A Fuzzy Analytical Hierarchical Processing Model for Customers' Bank Selection Decision

Abstract

Ranking the priorities of customers in selecting commercial banks is essential for the elaboration of bank development strategies. The purpose of this paper is to implement a fuzzy analytical hierarchical process (FAHP) multi-criteria decision model for commercial banks selection by customers. Six criteria and five Bahraini retail commercial banks are used to formulate a decision problem structured in three-level hierarchies. After structuring the hierarchies, the FAHP is applied to determine the relative weights of the evaluation criteria. The results show that most selected banks focus on pricing strategy more than bank facilities. Interest rates on credits and deposits as well as transaction costs are the main factors used to attract customers. The study provides several implications for decision makers to develop the appropriate strategies towards their customers.

Key words: Multi-criteria decision making, Fuzzy logic, analytic hierarchy process, Commercial banks, Bahrain

JEL codes: G21, C44.

INTRODUCTION

The problem of bank selection has become increasingly fastidious and savvy due to improved competition among banks. Banks have recognized the importance of continuous improvement to satisfy customers and fulfill their needs. Several multi-attributes decision-making algorithm have been developed to model bank selection problem.

It is generally accepted that the best decisions are implemented with less conflict and more success when conducted by stakeholders (Voinov and Bousquet, 2010). Multi-criteria decision aids methods are increasingly seen as a means of assisting decision-makers in the development of composite processes that can answer their questions and raise ambiguities which reduce the strength of decisions taken.

The purpose of this paper is to implement a new FAHP multi-criteria decision methodology for commercial banks selection. Six criteria and five Bahraini retail commercial banks are used over the period (2008-2012) to formulate a decision problem structured in three hierarchical levels. FAHP is a multi-level decision-making tool taking into consideration human priorities; it captures the imprecision in ordinal judgments obtained from a group of experts and translates them into bounded priorities. After structuring the hierarchy, the FAHP is applied to determine the relative weights of the evaluation criteria.

The rest of the paper is organized as follows. The second section presents a review of literature relative to bank selection decision and preferences of customers for financial products. The third section presents the FAHP approach and its implementation for bank selection followed by presentation of main findings. The last section presents a discussion of the sensitivity analysis and practical implications followed by the summary and conclusion.

LITERATURE REVIEW

The FAHP Method

Several researchers used the multi-objective Analytic Hierarchy Process (AHP) approach to rank banks according to criteria established and assessed by a group of experts. This approach allows the decomposition of the bank selection problem into a hierarchical process. One of the particularities of this approach is its ease and consistency for the determination of the weights of criteria according to the designed hierarchy. Contrary to other comparative analysis techniques, the final judgment of each bank is determined from a consensus of the experts involved in the analysis. However, the AHP cannot capture uncertainty and imprecise judgment of the members of the panel of experts. To deal with the subjectivity and imprecision of decision makers, a Fuzzy AHP (FAHP) approach is adopted to extract the weights of the criteria and the sub-criteria.

The AHP method fragments a complex multi-criteria problem to a hierarchy and is based on the paired comparison of the importance of the different criteria and sub-criteria (Saaty, 1980). Each component of the analysis (criterion, sub-criterion or alternative) is divided to an appropriate level of detail. Once the hierarchy is built, decision makers judge the importance of each criterion in structured pair comparisons in comparative matrices. Judgments are made in the perspective of the superior direct criterion of those compared (Calabrese et al., 2013).

The use of FAHP method goes back to the work of Laarhoven and Pedrycz (1983). They show how to compare fuzzy ratios describing the functions of triangular affiliations. The FAHP is based on a questionnaire to assess customers' preferences criteria and to perform redundant pair-wise comparisons (Kasperczyk and Knickel, 2006). Chang (1996) presents an approach based on the FAHP method by introducing triangular fuzzy numbers for the binary comparison between criteria. He proposes for the first time a method for calculating priority for triangular fuzzy comparison matrices.

The FAHP method is widely used by many researchers to solve multi-criteria decision problems. Kahraman et al. (2003) present an approach based on the FAHP method for selection problem entities of installation locations in a supply chain. Similarly, Bozdag et al. (2003) implement the FAHP to choose the best system manufactured. Wang et al. (2008) showed that the properties of vectors determined by the method proposed by Chang (1996) led to wrong decisions.

Bank Selection Criteria

Selecting a bank is an act that engages the customer for the long term. The choice is generally based on the customer's personal preferences and depends on bank's competitive power. Several studies have attempted to identify the key criteria for bank selection by customers (Alferos and Cristobal, 2017; Ltifi, Hikkerova, Boualem and Gharbi, 2016; Dhinaiyagovind, 2016; Srouji et al., 2015; Chigamba and Fatoki, 2011; Renman and Ahmed, 2008; Devlin and Gerrard, 2004; Cicic, Brkic and Agic, 2003; Hun and Kar, 2000; Astous and Ahmed, 1995; Yue and Tom, 1995; Laroche et al. 1986; and Murdick and Roe, 1986).

Alferos and Cristobal (2017) found that the most important criteria for bank selection are interest rate on saving, convenient location, and the overall quality of service, followed by the availability of self-bank facilities, charges on services provided by banks, low interest rate on loans, long operating hours, availability of students' privileges and recommendations by friends and parents specifically.

Ltifi, Hikkerova, Boualem and Gharbi (2016) examined the explanatory factors for the customer selection of banks in Tunisia. They found that customers consider several factors while choosing a bank such as the quality of service offered by the financial institutions, trust, and compliance with Sharia law.

Dhinaiyagovind (2016) examined the determinants of preference and selection criteria of bank in India by investigating more than 2000 bank clients and found that customers look at the reputation of a bank before other attributes such as technology and prices.

Srouji et al. (2015) results showed that bank reputation is the most important determinant of bank selection in Jordan. The quality of services, location of branches and availability of ATMs' are less relevant for customers when selecting their banks.

Chigamba and Fatoki (2011) argued that bank selection is comparatively complicated and there are a lot of influential factors. Based on principal component analysis they show that six factors mainly determine the choice of commercial banks; service, proximity, attractiveness, recommendations, marketing and price are important. Renman and Ahmed (2008) and Devlin and Gerrard (2004) found that that customer recommendation is one of the most important variables influencing customer choices among other factors namely customer services. Cicic, Brkic and Agic (2003) found that the most important factors when selecting a bank is friendliness of bank personnel, service charges and ease of opening a bank account. Hun and Kar (2000) studied factors that determine selection of commercial banks in Singapore. They found out that the quality of banking services, staff recommendations, extra services (parking, advice, etc.), convenience and safety are decisive in selecting a bank.

An important marketing paradigm considered customers' preferences as dependent on their perceptions of the required product characteristics and attributes (Astous and Ahmed, 1995). This paradigm is based on a multi-criteria analysis that aims to identify and asses the attributes of each bank. Since banks have several attributes with different levels, the multi-criteria analysis approach appears an adequate tool running the relative bank weights through customer perceptions.

Yue and Tom (1995) found that the main determinant factors of bank selection criteria are bank fees, and interest rates on saving accounts and loans. Laroche et al. (1986) used a large sample of Canadian banks to examine bank selection criteria for households. Among 25 factors used, they found that location is the most important factor affection the selection decision by customers. Murdick and Roe (1986) argued that bank selection should start by an appropriate identification of selection criteria. They classified banks' criteria according to customers' preferences based on seven criteria (attitude of staff, location, price, the integrity, expertise, philosophy and working hours).

METHODOLOGY

Sample

A group of six experts has been used to define bank selection attributes followed by distribution of a questionnaire to a group of experts to define customer preferences for selected attributes and to define the banks' preferences for each attribute. The group of experts consists of bank customers,

bank staff, and two other experts in Bahrain banking sector were identified and invited for their expert opinion to validate the data collected from the five Bahraini banks. Once the Stakeholders are defined, a questionnaire is designed where each participant is interviewed to note the significance of the impacts for each criterion.

The selection process of the five banks begins with the consideration of appropriate criteria. The sample is broadly representative of the banking sector in Bahrain since the range of activities of most them reflects the common banking activities exerted by commercial banks in Bahrain.

The FAHP technique is preferred in the case of small samples as it requires variables of quantitative preferences which are sufficiently discriminating relative to the variables of the study. In this study, the weights of preferences are generated by experts based on an in-depth synthesis of several banks. Thus, the reduced number of banks allows sound assessment of the various banks under examination.

Criteria

Based on the literature review and the expert opinions, six criteria have been selected for five Bahraini retail commercial banks over the years 2008-2012. The first three are the interest rates on loans and deposit and fees and commissions. These three criteria define banks' pricing strategy. These criteria have been identified as the main factors affecting the selection of banks by the customer (Tootelian and Gaedeke, 1996; Khazheh and Decker, 1992; Belonax and Aaby, 1991).

The fourth criterion is the number of branches and number of ATMs. This dimension is generally considered as bank facility measurement (Stafford, 1994). The fifth and sixth criteria are transactions delays and staff recommendation, respectively. These two criteria decide about the quality of service (Tootlian and Gaedeke, 1996; Boyd et al., 1994; Sinkula and Lawtor 1988, and Laroche et al., 1986).

The FAHP Model

In this paper, standardization of criteria and sub-criteria was carried out according to a fuzzy triangular objective weighting. The calculation of the weights of each criterion and sub-criterion is conducted using FAHP to eliminate the uncertainty regarding the judgments of the stakeholders. The use of the FAHP analysis process based on stakeholders' judgment is adopted to extract the weights that will be introduced to classify the alternatives proposed by the stakeholders. The adopted hierarchical decision model for customer's bank selection is based on the selected criteria and the five decision alternatives, as illustrated in Figure 1.

The identification and structuring of stakeholders therefore appears as the first step in this work. In general, stakeholder theory is based on the identification and classification of stakeholder groups.

According to Freeman (1984), a stakeholder group refers to individuals that affects or is affected by the fulfillment of organizational objectives.

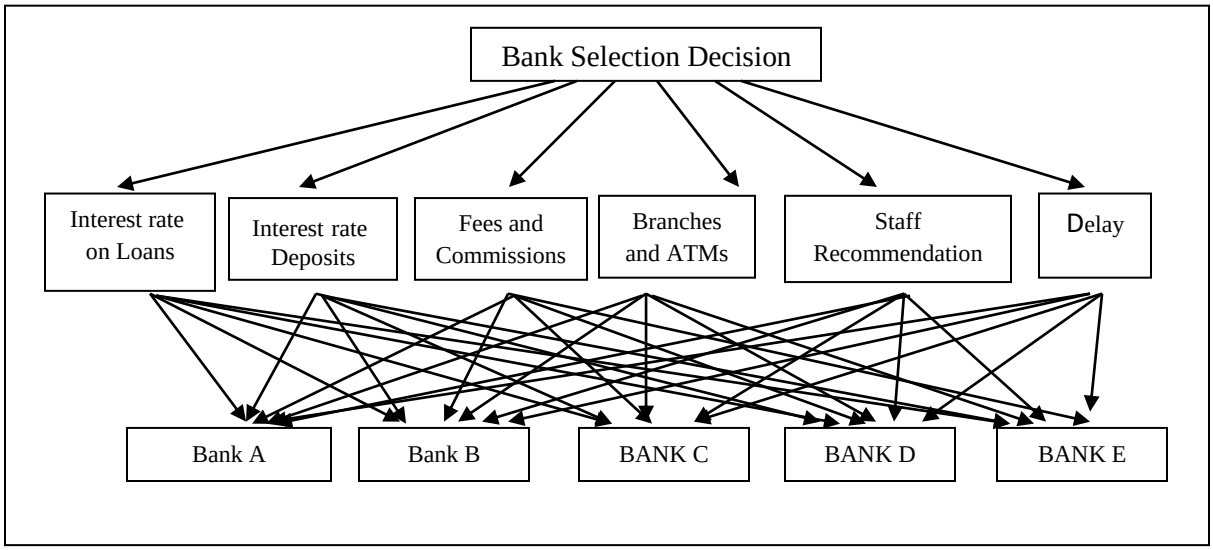

Figure 1 A Hierarchical Model for Bank Selection Decision

FAHP is known to eliminate weak criteria or sub-criteria. If a criterion or sub-criterion obtains a zero-average weight, it is that it has obtained a zero-weight for all the stakeholders and thus, justifying its practical elimination of the calculations (while keeping its weight equal to zero). It is useful to contrast the average weights of the sub-criteria with the weights by stakeholders. It may reveal how some other stakeholders tend to exaggerate or lessen the impact induced by a given factor. The evaluations are points in the three-dimensional space defined by the axes {weight, stakeholder, sub-criteria}.

The FAHP Model Formulation

The formulation of the FAHP is based on five steps.

Step 1: Calculation of TFN's

We set up the Triangular Fuzzy Numbers (TFN's). Each expert makes a pair-wise comparison of the decision criteria and gives them relative scores. In this methodology, the fuzzy conversion scale is shown in Table 2. Different scales can be found in the literature (Lee et al., 2008; Paksoy et al., 2012; and Zeydan et al., 2011).

Table 1 Triangular Fuzzy Conversion Scale

	Linguistic Scale	Triangular Fuzzy Scale	Triangular Fuzzy Reciprocal Scale
1	Equal Importance	(1,1,1)	(1,1,1)
2	Weak or slight	(1,2,3)	(1/3,1/2,1)
3	Moderate importance	(2,3,4)	(1/4,1/3,1/2)
4	Moderate plus	(3,4,5)	(1/5,1/4,1/3)
5	Strong importance	(4,5,6)	(1/6,1/5,1/4)
6	Strong plus	(5,6,7)	(1/7,1/6,1/5)
7	Very strong or demonstrated importance	(6,7,8)	(1/8,1/7,1/6)
8	Very, very strong	(7,8,9)	(1/9,1/8,1/7)
9	Extreme importance	(9,9,9)	(1/9,1/9,1/9)

Consider $\tilde{A}$a triangular fuzzy comparison matrix:

$$\tilde{A} = \begin{bmatrix} 1 & \tilde{a}_{12} & \dots & \tilde{a}_{1n} \\ & & \dots & \\ \tilde{a}_{n1} & \tilde{a}_{n2} & \dots & 1 \end{bmatrix} = \begin{bmatrix} (1,1,1) & \dots & (l_{1,n}, m_{1n}, u_{1n}) \\ & & \dots & \\ (l_{1,n}, m_{1n}, u_{1n}) & \dots & (1,1,1) \end{bmatrix} \quad (1)$$

With: $\tilde{a}_{ij} = \tilde{a}_{ji}^{-1}$ and $\tilde{a}_{ji}^{-1} = (\frac{1}{u_{ij}}, \frac{1}{m_{ij}}, \frac{1}{l_{ij}})$ (2)

We calculate the sum of each line of $\widetilde{A}$.

$RS_i = \sum_{j=1}^{n} \tilde{a}_{ij} = (\sum_{j=1}^{n} l_{ij}, \sum_{j=1}^{n} m_{ij}, \sum_{j=1}^{n} u_{ij},)$, i=1, …, n. (3)

Step 2: Following Wang (2008), the fuzzy synthetic extent value *(S_i)* with respect to i^{th} criterion is defined as:

$$\tilde{S} = \frac{RS_i}{\sum_{j=1}^{n} RS_j} \left(\frac{\sum_{j=1}^{n} l_{ij}}{\sum_{j=1}^{n} l_{ij} + \sum_{k=1}^{n} \sum_{j=1}^{n} u_{kj}}, \frac{\sum_{j=1}^{n} m_{ij}}{\sum_{k=1}^{n} \sum_{j=1}^{n} m u_{kj}}, \frac{\sum_{j=1}^{n} u_{ij}}{\sum_{j=1}^{n} u_{ij} + \sum_{k=1}^{n} \sum_{j=1}^{n} l_{kj}}\right) \text{withk} \neq \text{i.} \quad (4)$$

Step 3: Calculation of the degree of possibility of $\tilde{S}_i \geq \tilde{S}_j$

$$V(\tilde{S}_i \geq \tilde{S}_j) = \begin{Bmatrix} 1, & If m_i > m_j \\ \frac{u_i - l_j}{(u_i - m_j) + (m_i - l_j)}, & If l_j \leq u_i \\ 0, & If not \end{Bmatrix} \quad \text{i,j= 1,…n and j} \neq \text{i.} \quad (5)$$

Figure 2 illustrates the graphical representation of the degree of possibility of $\tilde{S}_i \geq \tilde{S}_j$.

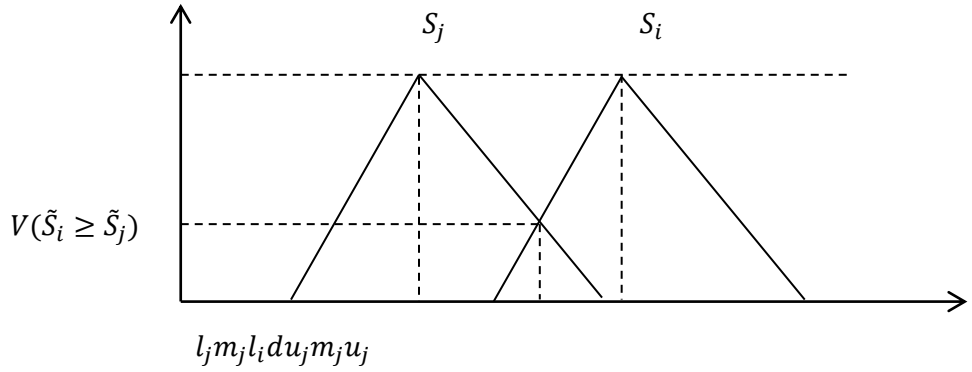

Figure 2 Graphical Representation of $V(\tilde{S}_i \geq \tilde{S}_j)$ Chang (1996)

Step 4: Calculation of the degree of possibility for each $\tilde{S}_i$compared to other fuzzy numbers

$$V(\tilde{S}_i \geq \tilde{S}_j | j = 1, \dots, n; j \neq i) = \min_{j \in \{1,\dots,n\}, j \neq i} V(\tilde{S}_i \geq \tilde{S}_j), \quad (6)$$

Step 5: Definition of the priority vector $W = (w_1, \dots, w_n)^T$ for fuzzy comparison matrix:

$$W_i = \frac{V(\tilde{S}_i \geq \tilde{S}_j | j=1,\dots,n; j \neq i)}{\sum_{k=1}^{n} V(\tilde{S}_k \geq \tilde{S}_j | j=1,\dots,n; j \neq k)} \qquad i = 1, \dots, n. \quad (7)$$

Model Consistency Check

The CI is used to measure the inconsistency of pair-wise comparison weights, where the eigenvalue λ_{max} is be computed by averaging all eigenvalues of the pair-wise comparison matrix.

$$CI = \frac{\lambda_{max} - n}{n - 1}$$

With$\lambda_{max} = \sum_{j=1}^{n} a_{ij} \frac{W_j}{W_i}$, *i,j=1,2, …,n*

Consistency ratio (CR) is required to check whether the weights assigned based on expert reasoning are correct, usually its value is less than 0.1 which shows that the weights are consistent.

$$CR = \frac{CI}{RI}$$

Where, RI is random index already given for specified number of criteria.

RESULTS AND DISCUSSION

To understand the criteria relevant for bank selection by customers, the weights of the six criteria obtained from the FAHP approach are examined. The priorities indicate the relative importance of each criterion relative to other criteria.

Fuzzy Pairwise Comparisons and Weights of Banks Selection Criteria

Table 2 presents the fuzzy comparisons between each pair of criteria. The comparison values are presented in the form of (l_{ij}, m_{ij}, u_{ij}). We display only values above the diagonal. The values below the diagonal are found by equation (2).

After running the pairwise comparison using MATLAB code, the weights of the FAHP selection criteria can be determined. The results are shown in Table 3. The consistency ratio is (0.053) less than threshold value of 0.1, which confirms that priorities are acceptable.

Table 2 Fuzzy Comparisons between each Criteria Pair

	Int. Loans	Int. Deposits	Fees	Branches	Recommendations	Delay
Int. Loans	1	(1/3,1/2,1)	(5,4,9)	(2,3,5)	(3,4,5)	(1,4,6)
Int. Deposits		1	(2,4,6)	(1/2,4,5)	(1/5,1/3,1/2)	(1/3,1,2)
Fees			1	(1/4,1/3,1/2)	(1/3,1/2,1)	(1/5,1/4,1/2)
Branches				1	(1/2,3,5)	(1,3,6)
Recommendations					1	(1/3,1/2,2)
Delay						1

Table 3 Weights of the FAHP Selection Criteria

Criteria	Weights	Consistency
Int. Loans	0.382	0.053
Int. Deposits	0.239	
Fees	0.125	
Branches	0.103	
Recommendations	0.114	
Delay	0.036	

The results show that interest rate on loans is the principal criterion for customers' bank selection decision (0.382). The cost of financing is more important than interest rates on deposits and bank fees that come in second and third rank, respectively. This result corroborates with that of Afanasieff et al. (2002) who showed that offered rates on loans and deposits are the main factors used by banks to attract customers.

This result confirms, in some way, the findings of Saunders and Chumacher (2000), who argued that the spread between deposit rates and lending rates decides the banks' competitiveness. This result is also in line with that of Lunt (1994) who suggests that when making bank selection, Asians are very rate conscious. However, the result of this study contradicts that of Javalgi et al. (1989) which showed that, in the US banking sector, paying higher interest rates on savings was more attractive for customers than paying lower interest rates on loans.

The number of branches is no longer a priority for customers as most transactions are made through ATMs or via internet. The delay for transaction appears not very interesting for the selection of banks and displays the lowest weight 0.036, respectively. The consistency ratio is 0.051 and is within the acceptable range of 0.1 proposed by Saaty (1980).

Fuzzy Comparison Matrices of Banks According to Selection Criteria

The next step is to determine a pair-wise comparison of banks for each criterion. The banks are compared based on interest on loans, interest on deposit, fees, number of branches, customer recommendations, and transaction delay. The results are reported in Tables 4-9).

Table 4 Fuzzy Comparison Matrix of Banks According to Int. Loans

	Bank A	Bank B	Bank C	Bank D	Bank E
Bank A	1	(2,3,5)	(1,4,9)	(1,3,5)	(3,4,5)
Bank B		1	(1/3,3,2)	(1/2,4,5)	(2,3,6)
Bank C			1	(2,4,6)	(1/3,3,4)
Bank D				1	(2,1/4,1)
Bank E					1

Table 5 Fuzzy Comparison Matrix of Suppliers according to Int. Deposits

	Bank A	Bank B	Bank C	Bank D	Bank E
Bank A	1	(1,3,6)	(1,2,4)	(1,2,3)	(3,4,5)
Bank B		1	(1/3,1,2)	(1/3,3,4)	(1/2,2,4)
Bank C			1	(2,4,6)	(1/3,1/2,1)
Bank D				1	(1/4,1/3,1/2)
Bank E					1

Table 6 Fuzzy Comparison Matrix of Suppliers According to Fees

	Bank A	Bank B	Bank C	Bank D	Bank E
Bank A	1	(1/2,1,2)	(1/4,1/2,3)	(1/2,2,4)	(1,2,3)
Bank B		1	(1/2,1,4)	(1,2,5)	(2,4,7)
Bank C			1	(1/2,1,3)	(1/5,1/3,1)
Bank D				1	(1/3,1, 3)
Bank E					1

Table 7 Fuzzy Comparison Matrix of Suppliers According to Branches

	Bank A	Bank B	Bank C	Bank D	Bank E
Bank A	1	(1/3,1/2,2)	(2,4,5)	(1,3,4)	(1,2,4)
Bank B		1	(1,2,6)	(1/3,1/3,7)	(1,3,5)
Bank C			1	(1,4,5)	(2,5,6)
Bank D				1	(1,2,5)
Bank E					1

Table 8 Fuzzy Comparison Matrix of Suppliers According to Recommendations

	Bank A	Bank B	Bank C	Bank D	Bank E
Bank A	1	(1,3,4)	(2,3,5)	(1,4,6)	(1,2,3)
Bank B		1	(1,3,4)	(2,4,7)	(1,3,5)
Bank C			1	(1/3,1/2,2)	(1/3,3,4)
Bank D				1	(1/3,1,4)
Bank E					1

Table 9 Fuzzy Comparison Matrix of Suppliers according to Delay

	Bank A	Bank B	Bank C	Bank D	Bank E
Bank A	1	(2,4,5)	(1,2,3)	(1,2,4)	(3,2,5)
Bank B		1	(1/3, 1/2, 1)	(1/3,2,3)	(2,4,5)
Bank C			1	(2,4,6)	(1/4,1/2,1)
Bank D				1	(1,2, 3)
Bank E					1

Fuzzy Weights and Consistency of Banks According to Selection Criteria

After developing pair-wise comparison for banks by selection criteria we measure priority for each bank according to each criterion. The weight of each criterion is calculated by employing the de-fuzzification procedure. Priorities and consistency ratios are presented in Table 10.

Table 10 FAHP Weights and Consistency of Banks

	Bank A	Bank B	Bank C	Bank D	Bank E	Consistency ratio
Int. Loans	0.391	0.182	0.293	0.283	0.195	0.032
Int. Deposits	0.256	0.153	0.181	0.201	0.321	0.039
Fees	0.482	0.219	0.114	0.397	0.123	0.078
Branches	0.081	0.192	0.126	0.143	0.048	0.037
Recommendations	0.102	0.041	0.192	0.056	0.063	0.058
Delay	0.093	0.083	0.174	0.029	0.174	0.042

The last step is to find the overall priorities of each bank. The overall weight is the sum of all banks' priorities. The priorities of selection criterion of Table 3 are multiplied by the corresponding weight of the bank in Table 11. Equation (8) shows how the overall weight for Bank A.

$$[0.391 \quad 0.256 \quad 0.482 \quad 0.081 \quad 0.102 \quad 0.093] \times \begin{bmatrix} 0.382 \\ 0.239 \\ 0.125 \\ 0.103 \\ 0.114 \\ 0.036 \end{bmatrix} = 0.2941 \qquad (8)$$

All other banks' weights are computed in the same way. Table 11 reports final priority for each bank.

Table 11 Overall Weights of Banks

	Final Weights
Bank A	0.29411
Bank B	0.16090
Bank C	0.21056
Bank D	0.22792
Bank E	0.18497

Considering the overall bank preference, the global weight shows that Bank A is the most preferred bank, with a global weight of 0.294. Bank D and Bank C come second and third with respective weighs of 0.2279 and 0.2105. The least weighted banks are Bank E and Bank B as explained by their low performance on most criteria.

SENSITIVITY ANALYSIS AND PRACTICAL IMPLICATIONS

Sensitivity analysis

A sensitivity analysis monitors the robustness of the preferential ranking of alternatives (Kaya and Kahraman, 2011). It creates several combinations of weights and performing the FHAP method for all these combinations. The changes resulting from these combinations in the classification allow to appreciate the stability of the main classification obtained using the FAHP method.

Table 12 shows the weight combinations of the criteria used in the analysis. The first line corresponds to the current weights, whereas the second line (case 1) is the case where all the weights are equal. The different cases allow one to check of the relationship between the ranking and the sub-criteria one by one.

Table 13 displays the classifications by combinations. As it can be observed, Bank A is ranked first in 7 cases among 8 banks, Bank D is ranked second in five cases among 8 banks, and Bank C,

Bank E and Bank B are ranked third, fourth, fifth, respectively. These results confirm the stability of the classification obtained by the weights of the FAHP method.

Table 12 Weight combinations of the criteria.

	Int. Loans	Int. Deposits	Fees	Branches	Recommendations	Delay
FAHP Weights	0.382	0.239	0.125	0.103	0.114	0.036
Case 1	0.166	0.166	0.166	0.166	0.166	0.166
Case 2	0.54	0.11	0.11	0.11	0.11	0.11
Case 3	0.11	0.54	0.11	0.11	0.11	0.11
Case 4	0.11	0.11	0.54	0.11	0.11	0.11
Case 5	0.11	0.11	0.11	0.54	0.11	0.11
Case 6	0.11	0.11	0.11	0.11	0.54	0.11
Case 7	0.11	0.11	0.11	0.11	0.11	0.54

In case 3, Bank C and Bank D are ranked 2 and 3, respectively, while, Bank B is ranked 4 and Bank E is ranked 5. In case 7 also, Bank B is ranked 4 and Bank E is ranked 5. These observations suggest that the ranking of Bank B, Bank E, and Bank C may exchange their ranking relative to a given criterion and are therefore, unstable relative to the mono-criterion sensitivity analysis even if they are stable for a multi-criteria analysis.

Table 13 Alternative Weight Classifications by Weight Combination

	Ranked 1	Ranked 2	Ranked 3	Ranked 4	Ranked 5
FAHP Weights	Bank A	Bank D	Bank C	Bank E	Bank B
Case 1	Bank A	Bank D	Bank C	Bank E	Bank B
Case 2	Bank A	Bank C	Bank D	Bank B	Bank E
Case 3	Bank A	Bank E	Bank D	Bank C	Bank B
Case 4	Bank A	Bank D	Bank C	Bank E	Bank B
Case 5	Bank A	Bank D	Bank C	Bank E	Bank B
Case 6	Bank A	Bank D	Bank C	Bank E	Bank B
Case 7	Bank D	Bank A	Bank C	Bank B	Bank E

Practical Implications: Performance of Banks According to Pricing Strategy and Service Quality

To examine the performance of each bank according to its pricing strategy and quality of service, the six attributes according to these two dimensions are provided in Table 14. The pricing strategy includes fees and interest on loans and deposits.

The weight of pricing strategy dimension is the sum of the three attributes (0.382, 0.239 and 0.125). The quality of service includes delay, number of branches and recommendations. The weight of quality of service dimension is given also by the sum of these attributes (0.103, 0.114 and 0.036). The weights of the two strategy dimensions for each bank are similarly obtained.

Table 14 shows that pricing strategy is relatively more important (0.746) for banks than the quality of service dimension (0.253). All banks have more preference for the pricing strategy. Bank C has almost similar weight for pricing and quality of service strategies.

Table 14 Customers Priorities and Bank Strategies

	Level 2 Priorities	**Level 3 Findings Priorities**				
		Bank A	**Bank B**	**Bank C**	**Bank D**	**Bank E**
Pricing Strategy	**0.746**	**1.129**	**0.554**	**0.588**	**0.881**	**0.639**
Interest Loans	0.382	0.391	0.182	0.293	0.283	0.195
Interest Deposits	0.239	0.256	0.153	0.181	0.201	0.321
Fees	0.125	0.482	0.219	0.114	0.397	0.123
Service Quality	**0.253**	**0.276**	**0.316**	**0.492**	**0.228**	**0.285**
Branches	0.103	0.081	0.192	0.126	0.143	0.048
Recommendation	0.114	0.102	0.041	0.192	0.056	0.063
Delay	0.036	0.093	0.083	0.174	0.029	0.174

Bank A also shows considerable difference between the weight of pricing strategy (1.129) and quality of service strategy weight (0.276). In fact, this bank should further develop its service quality strategy to strengthen its competitiveness. As known, the perceived quality of the services offered depends in part on how customers are involved in the serving process (queues, use of ATMs, etc.).

The results also show that Bank C has relative preference for the quality service strategy. Bank B can strengthen its competitiveness by adjusting its pricing strategy. This can be achieved by focusing on two price strategies. The first is the traditional strategy that consists on the penetration of one or more segments, the maximization of the volume and maximization of profit. The oligopolistic nature of the banking sector leads to prices that do not necessarily reflect actual costs, in particular because of cross subsidies between services. The second is the emerging approach based on encouraging customers to develop contacts with the service provider with long-term offers, packages or bundles or mixed bundling (i.e. special offers for savings accounts, preferential rates for holders of demand accounts, etc.).

SUMMARY AND CONCLUSIONS

This paper examines the problem of customers' bank selection decision in Bahrain. Experts are often uncertain in assigning the pairwise evaluation of criteria and alternatives with conventional AHP. Therefore, a hybrid multi-criteria technique is used. This paper applies a hybrid FAHP approach to solve the problem of evaluating and selecting commercial banks. Six decision criteria have been used for assessing five different banks from Bahrain. A group of experts is formed to

build our pair-wise comparison matrix. These pair-wise comparisons of criteria and alternatives are made using a triangular fuzzy number. We show that the proposed new hybrid FAHP model is fully appropriate to deal with both objective and subjective criteria in process of decision making simultaneously. The FAHP approach overcomes the weakness of the conventional AHP to deal with uncertainty and imprecise judgment of the members of the panel of experts.

This research indicates to decision makers how to increase its competitiveness in the banking market which sees more and more competitive. The findings show that the surveyed Bahraini banks have a relative preference for the pricing strategy over the quality of service strategy. While service quality received less rating, however, this does not in any way imply that it is not important at all.

The results are expected to raise customer-centric strategic implications in strengthening their competitiveness of banks in the Bahraini market. The results are of interest for banks' managers in adjusting their management strategies. The results would allow them to control banks' level of performance for each criterion and to enhance weak attributes and improve customer's attractiveness to strengthen their bank's competitiveness.

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