	12.18300	5,56070	74.50631	30.88148	83.44568	2.86443	7.92805	1.10194 (	0.80338 1	2.96074	17.19578	0.26770	116.29720	0.55100	8.65510	2.23501	9.48939	7.19459
CANARA BANK	4.61356	3.17500	33.56163	79.06614	9.21100	3 53100	12.74200	5.17855	70.79400	30.19330	8634865	2.08163	8.06056	1.00143 (	37895	9.65538	11.88468	0.37290	129.97760	0.55200	9.14959	1.65681	9.64473	7.65291
BANK OF BARODA	4.81946	2.15000	29.90751	\$3.19988	9.89700	3,43700	13,33400	4,44053	70.77363	23.26806	85.62900	2.23882	6.67712	0.89628 (	1 197751	0.22372	13.38048	0.53000	152,28000	0.609.0	10.61275	1.77648	7,87753	7.58371
BANK OF INDIA	6.49640	2.70000	30.21615	80.95415	8.55800	3.33000	11.38800	5,60503	73.06696	25.73133	84.48836	2.14740	7.15505	0.93610	1 03500 1	0.84785	13.60844	0.13200	156.67000	0.49500	5.25102	1.65118	8.27187	75197
HDFC BANK LTD.	1.13208	0.30400	63.27120	75.89251	12.34400	3.69900	16.04300	7,94303	79.94473	35.38205	74.88639	4.22338	8.90216	1.76799 (	0.87875	9.39088	13,41717	1.06530	38.76000	1.77800	18.39604	3.19206	11.46437	7,46202
ICICI BANK LIMITED	5,59591	2.32400	26.28321	80.63403	13.33800	4.55300	17.89100	7,79097	98.26684	49.20428	57 29953	2.65665	7,43151	1.97682 (	.64890	7.49231	0.77224	1.19000	86.86000	1.40100	10.66536	2.83070	9,29314	6.51407
CENTRAL BANK OF INDIA	8 00421	4.45900	20.50827	83.97070	7.52400	3.67900	11 20300	9 27336	66.90312	32.69327	86.41809	216144	11611.8	0,74306	1 16669	3.79337	5.76139	-0.12480	98.46130	-0.06400	-0.58382	1.10794	10.10327	7.36249
UNION BANK OF INDIA	5.73445	3.09300	24.59169	84,63453	8.26600	3.42400	11.69000	5.68486	75.56060	29.47714	84.72907	2.41017	8.09532	0.99156	.88734 1	0.10450	12.66425	0.36750	126.74000	0.55700	9.37615	1.81915	9,30522	7.82565
SYNDICATE BANK	4.42413	2.39600	29.28958	80.27384	8.62400	3.43900	12.06300	5.96993	77.63253	26.49973	85.73357	2.33820	7.87800	0.76703	10100 1	2 09111	14.65747	0.22260	119.24030	0.39400	8 34023	1 50391	9.12994	7 32812

Criteria	Weight of Criteria	Sub- Criteria	Weight of sub- Criteria
		Ratio of Gross NPA to Gross advance $(W_{A1})$	0.273407701
Accest Onality (W.)		Ratio of Net NPA to Net advance $(W_{A2})$	0.273510407
Asset Quanty (WA)		Provision coverage ratio (WA3)	0.210829647
	0.136429646	Ratio of secured advance to total advances ( $W_{A4}$ )	0.242252245
		Capital Adequacy( Teir-I) (W <sub>C1</sub> )	0.352191019
Capital Adequacy ( $W_C$ )		Capital Adequacy( Teir-II) (W <sub>C2</sub> )	0.332984183
	0.192055012	CRAR (W <sub>C3</sub> )	0.314824797
		Cash to Deposit Ratio (WL1)	0.299378735
Timutity (W.)		Credit to Deposit Ratio (WL2)	0.215927211
ridingity (wD		Invest. To Deposit Ratio(WL3)	0.233310067
	0.170434783	Deposit to Total liability (WL4)	0.251383987
		Net Interest Margin (W <sub>E1</sub> )	0.261303840
Earning (W.)		Ratio of interest Income to Total Assets (W <sub>E2</sub> )	0.271911247
Laning (WE)		Ratio of Non- interest Income to Total Assets $(\mathrm{W}_{\mathrm{E3}})$	0.222243921
	0.156895566	Operating Cost to Operating Income ( $W_{E4}$ )	0.244540992
		Profit per employee (W <sub>M1</sub> )	0.321126329
Management Efficiency (W. )		Business per employee (WM2)	0.239431473
Management Enciency (WM)		Ratio of wage bill to total expenses ( $W_{M3}$ )	0.222731143
	0.167098233	Ratio of wage bill to total income $(W_{M4})$	0.216711055
	an a	Return on Assets(ROA) (W <sub>P1</sub> )	0.188306358
		Return on Equity(ROE) (WP2)	0.226402413
Profitability (WP)		Ratio of operating profit to total assets (Wp3)	0.204549840
		Return on Advances (WP4)	0.188010454
	0.177086759	Return on Investment $(W_{P5})$	0.192730936

### Table: 5.2: Weight of identified criteria and sub-criteria

Rank	Criteria	Sub- Criteria	Global weights of Criteria
1	Capital Adequacy (Wc)	Capital Adequacy( Teir-I) (W <sub>C1</sub> )	0.067640050
2	Capital Adequacy (W <sub>C</sub> )	Capital Adequacy( Teir-II) (W <sub>C2</sub> )	0.063951281
3	Capital Adequacy (W <sub>C</sub> )	CRAR (W <sub>C3</sub> )	0.060463680
4	Management Efficiency (W <sub>M</sub> )	Profit per employee (W <sub>M1</sub> )	0.053659642
5	Liquidity (WL)	Cash to Deposit Ratio (WL1)	0.051024550
6	Liquidity (WL)	Deposit to Total liability (WL4)	0.042844575
7	Earning (W <sub>E</sub> )	Ratio of interest Income to Total Assets $(W_{E2})$	0.042661669
8	Earning (W <sub>E</sub> )	Net Interest Margin (W <sub>E1</sub> )	0.040997414
9	Profitability (WP)	Return on Equity(ROE) (WP2)	0.040092870
10	Management Efficiency (W <sub>M</sub> )	Business per employee (W <sub>M2</sub> )	0.040008576
11	Liquidity (WL)	Invest. To Deposit Ratio(WL3)	0.039764151
12	Earning (W <sub>E</sub> )	Operating Cost to Operating Income (WE4)	0.038367397
13	Asset Quality (WA)	Ratio of Net NPA to Net advance $(W_{A2})$	0.037314928
14	Asset Quality (W <sub>A</sub> )	Ratio of Gross NPA to Gross advance (WA1)	0.037300916
15	Management Efficiency (WM)	Ratio of wage bill to total expenses ( $W_{M3}$ )	0.037217980
16	Liquidity (WL)	Credit to Deposit Ratio (WL2)	0.036801507
17	Profitability (WP)	Ratio of operating profit to total assets (WP3)	0.036223068
18	Management Efficiency (W <sub>M</sub> )	Ratio of wage bill to total income $(W_{M4})$	0.036212034
19	Earning (W <sub>E</sub> )	Ratio of Non-interest Income to Total Assets (WE3)	0.034869086
20	Profitability (WP)	Return on Investment (WP5)	0.034130097
21	Profitability (WP)	Return on Assets(ROA) (W <sub>P1</sub> )	0.033346563
22	Profitability (WP)	Return on Advances (W <sub>P4</sub> )	0.033294162
23	Asset Quality (W <sub>A</sub> )	Ratio of secured advance to total advances ( $W_{A4}$ )	0.033050388
24	Asset Quality (W <sub>A</sub> )	Provision coverage ratio (WA3)	0.028763414

### Table: 5.3: Global weight of selected sub-criteria

Name of Bank	Preference score	Rank
HDFC Bank Ltd.	0.887420275	1
ICICI Bank Ltd.	0.816487122	2
Canara Bank	0.653474296	3
Bank of Baroda	0.649396372	4
State Bank of India	0.647864331	5
Union Bank of India	0.643199577	6
Punjab National Bank	0.634658742	7
Syndicate Bank	0.610560365	8
Bank of India	0.609132747	9
Central Bank of India	0.555516108	10

Table: 5.4: Preference score and ranking of commercial selected banks

Figure: 5.1 : Graphical representation of preference score and ranking of Selected commercial banks



#### **Results & Discussions**

The data of 24 financial ratios of ten largest Indian commercial banks for the time period of 2009 to 2018 is extracted from the RBI statistical reports and the weightage of selected criteria and sub-criteria is calculated by employing paired comparison method based on the response of banking experts using AHP. The capital adequacy ratio has highest weightage (0.192055012) among all the criteria followed by profitability (0177086759), liquidity (0.170434783), management efficiency (0.167098233), earning (0.156895566) and asset quality (0.136429646) which has least weightage. Similarly, the capital adequacy ratio tier-I has highest weightage among all the sub-criteria (0.352191019), and return on advance has been assigned the least weight (0.188306358) (table 5.2). Then the global weight is calculated by multiplying the weight of all the criteria with the weight of the respective sub- criteria (table 5.3.) shows

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that the global weight of capital adequacy ratio tier-I has highest weightage (0.06764005) among all the sub criteria and the provision coverage ratio has least weightage (0.028763414), the ranking of all the sub- criteria based on their weightage is obtained (table5.3). Further, the average of 24 financial ratios of ten largest Indian commercial banks for the period of 2009 to 2018 is taken as decision matrix (table5.1). To make all the financial ratios comparable normalization is done because all the financial ratios have different units of measurement. So linear normalization technique is used to get the normalized decision matrix. Subsequently, global weight of all financial ratios is multiplied with the respective value of these normalized financial ratios, and a weighted normalized decision matrix is obtained. The value in each cell of the weighted normalized decision matrix is taken as the performance value, and the sum of the performance value of all the financial ratios representing 24 sub-criteria of the respective bank is calculated to obtain the overall preference score (table 5.4). Based on the preference score, the ranking is obtained, higher the overall preference score higher is the ranking (table-5.4, fig 5.1). The overall preference score shows that HDFC Bank Ltd. is having highest preference score(0.887420275) followed by ICICI Bank Ltd (0.816487122), Canara Bank (0.653474296), Bank of Baroda (0.649406372), State Bank of India (0.647864331), Union Bank of India (0.643209577), Punjab National Bank (0.634668742), Syndicate Bank (0.610560365), Bank of India (0.609132742), whereas the Central bank has got least preference score (0.555516108). Further the result suggest that the banks which are lower in ranking need to improve their certain key financial ratios such as capital adequacy ratio, profit per employee, cash to deposit ratio, deposit to liability and ratio of interest

income to total assets etc., these are some of the financial ratios which are having highest weightage and these banks need to improve these ratios in order to improve their financial performance.

#### Conclusion

The study has ranked the financial performance of ten commercial banks working in India based on selected criteria. AHP method is utilized for providing relative weight to set criteria and appropriate ranking has been assigned to banks on the basis of their evaluation. The result of the study has demonstrated that the private sector bank HDFC has attained highest rank among ten commercial banks under study followed by ICICI. State bank of India, which is the largest commercial bank in India, has been ranked on fifth position. It is evident from the study the size of the bank is not associated with the financial performance of the banks. Further, this paper gives priority ranking to the different key financial ratio based on their weightage which enables the bank management to take a decision for improvement of the key financial ratios and their financial results thereof.

As the study is confined to ten commercial banks working in India, the findings cannot be generalized for all the Indian commercial banks. In future researches, larger sample size can be considered for study. Further, the ranking can be obtained for each year separately to understand the change in performance every year. Moreover, different sets of criteria can be explored to validate the results of existing studies.

List of ten largest Indian commercial banks	based on No. of branch offices present in India	1
Name of Bank	No of functioning Offices of the commercial banks at the end of	Ranks
State Bank Of India	23578	1
Punjab National Bank	7127	2
Canara Bank	6509	3
Bank of Baroda	5715	4
Bank of India	5357	5
HDFC Bank Ltd.	5035	6
ICICI Bank Ltd.	4874	7
Central Bank of India	4775	8
Union Bank of India	4439	9
Syndicate Bank	4253	10

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