
Ranking of Credit Cards of Different Banks using Group AHP

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Abstract

A credit card is one of the most useful and powerful, yet dangerous, payment systems. Credit cards, or plastic money as they are called these days, are fast becoming an integral part of money management and banks are wooing customers with irresistible offers like reward points, privilege memberships etc on credit card usage. So, to select a credit card, there are some criteria that are suggested by some experts. This study is performed for the customers who earn Rs. 20,000/- to 40,000/- per month. In this study, group AHP is employed to find out the most preferred credit card from the different banks that are under consideration and the priority of selection criteria of the credit cards. The result of the study is that the credit card of the ICICI bank is the most preferred by the customers and the rate of interest is the important criterion to select a credit card from banks.

Keywords: Bank Credit Cards, Multi-Criteria Decision Model, Analytic Hierarchy Process.

Introduction: The Indian money market is classified into: the organised sector (comprising private, public and foreign owned commercial banks and cooperative banks, together known as scheduled banks); and the unorganised sector (comprising individual or family owned indigenous bankers or money lenders and non-banking financial companies (NBFCs)) (www.jeywin.com¹). The unorganised sector and microcredit are still preferred over traditional banks in rural and sub-urban areas, especially for non-productive purposes, like ceremonies and short duration loans.

In our day of age, the rapid growth of technological improvements has brought a different view and more competition to the banking sector. It is apparent that the institutions that are unable to keep up with these technological improvements of electronic banking are faced with the danger of not being able to compete (Okan, 2007²). In other words, electronic banking reshaped the competitive environment by increasing convenience of meeting customer needs and wants in terms of time and location. Therefore, electronic banking became the key of gaining competitive edge in banking sector. An important part of electronic banking is the credit card.

Credit is extended by a creditor, also known as a lender, to a debtor, also known as a borrower. Credit does not necessarily require money. The credit concept can be applied in barter economies as well, based on the direct exchange of goods and services. The credit card is used instead of paper money and is a contemporary tool for

paying bills. As the credit card services currently focus on customers, determining the effective factors on credit card ownership and usage is crucial for marketing purposes. Credit is a method of selling goods or services without the buyer having cash in hand. A credit card is only an automatic way of offering credit to a consumer.

The concept of using a card for purchases was described in 1887 by Edward Bellamy in his utopian novel "Looking backward". Bellamy used the term credit card eleven times in this novel, although this referred to a card for spending a citizen's dividend rather than borrowing. The concept of customers paying different merchants using the same card was expanded in 1950 by Ralph Schneider and Frank McNamara, founders of Diners Club, to consolidate multiple cards.

The important thing is the credit card issuing banks in India. There are several banks which provide credit cards in India. For issuing a credit card to a customer, it is necessary to know about the financial status of that customer. So, in the late 1990s, the need for a credit information system was increasingly felt in order to enable informed credit decisions and aid fact based risk management. In this context, the requirement of an adequate, comprehensive and reliable information system on the borrowers through an efficient database system was keenly felt by the Reserve Bank of India and the Government as well as credit institutions. As per the recommendations made by the Working Group, Credit Information Bureau (India) Ltd., (CIBIL) was set up in January 2000. CIBIL collects and maintains records of an

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individual's payments pertaining to loans and credit cards. These records are submitted to CIBIL by member banks and credit institutions, on a monthly basis. This information is then used to create Credit Information Reports (CIR) and credit scores which are provided to credit institutions in order to help evaluate and approve loan applications (www.wikipedia.com³).

A credit card is one of the most useful and powerful, yet dangerous, payment systems. The design of the credit card itself has become a major selling point in recent years. The value of the card to the issuer is often related to the customer's usage of the card, or to the customer's financial worth. Credit Cards, or plastic money as they are called these days, are fast becoming an integral part of money management and banks are wooing customers with irresistible offers like reward points, privilege memberships etc on credit card usage.

This paper shows that the analytic hierarchy process is applied to study the priorities of the credit card of the banks that are under consideration. The group AHP is employed to evaluate the overall preferences of the credit cards of the different banks and the priorities of the selection criteria also. Credit card selection criteria are used to analyse the most preferred credit card from considered banks. This paper shows that the credit card of ICICI bank is the mostly preferred by the customer who earns in range between Rs 20,000/- to 40,000/- per month.

Literature Review: Credit has been an attractive instrument for the general public as well as for the business community that facilitate them in their financial obligations. It not only help them discharge their liabilities, but also provide them with a leverage in their financial resources by providing various benefits like enhanced credit limit, payment in instalment, cash advance, promotions and discounts, acceptance at reputable and modern establishments, protection and insurance, etc.

The major emphasis of research has been on various issues like selection criteria of credit cards, frauds, security, usage pattern, new method of e-payment, etc. Since the time of its inception in the 1950s, credit card market has grown remarkably (Durkin and Price, 2000⁴).

Using a sample of major credit card issuers, this study examines the effects of credit card rates on card loan growth and delinquency rates between 1991 and 1994. Lower card rates failed to sufficiently increase card loans, and the delinquency rate was positively related to the card rate (Park, 1997⁵).

The study of Ramayah is aimed at validating criteria that influence the differences in attitudes among active and inactive cardholders. By focusing on relevant criteria that

have been identified, it is believed that credit card issuing banks can position themselves effectively via their marketing strategies to activate their existing cardholder's usage rate as well as to attract new active cardholders. Based on the results of the study, several suggestions are forwarded to credit card issuing banks as a step to stimulate credit cardholder's usage level. Among these are to work closer with various retailers to promote the credit card payment mode, to provide adequate credit limit to cardholders, to extend interest free repayment period from 20 days to 30 days, to implement strategic alliances with firms involved in travelling, entertainment, insurance, and telecommunications and, to advertise more so as to create a brand name for the issuing bank (Ramayah, 2002⁶).

Credit card fraud is a serious and growing problem. While predictive models for credit card fraud detection are in active use in practice, reported studies on the use of data mining approaches for paper credit card fraud detection are relatively few, possibly due to the lack of available data for research. This evaluates two advanced data mining approaches, support vector machines and random forests, together with the well known logistic regression, as part of an attempt to better detect (and thus control and prosecute) credit card fraud. The study is based on real-life data of transactions from an international credit card operation (Bhattachayya, 2011⁷).

Credit card customer classification is an important part of credit card customer management, which is also the key of risk control (Lia, 2013⁸). As an effective approach, MCLP (multi-criteria linear programming) model has been applied to credit card customer classification successfully. Here, b is an important parameter in MCLP model which is decided by decision makers during the classification process. How the parameter affects the classification accuracy in the MCLP model is an important problem. Thus, sensitivity analysis of b is analyzed in the paper for credit card-holders classification and credit card-holder's datasets are selected for experiments. The experiment results show that b equals to zero is the best choice for this problem.

Thirteen important criteria (Ramayah, 2002⁹) were used to measure credit cardholder's attitude. These criteria include acceptance level, credit limit, interest-free repayment period, annual fee, application approval period, ancillary functions, handling of cardholder's complaints, issuing bank image, gift/bonus to new applicants, card design, leaflet to describe the card, and advertising by the issuing bank.

The important credit card selection criteria are annual service fee, interest rate, security measures, credit limit, reward points, status symbol, supplementary cards,

joining fee, and overseas facilities (Butt, 2010¹⁰).

AHP has been widely used to rank order the alternatives of problems formulated in hierarchical structures (Saaty 1972, 1977a, 1977b, 1980, 1990a¹¹). The AHP is a popular technique for determining weights in multi-criteria problems (Shim 1989¹²), and it has been used to evaluate projects (Liberatore 1987¹³, Lockett et al. 1984¹⁴).

The Analytic Hierarchy Process (AHP) is a multi-criteria decision making (MCDM) technique proposed by Saaty (1977, 1980), that integrates pair-wise comparison ratios into a ratio scale. One advantage of this MCDM tool is that it allows us to measure the consistency of the decision maker when eliciting the judgements in a formal and elegant way (Jimenez, 2003¹⁵).

Group decision making (Ozer and Lane, 2010¹⁶) techniques and concepts are analyzed to examine how the suite of alternative decision support methods in a group setting provide rationale for resolving the group problem. Specifically, the following group methods are presented as representative of a wider set of methods: a) the AHP method; b) the AHP combined method; and c) the Group (self) evaluation method. There are three possible situations for AHP group decision making (Moreno 2002). These are: i) Joint Action Group Decision - decision makers seek a common result by acting jointly as a single decision maker, e.g., equitable input weights; ii) Negotiated Decision - each decision maker argues or persuades others of their own judgment and then through discussion with the other decision makers achieves a common solution (e.g., Delphi method); and iii) Systematic Decision - each decision maker acts independently and a group result is a function of each member's independent output ranking of the alternative. In AHP Combined, the inputs are combined by using a geometric mean approach across all individual decision makers. In the group evaluation, overall weights are applied to individuals' results from the decision makers' own feedback in the form of self evaluation of the group members.

Research Methodology: Multi-criteria decision model (MCDM) is a powerful method that is used to evaluating and ranking of different decision alternatives containing multiple conflicting criteria.

AHP was developed in the 1970s by Thomas L. Saaty is a multi-criteria decision making (MCDM) methodology. It has been used extensively for analyzing complex decisions. The approach can be used to help decision-makers for prioritizing alternatives and determining the optimal alternative using pair-wise comparison judgments (Liberatore and, Nydick, 1997¹⁷; Yoo and Choi, 2006¹⁸). Weighting the criteria by multiple experts

avoids the bias decision making and provides impartiality (Dagdeviren, 2009¹⁹). The AHP is a selection process that consists of following steps (Saaty, 1990, 2008²⁰; Saaty and Vargas, 2001²¹):

1. Define the problem and determine the criteria. Factors and related sub factors must be correlated (Lee, 2012²²).
2. Structure the decision hierarchy taking into account the goal of the decision.
3. Construct a set of all judgments in a square comparison matrix in which the set of elements is compared with itself (size n x n) by using the fundamental scale of pair-wise comparison shown in Table 1 assign the reciprocal value in the corresponding position in the matrix. Total number of comparison is n(n-1)/2 (Lee, 2012²³).

Table 1: The fundamental scale of pair-wise comparison for AHP

Verbal Judgement	Numerical Rating
Equally importance	1
	2
Moderately importance	3
	4
Strongly importance	5
	6
Very Strongly importance	7
	8
Extremely importance	9
Intermediate levels of importance	2,4,6,8

4. Use overall or global priorities obtained from weighted values for weighting process. For synthesis of priorities obtain the principal right eigenvector and largest eigen value. Matrix $A = (a_{ij})$ is said to be consistent if $a_{ij} \cdot a_{jk} = a_{ik}$ and its principal eigen value (λ_{max}) is equal to n.

The general eigen value formulation is:

$$Aw = \lambda_{max} w$$

For measure consistency index (CI) adopt the value:

$$CI = (\lambda_{max} - n) / (n-1)$$

Accept the estimate of w if the consistency ratio (CR) of CI that random matrix is significant small. If CR value is too high, then it means that experts' answers are not consistent (Lee, 2012²⁴; Saaty, 1980). Acceptable values of CR must be less than 0.1 (Saaty, 1990). The CR is obtained by comparing the CI with an average random consistency index (RI).

$$CR = CI/RI$$

Briefly, maximized Eigen value, CI and CR are found to obtain the weights of each criteria. Experts are asked to compare the criteria on a pair-wise basis to determine their relative importance. AHP was used in order to determine which credit card is the most preferred by the customers that are considered for the study and the preference of the criteria is also calculated by AHP.

Two important issues in AHP decision making are: (i) to aggregate individual judgement in a group into single representative judgement for the entire group and (ii) to construct a group choice from individual choice (Saaty, 1989²⁵).

If the individuals are experts, they may not wish to combine their judgements but only their final outcomes obtained by each from their own hierarchy. In that case, one takes the geometric mean of the final outcomes. If the individuals have different priorities of importance, their judgements (final outcomes) are raised to the power of their priorities and then, the geometric mean is formed (Saaty, 2008²⁶).

Model Development:

Step 1: The criteria are selected with the help of an expert that affects the customer's decision. Following criteria with description are considered for selecting a credit card:

Criteria	Description
Credit Limit (CR-1)	It describes that how much amount can be credited by using the credit card.
Supplementary Cards (CR-2)	It tells about the add-on cards facility of the credit card.
Status Symbols (CR-3)	It defines in terms of how much prestigious is the credit card.
Security Measures (CR-4)	It relies on the physical security of the plastic card as well as the privacy of the credit card number.
Service Charges (CR-5)	It specifies the service charges that are given by the credit card holder.
Joining/Annual Fee (CR -6)	It tells about the amount of the joining/annual fee of using the credit card.
Rate of Interest(CR-7)	This criterion defines the interest rate that a credit card holder is to pay for using the card.
Overseas Facilities (CR- 8)	It defines the abroad acceptance of the card with ease and convenient way.
Rewards (CR-9)	It describes the offers, gifts and points that are presented by the credit card.

Table 1: Selected criteria and their description

There are number of banks in India that provide credit card facility. So the most popular public, private and foreign banks are considered below as decision alternatives:

1. State Bank of India (SBI)(B-1)
2. Punjab National Bank (PNB)(B-2)
3. Axis Bank(B-3)
4. ICICI Bank(B-4)
5. HSBC Bank(B-5)
6. Standard Chartered Bank(B-6)

First, the hierarchical model is developed that is as follows:

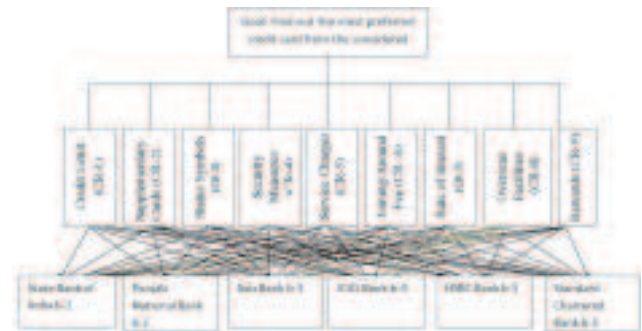


Fig: Hierarchical model for the best credit card selection

Step 2: The pair-wise comparison matrix is drawn by using the pair-wise comparison of the criteria. There are 3 comparison matrices that are built using data of the consumers who earn Rs. 20,000p.m. to Rs. 40,000p.m. The geometric mean of the input is taken to evaluate the priorities of the criteria

Then the consistency ratio is calculated using consistency index (CI) that is shown below:

$$CI = (\lambda_{\max} - n) / (n-1)$$

Where λ_{\max} is average and n is the number of items to be compared.

The consistency ratio is

$$CR = CI / RI$$

Where RI is random index and here n=9 so, RI = 1.45. All of the above calculation is performed for all three comparison matrices.

Step 3: Other priorities are calculated for each of the alternatives means SBI bank, PNB bank, Axis bank, ICICI bank, HSBC bank, and Standard Chartered bank. But geometric mean of the input data means the comparison matrix of the decision alternatives for each criterion is taken to calculate the overall preference of the decision alternatives.

Step 4: Overall priorities are calculated for each decision alternative.

Step 5: By taking geometric mean of all the inputs in steps 2 and 3, ranking of all alternatives are calculated. The most preferred credit card is the credit card of the ICICI bank. This credit card satisfies all the requirement of the customer whose monthly income is in range between Rs. 20,000 to Rs. 40,000. So, it is preferred by the consumer frequently.

Results and Analysis: Pair-wise comparison matrix of criteria is used to evaluate the priority of the decision alternatives. In this study, we have taken data form 3 decision expert of same company whose monthly salary is in range of Rs. 20,000/- to 40,000/- per month and they are using the facilities of credit cards more than 2 years. Then, pair-wise comparison matrix of each decision expert is shown below in Table 2, 3, and 4.

Criteria→ ↓	CR-1	CR-2	CR-3	CR-4	CR-5	CR-6	CR-7	CR-8	CR-9
CR-1	1	1	2	1	1/2	1/3	1/4	1/2	1/3
CR-2	1	1	1	1/2	1/2	1/6	1/4	1/3	1/5
CR-3	1/2	1	1	1/2	1	1/3	1/2	1	1/3
CR-4	1	2	2	1	3	1/2	1/2	1/3	1/4
CR-5	2	2	1	1/3	1	1/3	1/5	1/2	1/2
CR-6	3	6	3	2	3	1	2	1	1
CR-7	4	4	2	2	5	1/2	1	3	1/2
CR-8	2	3	1	3	2	1	1/3	1	2
CR-9	3	5	3	4	2	1	2	1/2	1

Table 2: Criteria Comparisons Matrix by Decision Expert 1.

Criteria→ ↓	CR-1	CR-2	CR-3	CR-4	CR-5	CR-6	CR-7	CR-8	CR-9
CR-1	1	1/2	4	1/4	1/3	1/2	1/4	1	1/3
CR-2	2	1	2	1/2	1	1/3	1/2	1/3	1/6
CR-3	1/4	1/2	1	1/3	1/2	1/9	1/3	1/5	1/5
CR-4	4	2	3	1	2	1/2	1/2	1/3	1
CR-5	3	1	2	1/2	1	1/3	1/3	1/2	1/3
CR-6	2	1	9	2	3	1	1	3	1/6
CR-7	4	2	3	2	3	1	1	2	1/3
CR-8	1	3	5	3	2	1/3	1/2	1	2
CR-9	3	6	5	1	3	2	3	1/2	1

Table 3: Criteria Comparisons Matrix by Decision Expert 2.

Criteria→ ↓	CR-1	CR-2	CR-3	CR-4	CR-5	CR-6	CR-7	CR-8	CR-9
CR-1	1	3	5	1/4	1/3	1/2	1/3	5	1
CR-2	1/3	1	2	1/2	1/2	2	1/7	4	2
CR-3	1/5	1/2	1	1/7	1/3	1/3	1/6	4	1/3
CR-4	4	2	7	1	3	6	1	9	3
CR-5	3	2	3	1/3	1	2	1/5	3	1/3
CR-6	2	1/2	3	1/6	1/2	1	1/7	2	1/3
CR-7	3	7	2	1	2	2	1	9	6
CR-8	1/5	1/4	1/4	1/9	1/3	1/2	1/9	1	1/3
CR-9	1	1/2	3	1/3	3	3	1/6	3	1

Table 4: Criteria Comparisons Matrix by Decision Expert 3.

The Table 5 shows the geometric mean of the pair-wise comparison matrix of the 3 decision experts. The priorities of the criteria are calculated with the data of Table 5. To calculate the priority, it is necessary to check the consistency of the decision expert's input. The Consistency Ratio of Table 5 is 0.027, which is less than 0.10 or 10%. It means the data given by the decision experts are consistent.

Criteria ↓ →	CR-1	CR-2	CR-3	CR-4	CR-5	CR-6	CR-7	CR-8	CR-9	Priority
CR-1	1	1 1/7	3 3/7	2/5	3/8	3/7	2/7	1 1/3	1/2	0.076
CR-2	7/8	1	1 3/5	1/2	5/8	1/2	1/4	3/4	2/5	0.062
CR-3	2/7	5/8	1	2/7	5/9	1/4	1/3	1	2/7	0.045
CR-4	2 1/2	2	3 1/2	1	2 5/8	1 1/7	5/8	1	1	0.144
CR-5	2 5/8	1 3/5	1 4/5	3/8	1	3/5	1/4	1	3/8	0.083
CR-6	2 2/7	1 4/9	4 1/3	7/8	1 2/3	1	2/3	1 4/5	3/8	0.129
CR-7	3 5/8	3 5/6	2 2/7	1 3/5	3 1/9	1	1	3 7/9	1	0.206
CR-8	3/4	1 1/3	1	1	1 1/9	5/9	1/4	1	1 1/9	0.089
CR-9	2	2 1/2	3 5/9	1 1/9	2 5/8	1 4/5	1	1	1	0.167

Table 5: After taking geometric mean criteria comparisons matrix and the priority of criteria.

Then, the further calculation for evaluating the overall priority is performed. The priority of each decision alternative for each criterion is shown below in Table 6.

Criteria Banks ↓ →	CR1	CR2	CR3	CR4	CR5	CR6	CR7	CR8	CR9
B1	0.079	0.071	0.062	0.036	0.374	0.231	0.050	0.121	0.097
B2	0.029	0.027	0.025	0.034	0.193	0.165	0.019	0.024	0.071
B3	0.073	0.061	0.053	0.074	0.041	0.091	0.049	0.098	0.139
B4	0.163	0.204	0.248	0.322	0.274	0.417	0.330	0.273	0.198
B5	0.214	0.368	0.208	0.244	0.054	0.066	0.309	0.224	0.236
B6	0.443	0.268	0.404	0.291	0.064	0.030	0.242	0.261	0.258
	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

The overall priority of each credit card of different banks is as given below in Table 7. The most preferred credit card is of ICICI bank's credit card that is frequently used by the customer who earns Rs. 20,000/- to 40,000/- per month.

Banks	Overall Priority	RANK
B1	0.109	4
B2	0.060	6
B3	0.068	5
B4	0.269	1
B5	0.201	3
B6	0.215	2

Table 7: Bank's Overall Priority.

Conclusion: In this paper, group AHP is used to find out the most preferred credit card among the credit cards of the selected banks for study. The Geometric mean of the input of decision experts is applied to get the proper pair-wise comparison matrix of criteria and decision alternatives with respect to each criterion. These credit

cards are selected on the basis of their selection criteria that make one credit card different from the other. By using synthesize and consistence data of different users of credit card, we analyze the data with AHP's priority calculation to prioritize the criteria of selection the credit card. The most important criterion is Rate of Interest. Then, security measures, joining/annual fee, overseas facilities, service charges, rewards, credit limit, service charges, and supplementary cards are considered. The prioritized criteria are used to find out the most preferred credit card for the user whose monthly income is in range Rs. 20,000 to Rs 40,000. The result of the study shows that the credit card of the ICICI bank is mostly preferred by the customers or users who earn within in the given range. This study also infers that the banks of the public sector are not preferred by the users because their facilities are not satisfactory. So, the banks of the public sector have to improve their facility to grow up their market. The banks, whose credit cards are not preferred, have to make improvement in their facilities such as rate of interest, overseas facilities etc because these facilities attract customers to take that credit cards.

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