APPLYING CONSISTENT FUZZY PREFERENCE RELATION TO SELECT MERGER STRATEGY FOR FINANCIAL ORGANIZATIONS

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Abstract:
This investigation establishes an analytical hierarchy framework to help banks choose merger strategies based on six main criteria. The consistent fuzzy preference relation is used to improve decision making consistency and effectiveness. The analytical results demonstrate that risk management and financial composition of banks are the major considerations for banks in strategy selection. Furthermore, analytical results demonstrate the best futuristic policy is “merging with other financial organizations to become part of an existing bank.”

Keywords:
Financial merger; financial holding company; multi-criteria decision making, consistent fuzzy preference relation

1. Introduction
Mergers of financial organizations are closely linked to organizational performance, government policy, shareholder rights and customer satisfaction. It is essential for financial organizations to select their merger strategy carefully. A well-known approach that can effectively deal with this problem is the Analytic Hierarchy Process (AHP) proposed by Saaty [11]. Although AHP is widely employed in diverse fields [4, 10, 11], inconsistency occurs given increasing hierarchies of criteria or alternatives. To alleviate this dilemma, Herrera-Viedma et al. [6] presented the consistent fuzzy preference relations for facilitating decision-making, thus enhancing its effectiveness and accuracy of selections. This study utilizes this method as the basis for selecting merging financial organizations.

2. Operating Environment and Merger Strategy
2.1. Financial holding company and operational environment
The Taiwanese government passed the Financial Organization Merging Law, which limited mergers of organizations sharing similar characteristics, to reduce the number of financial organizations and enhance national competitiveness by establishing financial holding companies. Financial holding systems differ among countries [7].

Following rapid economic development and population growth, Taiwan currently has 47 domestic banks and 31 credit cooperatives [2]. Both general banks and large financial holding companies face pressure to reorganize and merge.

2.2. Financial organization merger strategies
Various alternative merger policies exist for financial organizations, namely, i) merging with other financial organizations to become an existing bank, ii) merging with other financial organizations to become a merged bank, iii) focusing on enhancing core business competitiveness to become a specialized and stable bank [1].

3. Research Methodology
This study is based on the methodology of consistent fuzzy preference relations, which is presented below:

3.1. Consistent fuzzy preference relations
Herrera et al. [6] proposed the consistent fuzzy preference relations in accordance with two preference relations, namely multiplicative preference relation and fuzzy preference relation [14].

(1) Multiplicative preference relation. Experts express their preferences regarding a set of alternatives since $X$ can be denoted by a preference relation matrix $A \in X \times X$, $A = (a_{ij}), a_{ij} \in [\frac{1}{9}, 9]$, where $a_{ij}$ denotes the ratio of the preference degree of alternative $x_i$ over $x_j$. As $a_{ij} = 1$ indicates no difference between $x_i$ and $x_j$, $a_{ij} = 9$...
indicates that \( x_i \) is strongly preferable to \( x_j \). \( A \) is assumed to be a multiplicative reciprocal, that is
\[
a_{ij} \cdot a_{ji} = 1 \tag{1}
\]

(2) Fuzzy preference relation. Expert preferences over a set of alternatives where \( X \) is denoted by a positive preference relation matrix \( P \subset X \times X \) with membership function: \( \mu_P(x_i, x_j) = p_{ij} \) indicates the ratio of the preference intensity of alternative \( x_i \) to that of \( x_j \). Moreover, if \( p_{ij} = \frac{1}{2} \) implies indifference between \( x_i \) and \( x_j \) (\( x_i \sim x_j \)), \( p_{ij} = 1 \) indicates that \( x_i \) is absolutely preferred to \( x_j \), \( p_{ij} = 0 \) indicates \( x_j \) is absolutely preferred to \( x_i \), and \( p_{ij} > \frac{1}{2} \) indicates that \( x_i \) is preferred to \( x_j \) (\( x_i > x_j \)). Meanwhile, \( P \) is assumed to be an additive reciprocal, given by
\[
p_{ij} + p_{ji} = 1 \tag{2}
\]

**Proposition 1** Reciprocal additive fuzzy preference relation
\[
p_{ij} + p_{jk} + p_{ki} = \frac{1}{2} \quad \forall i, j, k \tag{3}
\]
\[
p_{ij} + p_{jk} + p_{ki} = \frac{1}{2} \quad \forall i < j < k \tag{4}
\]
\[
p_{i(j+1)} + p_{i(j+2)} + \ldots + p_{i(j-j)} + p_{ji} = \frac{e^{-i}}{2} \quad \forall i < j \tag{5}
\]

**Proposition 2** Suppose the existence of a set of alternatives \( X = \{x_1, x_2, \ldots, x_n\} \), which is associated with a multiplicative preference relation \( A = (a_{ij}), a_{ij} \in [0, 1] \), then the corresponding reciprocal additive fuzzy preference relation \( P = (p_{ij}) \) with \( p_{ij} \in [0, 1] \) to \( A = (a_{ij}) \) is defined as follows.
\[
p_{ij} = g(a_{ij}) = \frac{1}{2}(1 + \log_a a_{ij}) \tag{6}
\]

Using the transformation function \( g(a_{ij}) \), a multiplicative preference relation matrix can be transformed into various preference relations.

Notably, according to Proposition 1, only \( n - 1 \) \((n=\{p_{12}, p_{23}, \ldots, p_{n-1n}\})\) judgments are required to construct consistent fuzzy preference relations. The other incomplete elements can be done by additive transitivity. If the preference matrix contains values that are not in the interval \([0, 1]\), but rather are in \([-a, 1+a]\), a linear transformation is required to preserve the reciprocity and additive transitivity, that is \( f^{-1} : [-a, 1+a] \rightarrow [0, 1] \). For further detail see Herrera et al. [6].

### 4. Framework for Merged Strategy Selection under Multi-criteria Decision Making

#### 4.1. Evaluated criteria and framework of the evaluation model

The main satisfaction criteria comprise (1) personnel quality, (2) product quality, (3) bank image, (4) service quality, and (5) accessibility [9]. Luo [8] employed employees, assets, and equity to assess bank profitability. Bad debits influence bank achievements. Moreover, the subjective judgements of creditors may produce incorrect risk measurements [3].

Thomson [13] demonstrated that bank failure is a function of multiple variables, including management quality and profitability. Notably, risk and profitability management are closely related. Risk-taking is fundamental to future profitability. That is, present risks may become future realities. Accordingly, bank survival depends on managing these risks [5].

Based on synthesis of the literature review, the criteria are summarized as follows: Operating performance (\(C_1\)), Staffs rights (\(C_2\)), Customers service (\(C_3\)), Financial composition of bank (\(C_4\)), Government finance policy (\(C_5\)) and Risk management (\(C_6\)).

Figure 1 shows the analytical framework.
4.2. Hierarchical analytical process for selection of merger strategy

4.2.1. Linguistic variables

This study compares pairs of criteria using a five level scale with values indicated by actual numbers (see Table 1). Additionally, three linguistic variables are used to measure the merger strategies of commercial banks (see Table 2).

Table 1. Linguistic terms for priority weights of influential factors

<table>
<thead>
<tr>
<th>Definition</th>
<th>Intensity of importance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equally important (EQ)</td>
<td>1</td>
</tr>
<tr>
<td>Weakly more important (WK)</td>
<td>3</td>
</tr>
<tr>
<td>Strongly more important (ST)</td>
<td>5</td>
</tr>
<tr>
<td>Very strongly more important(VS)</td>
<td>7</td>
</tr>
<tr>
<td>Absolutely more important (AB)</td>
<td>9</td>
</tr>
<tr>
<td>Intermediate values used to present compromise</td>
<td>2,4,6,8</td>
</tr>
</tbody>
</table>

Table 2. Linguistic variables for the priority rating of merged strategy

<table>
<thead>
<tr>
<th>Definition</th>
<th>Intensity of importance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fair (F)</td>
<td>1</td>
</tr>
<tr>
<td>High (H)</td>
<td>3</td>
</tr>
<tr>
<td>Very high (VH)</td>
<td>5</td>
</tr>
<tr>
<td>Intermediate values used to present compromise</td>
<td>2,4</td>
</tr>
</tbody>
</table>

4.2.2. Consistent fuzzy preference relation for prioritizing the evaluation criteria

This study employs the reciprocal additive consistent fuzzy preference relation designed by Herrera-Viedma et al. [6] because it only requires \( n - 1 \) judgments from a set of \( n \) elements.

The procedures of the reciprocal additive consistent fuzzy preference relation for prioritizing the assessment criteria are given below.

1. Establish pairwise comparison matrices among all the criteria \( C_i, \ i = 1, 2, ..., n \) in the dimensions of the hierarchy system. The evaluators \( (E_k, \ k = 1, 2, ..., m) \) provide the more important of each of the pairs of considered criteria for a set of \( n - 1 \) preference values \( (a_{12}, a_{23}, ..., a_{(n-1)n}) \), for example:

\[
A^k = \begin{bmatrix}
C_1 & C_2 & \cdots & C_n \\
C_1 & 1 & a_{12} & x & x \\
C_2 & 1 & 1 & a_{23} & x \\
& \vdots & \vdots & \vdots & \vdots \\
C_n & x & x & \cdots & 1
\end{bmatrix}
\]

Where \( a_{ij}^k \) denotes the preference intensity toward considered criteria \( i \) and \( j \) are assessed by evaluator \( k \).

The sign “ \( x \) ” indicates the remaining \( a_{ij}^k \), which can be done via inverse comparison.

2. Transform the preference value \( a_{ij}^k \) into \( p_{ij}^k \) using an interval scale \([0, 1]\), then derive the remaining \( p_{ij}^k \) based on the reciprocal transitivity property, as follows

\[
p_{ij} = \frac{1}{2} \left( 1 + \log_{10} A^k \right) = \begin{bmatrix}
C_1 & C_2 & \cdots & C_n \\
C_1 & 0.5 & p_{12}^k & x & x \\
C_2 & x & 0.5 & p_{23}^k & x \\
& \vdots & \vdots & \vdots & \vdots \\
C_n & x & x & \cdots & 0.5
\end{bmatrix}
\]

where \( p_{ij} = 0.5 \) indicates no difference between criteria \( i \) and \( j \). The remaining \( p_{ij}^k \) can be calculated using Eqs (2) and (5), but in an interval \([-a, 1+a]\), and a transformation function is required to preserve the reciprocity and additive transitivity. The transformation function is

\[
f(p_{ij}^k) = (p_{ij}^k + a) / (1 + 2a)
\]

where \( a \) denotes the absolute value of the minimum negative value in this preference matrix.

3. Pull the opinions of evaluators to obtain the aggregated weights of the criteria. Moreover, let \( p_{ij}^k \) denote the transformed fuzzy preference value of evaluator \( k \) for assessing the criteria \( i \) and \( j \). This study uses the notation of the average value to integrate the judgment values of \( m \) evaluators, namely

\[
p_{ij} = (p_{ij}^1 + p_{ij}^2 + ... + p_{ij}^m) / m
\]

4. Normalizing the aggregated fuzzy preference relation matrices \( r_{ij} \) is used to indicate the normalized fuzzy preference values of each considered criteria, such as

\[
r_{ij} = p_{ij} / \sum_{i,j}^n p_{ij}
\]

5. Using the \( \sigma_i \) denoting the average priority weight of considered criteria \( i \), the priority of each criteria can be
obtained, that is
\[ \vec{\omega}_i = \frac{1}{n} \sum_{j=1}^{n} r_{ij} \]  
where \( n \) denotes the number of criteria considered.

### 4.2.3. Obtaining the synthetic utility value for merger strategies with respect to each criteria

The evaluators were asked to express their subjective judgments regarding the preference ratings of merger strategies \( (A_u, u = 1, 2, ..., s) \) with respect to each considered criteria in linguistic terms.

1. For each considered criteria, the evaluators were asked to choose the best among three merger strategies for a set of \( s - 1 \) preference data \( (E_{12}, E_{23}, ..., E_{s-1,s}) \), for example
   \[ A_1, A_2, ..., A_n \]
   \[ C_{(1,2)} \]
   \[ C_{(2,3)} \]
   \[ C_{(3,s-1,s)} \]

2. Next, the preference value \( \vec{q}_{uv}^k \) is transformed within the range \( \left[ \frac{1}{2}, 5 \right] \) into \( \vec{q}_{uv}^k \) in an interval scale \([0, 1]\), and the remaining \( \vec{q}_{uv}^k \) are obtained via the reciprocal transitivity property, as follows
   \[ \vec{Q} = \frac{1}{2} (1 + \log _{s} G) = \frac{1}{2} \left( 1 + \log _{s} G \right) \]

3. The opinions of evaluators then are taken to obtain the transformed synthetic rating of the merged strategy for each considered criteria \( \vec{q}_{uv}^k \) which denotes the transformed fuzzy preference value of evaluator \( k \) for assessing merger strategies \( u \) and \( v \) in terms of considered criteria \( i \). This study uses the notation of average value to integrate the judgment values of \( m \) evaluators; that is
   \[ \vec{q}_{uv} = \frac{1}{m} \sum_{k=1}^{m} \vec{q}_{uv}^k \]  
(11)

Following normalizing the synthetic fuzzy preference rating of the merger strategy for each considered criteria, \( \gamma_{uv}^i \) is adopted to indicate the normalized rating of merger strategies \( u \) and \( v \) with respect to considered criteria \( i \), for example

\[ \gamma_{uv}^i = \frac{\vec{q}_{uv}}{s} \sum_{i=1}^{s} \vec{q}_{uv} \]  
(12)

(5) Consequently, \( \vec{\eta}_{uv} \) denotes the average rating of merged strategy \( u \) with respect to considered criteria \( i \). The desired rating of each merger strategy can be derived for each considered criteria, that is,

\[ \vec{\eta}_{u} = \frac{1}{s} \sum_{v=1}^{s} \gamma_{uv} \]  
(13)

where \( s \) represents the number of the merged strategy.

### 4.2.4. Obtaining the priority weight for selection

A preferred value \( R_u \) for commercial banks is obtained by multiplying the priority weights of considered criteria by the ratings of merged strategies. That is,

\[ R_u = \sum_{i=1}^{s} \vec{\eta}_{u} \vec{\omega}_i \]  
(14)

where \( \vec{\omega}_i \) denotes the aggregated weight of considered criteria \( i \).

### 4.3. Empirical case for merged strategy selection

This study used a commercial bank in Taiwan as an example to demonstrate the framework. A total of 12 questionnaires were dispatched.

#### 4.3.1. Weighting calculation of the evaluating criteria

The following examples clarify the computational process used to derive the priority weights using the reciprocal additive consistent fuzzy preference relation approach.

1. Based on interviews with 12 representatives regarding the importance of six evaluation criteria, Table 3 lists the the pairwise comparison matrices for a set of \( n - 1 \) neighbouring criteria \( \{a_{12}, a_{23}, ..., a_{16}\} \).

| Table 3. The linguistic terms toward six factors assessed by evaluators |
|---|---|---|---|---|---|---|---|---|---|
| E₁ | E₂ | E₃ | E₄ | E₅ | E₆ | E₇ | E₈ | E₉ | E₁₀ |
| C₁ | WE | WK | ST | WK | VT | WK | ST | EQ | WK | VT | LWK | WK |
| C₂ | LVS | LVS | LSLV | EQ | LWS | LST | LWK | ELW | LKW | ELW | LWS | LVS |
| C₃ | LST | WK | ST | LST | ST | LST | EQ | WK | LVS | EQ | ELW |

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The ranks of the evaluation criteria weights thus are substituted as:

\[ C_4 > C_5 > C_3 > C_2 > C_1 > C_6 > C_7 > C_8 > C_9 > C_{10} \]

Table 4. Aggregated pairwise comparison matrices of 12 evaluators

<table>
<thead>
<tr>
<th></th>
<th>( C_1 )</th>
<th>( C_2 )</th>
<th>( C_3 )</th>
<th>( C_4 )</th>
<th>( C_5 )</th>
<th>( C_6 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( C_1 )</td>
<td>0.500</td>
<td>0.673</td>
<td>0.493</td>
<td>0.475</td>
<td>0.713</td>
<td>0.424</td>
</tr>
<tr>
<td>( C_2 )</td>
<td>0.327</td>
<td>0.500</td>
<td>0.321</td>
<td>0.302</td>
<td>0.541</td>
<td>0.251</td>
</tr>
<tr>
<td>( C_3 )</td>
<td>0.507</td>
<td>0.679</td>
<td>0.500</td>
<td>0.482</td>
<td>0.720</td>
<td>0.430</td>
</tr>
<tr>
<td>( C_4 )</td>
<td>0.525</td>
<td>0.698</td>
<td>0.518</td>
<td>0.500</td>
<td>0.738</td>
<td>0.449</td>
</tr>
<tr>
<td>( C_5 )</td>
<td>0.287</td>
<td>0.459</td>
<td>0.280</td>
<td>0.262</td>
<td>0.500</td>
<td>0.211</td>
</tr>
<tr>
<td>( C_6 )</td>
<td>0.576</td>
<td>0.749</td>
<td>0.570</td>
<td>0.551</td>
<td>0.789</td>
<td>0.500</td>
</tr>
</tbody>
</table>

(2) Transferred the linguistic terms into corresponding numbers using the fuzzy preference degree as listed in table 1.

(3) Equation (6) was used to transform the elements into an interval \([0, 1]\), yielding the following values:

\[ p_{12} = \frac{1 + \log_9 2}{2} = 0.658 \quad p_{23} = \frac{1 + \log_9 2}{2} = 0.057 \]
\[ p_{34} = \frac{1 + \log_9 4}{2} = 0.134 \quad p_{45} = \frac{1 + \log_9 2}{2} = 0.943 \]
\[ p_{56} = \frac{1 + \log_9 2}{2} = 0.057 \]

The remaining values then can be calculated using Eqs. (2) and (5).

The fuzzy preference relation matrix for six evaluation criteria assessed by evaluator 1 is established, and the linear transformation stated in Eq. (7) is employed to ensure the reciprocity and additive transitivity for the preference relation matrix.

(4) Likewise, the above computational procedures can calculate the fuzzy preference relation matrices of the other 11 evaluators; therefore, using Eq. (8), the aggregated pairwise comparison matrix of twelve evaluators can be derived, as listed in Table 4.

Table 5. Normalized matrix of priority weight and rank of influential factors

<table>
<thead>
<tr>
<th>( E_1 )</th>
<th>( E_2 )</th>
<th>( E_3 )</th>
<th>( E_4 )</th>
<th>( E_5 )</th>
<th>( E_6 )</th>
<th>( E_7 )</th>
<th>( E_8 )</th>
<th>( E_9 )</th>
<th>( E_{10} )</th>
<th>( E_{11} )</th>
<th>( E_{12} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( C_1 )</td>
<td>0.184</td>
<td>0.179</td>
<td>0.131</td>
<td>0.185</td>
<td>0.178</td>
<td>0.187</td>
<td>1.044</td>
<td>0.174</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( C_2 )</td>
<td>0.120</td>
<td>0.133</td>
<td>0.085</td>
<td>0.118</td>
<td>0.135</td>
<td>0.111</td>
<td>0.702</td>
<td>0.117</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( C_3 )</td>
<td>0.186</td>
<td>0.181</td>
<td>0.133</td>
<td>0.187</td>
<td>0.180</td>
<td>0.190</td>
<td>1.057</td>
<td>0.176</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( C_4 )</td>
<td>0.193</td>
<td>0.186</td>
<td>0.138</td>
<td>0.174</td>
<td>0.184</td>
<td>0.198</td>
<td>1.093</td>
<td>0.182</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( C_5 )</td>
<td>0.105</td>
<td>0.122</td>
<td>0.075</td>
<td>0.102</td>
<td>0.125</td>
<td>0.093</td>
<td>0.622</td>
<td>0.104</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( C_6 )</td>
<td>0.212</td>
<td>0.199</td>
<td>0.152</td>
<td>0.214</td>
<td>0.197</td>
<td>0.221</td>
<td>1.195</td>
<td>0.199</td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The results show that the three main assessment attributes are Risk management (0.199), financial composition of bank (0.182) and customer service (0.176).

4.3.2. Calculation of the weights for merged strategies with respect to evaluation criteria

(1) Examining the situation of this bank, the 12 evaluators are interviewed to assess which is more likely to occur according to each evaluating criteria (see Table 6).

<table>
<thead>
<tr>
<th>( E_1 )</th>
<th>( E_2 )</th>
<th>( E_3 )</th>
<th>( E_4 )</th>
<th>( E_5 )</th>
<th>( E_6 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( A_1 )</td>
<td>LH</td>
<td>VH</td>
<td>VH</td>
<td>LH</td>
<td>f</td>
</tr>
<tr>
<td>( A_2 )</td>
<td>LH</td>
<td>VH</td>
<td>f</td>
<td>f</td>
<td>f</td>
</tr>
<tr>
<td>( A_3 )</td>
<td>LH</td>
<td>H</td>
<td>f</td>
<td>f</td>
<td>f</td>
</tr>
<tr>
<td>( A_4 )</td>
<td>LH</td>
<td>f</td>
<td>f</td>
<td>f</td>
<td>f</td>
</tr>
<tr>
<td>( A_5 )</td>
<td>LH</td>
<td>H</td>
<td>f</td>
<td>f</td>
<td>f</td>
</tr>
<tr>
<td>( A_6 )</td>
<td>LH</td>
<td>f</td>
<td>f</td>
<td>f</td>
<td>f</td>
</tr>
<tr>
<td>( A_7 )</td>
<td>LH</td>
<td>H</td>
<td>f</td>
<td>f</td>
<td>f</td>
</tr>
<tr>
<td>( A_8 )</td>
<td>LH</td>
<td>f</td>
<td>f</td>
<td>f</td>
<td>f</td>
</tr>
<tr>
<td>( A_9 )</td>
<td>LH</td>
<td>H</td>
<td>f</td>
<td>f</td>
<td>f</td>
</tr>
<tr>
<td>( A_{10} )</td>
<td>LH</td>
<td>f</td>
<td>f</td>
<td>f</td>
<td>f</td>
</tr>
<tr>
<td>( A_{11} )</td>
<td>LH</td>
<td>H</td>
<td>f</td>
<td>f</td>
<td>f</td>
</tr>
<tr>
<td>( A_{12} )</td>
<td>LH</td>
<td>f</td>
<td>f</td>
<td>f</td>
<td>f</td>
</tr>
</tbody>
</table>
$C_k A_{1H} \text{ HF} \text{ HF} \text{ LH} \text{ H} \text{ F} \text{ F} \text{ VH} \text{ VH} \text{ F} \text{ A}_2$

$A_{2VH} \text{ LH} \text{ F} \text{ VH} \text{ VH} \text{ F} \text{ F} \text{ VH} \text{ LH} \text{ F} \text{ A}_3$

(2) Translate the linguistic variables into the corresponding numbers.

(3) Using Eq.(11), the synthetic rating of merger strategies can be obtained. Eqs. (12)-(13) can then be employed to normalize and synthesize the fuzzy preference rating of three merger strategies based on six evaluation criteria. Table 7 lists the normalized values and priority weights of all criteria.

Table 7. Normalized matrix of priority weight of all criteria and preference rate of candidates

<table>
<thead>
<tr>
<th>Priority weight</th>
<th>Weighted rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>weight</td>
<td>$A_1$</td>
</tr>
<tr>
<td>$C_1$</td>
<td>0.183</td>
</tr>
<tr>
<td>$C_2$</td>
<td>0.123</td>
</tr>
<tr>
<td>$C_3$</td>
<td>0.185</td>
</tr>
<tr>
<td>$C_4$</td>
<td>0.191</td>
</tr>
<tr>
<td>$C_5$</td>
<td>0.109</td>
</tr>
<tr>
<td>$C_6$</td>
<td>0.209</td>
</tr>
<tr>
<td>Total</td>
<td>0.398</td>
</tr>
</tbody>
</table>

4.3.3. Weighting the selection priorities

Using Eq.(14), the priority weights of six evaluation criteria and the priority ratings of three merged strategies, in addition to the preference weightings of the candidates, are listed in Table 7. Take $A_1$ as an example, the preferred weights for the merger strategies are calculated as,

$A_1 = (0.183 \times 0.400) + (0.123 \times 0.399) + (0.185 \times 0.349) + (0.191 \times 0.419) + (0.109 \times 0.413) + (0.209 \times 0.411) = 0.398$

The ranking of alternative solutions is obtained as follows: Alternative $A_1$ (0.398) > Alternative $A_3$ (0.304) > Alternative $A_2$ (0.270).

5. Conclusions

The multi-criteria decision making model for merger strategy selection presented here clearly is applicable to the evaluation process. The proposed strategy also reveals the concerns and preferences of most bank stakeholders. The results of this study provide a valuable reference for bank administrators.

References: