The Multi-level Fuzzy Comprehensive Evaluation of Enterprise Growth

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Abstract: The article bases on the connotation of Enterprise Growth, Affect enterprises with growth factors, Put forward a more scientific evaluation of the Enterprise Growth Index System, and to establish a multi-level fuzzy comprehensive evaluation model, With a view to the adoption of the enterprise growth for a more reasonable assessment of enterprises to promote long-term development of scientific theory.

Key words: Enterprise Growth; Indicator System; Fuzzy Comprehensive Evaluation; Factor Analysis

0 Introduction

Since the 1980s, economic globalization and the rapid development of information technology cause the major changes of in the outside business environment, enterprises crisis of survival problems for the people's attention. Looking at the business development of the theory, the research so far, mainly from the perspective of the various enterprises the ability to define the theory. Various theories on the ability of enterprises to improve on the ability of enterprises to define. But the growth and development of enterprises in different stages, on the requirements and the ability of very different focus must exist, there is an urgent need to devise a set of indicators of the growth of the enterprise system. This article attempts to enterprises through the analysis of the impact of growth factors, the establishment of a business growth of the evaluation index system, and use fuzzy math theory, a measure of business growth of the construction of the multi-level fuzzy comprehensive evaluation model, For the evaluation of the business to provide a reference.

1 the connotation of Enterprise

Growth Business growth of the enterprises is a process of continuous change from small to large and from weak to strong in a long period of time. A longer period refers to the life of enterprises should be more than the industry average life expectancy; From small to large and from weak to strong refers to the various operating results continue to improve and enhance operating performance driven by the dynamic is constantly improving. Constantly change is the state of the continued survival, enterprises may be in tortuous process on the road of growth in a certain period of time, because of the existence of the process of change. For example, operating performance decline and organizational function weakening in temporary, This is a normal business in view of sustainable growth, even is necessary in order to achieve the goal of sustainable growth. However, from small to large and from weak to strong is the basic performance of growth sustainable business over a longer period. At the same time, I believe that the impact factors of business growth include corporate organization and management, entrepreneurship, corporate culture and economic environment under normal circumstances.

2 Analysis of Factors Affecting of Enterprise Growth

Fuzzy math on the evaluation of the Enterprise Growth and evaluation index system to identify at first, which identified factors set. Business growth with a number of factors, the impact of each factor on the growth of enterprises is not the same. Therefore, to determine the impact of growth factors is the evaluation work. The author on the basis of the analysis, determine the minimum several factors that impact on the business Growth: enterprise management, entrepreneurship, corporate culture and
economic environment. Specific indicators shown in table 1.

Because of the many relevant factors of the evaluation targets, it is very difficult to set a reasonable allocation of weights. Therefore, this paper uses a multi-level fuzzy comprehensive evaluation, Evaluation will be by property classification, the evaluation index system is arranged at different levels and hierarchical structure. Each level indicators symbols: The first tier is the evaluation criteria $U_i = (U_{1i}, U_{2i}, \ldots, U_{Ni})$, Known as the evaluation factors; The second tier is the elements for evaluation $U_{ij} = (u_{i1j}, u_{i2j}, \ldots, u_{ijn})$, Known as the evaluation elements; The third tier of indicators $U_{ijk} = (u_{i1kj}, u_{i2kj}, \ldots, u_{imkj})$, as indicators for evaluation.

3 Multi-level fuzzy comprehensive evaluation model

Fuzzy comprehensive evaluation of the basic idea is: To many factors, according to the different nature of certain types of atmosphere, each category includes a number of factors, a comprehensive
evaluation of their type and then to conduct comprehensive evaluation of all types, the evaluation process and specific steps are as follows:

3.1 Determining factor set
Factor set is collection the composition of the various factors. Assumptions factor set \( U = (U_1, U_2, \ldots, U_N) \), to each subdivided into several factors \( U_{ij} \) grade \( U_{ij} = (u_{i1}, u_{i2}, \ldots, u_{in}) \), one \( U_{ij} \) is i factors for the first j grades \( (i=1, 2, \ldots, n; j=1, 2, \ldots, m) \).

3.2 The establishment of weight Set
Identify specific methods of weight are generally subjective and objective two ways. In this paper, subjective law empowers the Delphi method for enterprise growth of the assignment evaluation index system. Each level of the vector symbol that is: \( U \) of the first layer that is the weight corresponding to remember \( A = (a_1, a_2, \ldots, a_N) \); The second level corresponding to the weight as \( A_i = (a_{i1}, a_{i2}, \ldots, a_{in}) \); The third level of the corresponding weight in mind \( A_{ik} = (a_{ik1}, a_{ik2}, \ldots, a_{ikm}) \). Which meet \( 0 < a_1, a_k, a_{ik} < 1 \), and

\[
\sum_{i=1}^{N} a_i = \sum_{k=1}^{n} a_{ik} = \sum_{j=1}^{m} a_{ikj} = 1
\]

3.3 Single factor determining evaluation matrix
The single factor that assessment of individual factors \( u_{ikj} \) evaluation, \( V \) are on the fuzzy sets \( (r_{ikj1}, r_{ikj2}, \ldots, r_{ikjp}) \), It is a \( U \) to \( V \) from the fuzzy mapping. For more than a third of the indicators can be judged accordingly Matrix are as follows:

\[
R_{ik} = \begin{bmatrix}
    r_{ik11} & r_{ik12} & \cdots & r_{ik1p} \\
    r_{ik21} & r_{ik22} & \cdots & r_{ik2p} \\
    \cdots & \cdots & \cdots & \cdots \\
    r_{ikm1} & r_{ikm2} & \cdots & r_{ikmp}
\end{bmatrix}
\]

3.4 Set evaluation identified
Evaluation is set to review the personnel evaluation index is given by a collection of reviews, that the ability to grow strong and weak corporate level. We set a rating \( V = (v_1, v_2, v_3, v_4, v_5) \) = (Strong, more, medium, weak, very weak). We passed law experts score a manner that is the ability of each business growth indicators in each of the evaluation scores, and experts score data aggregated basis, the specific results in table 2.

3.5 Comprehensive Evaluation
Evaluation is a multi-level evaluation process. The initial comprehensive evaluation of each \( U_{ik} = U_{ik} = (u_{ik1}, u_{ik2}, \ldots, u_{ikm}) \) factors based on the initial model for comprehensive assessment, be the single factor \( U_{ik} \) evaluation matrix \( B_{ik} = A_i \circ R_{ik} = (b_{ik1}, b_{ik2}, b_{ik3}, b_{ik4}, b_{ik5}) \).

Evaluation is a multi-level evaluation process. The initial comprehensive evaluation of each factor based on the \( m \) initial model for comprehensive assessment, be the single factor evaluation matrix:

2 rating is the second tier indicators \( U_{ik} \) single-factor set of evaluation matrix \( B_{ik} = (u_{i1}, u_{i2}, \ldots, u_{in}) \) of the \( n \)-evaluation of two factors, which are the first tier indicators: \( U \) single - Factors evaluation matrix \( B_{i} = A_i \circ R_{i} = (b_{i1}, b_{i2}, b_{i3}, b_{i4}, b_{i5}) \).

3 rating: empathy can be a factor set \( U = (U_1, U_2, U_3, U_4, U_5) \), a comprehensive evaluation of the results \( B \):

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4 Enterprise growth of multi-level fuzzy comprehensive evaluation

According to the above fuzzy comprehensive evaluation model and corporate growth of evaluation index system, as an example of a domestic enterprise (enterprise specific circumstances abbreviated), to evaluate its business growth.

(1) Fuzzy comprehensive evaluation of primary
First of Organization and Management \((U_1)\) indicators of organizational strategy \((U_{11})\) this indicator for a fuzzy comprehensive evaluation. In the \(U_{11}\) four sub-indexes under the weight as: \(A_{11} = (0.2, 0.3, 0.3, 0.2, )\). Fuzzy evaluation matrix:

\[ R = \begin{bmatrix}
0.2 & 0.3 & 0.3 & 0.1 & 0.1 \\
0.3 & 0.2 & 0.1 & 0.2 & 0.2 \\
0.1 & 0.3 & 0.2 & 0.3 & 0.1 \\
0.1 & 0.2 & 0.2 & 0.2 & 0.3
\end{bmatrix} \]

Organizational strategy \((U_{11})\) of a fuzzy comprehensive evaluation of the results:

\[ B_{11} = A_{11} \circ R_{11} = (0.2, 0.3, 0.3, 0.2, ) \circ \begin{bmatrix}
0.2 & 0.3 & 0.3 & 0.1 & 0.1 \\
0.3 & 0.2 & 0.1 & 0.2 & 0.2 \\
0.1 & 0.3 & 0.2 & 0.3 & 0.1 \\
0.1 & 0.2 & 0.2 & 0.2 & 0.3
\end{bmatrix} = (0.18, 0.25, 0.19, 0.21, 0.17 ) \]

Similarly available: \(B_{12} = A_{12} \circ R_{12} = (0.19, 0.21, 0.27, 0.17, 0.16 )\)
\(B_{13} = (0.20, 0.28, 0.23, 0.14, 0.15 )\)
\(B_{14} = (0.22, 0.26, 0.28, 0.12, 0.12 )\)
\(B_{15} = (0.27, 0.22, 0.20, 0.17, 0.14 )\)
\(B_{16} = (0.29, 0.22, 0.25, 0.12, 0.12 )\)
\(B_{17} = (0.32, 0.28, 0.27, 0.17, 0.14 )\)
\(B_{18} = (0.36, 0.28, 0.25, 0.16, 0.17 )\)

The two fuzzy comprehensive evaluation matrix:

\[ B = A \circ R = A \circ \begin{bmatrix}
B_1 \\
B_2 \\
B_3 \\
B_4 \\
B_5
\end{bmatrix} = (b_1, b_2, b_3, b_4, b_5 ) \]

(2) 2 fuzzy comprehensive evaluation
Organization and Management \((U_1)\) fuzzy comprehensive evaluation of the results:

\[ B_1 = A_1 \circ R_1 = (0.2, 0.3, 0.3, 0.2) \circ \begin{bmatrix}
0.18 & 0.25 & 0.19 & 0.21 & 0.17 \\
0.19 & 0.21 & 0.27 & 0.17 & 0.16 \\
0.20 & 0.28 & 0.23 & 0.14 & 0.15 \\
0.22 & 0.26 & 0.28 & 0.12 & 0.12
\end{bmatrix} = (0.197, 0.249, 0.244, 0.159, 0.151 ) \]

Similarly available: \(B_2 = A_2 \circ R_2 = (0.27, 0.22, 0.20, 0.17, 0.14 )\)
\(B_3 = A_3 \circ R_3 = (0.29, 0.22, 0.25, 0.12, 0.12 )\)
\(B_4 = A_4 \circ R_4 = (0.226, 0.188, 0.265, 0.159, 0.162 )\)

The two fuzzy comprehensive evaluation matrix:
Based on the evaluation of the weight distribution: \( A = (0.35, 0.25, 0.2, 0.2) \). And two fuzzy evaluation matrix, can be the ability to grow the business comprehensive evaluation results:

\[
B = A \circ R = \begin{pmatrix}
0.197 & 0.249 & 0.244 & 0.159 & 0.151 \\
0.27 & 0.22 & 0.20 & 0.17 & 0.14 \\
0.29 & 0.22 & 0.25 & 0.12 & 0.12 \\
0.226 & 0.188 & 0.265 & 0.159 & 0.162
\end{pmatrix} \times \begin{pmatrix}
0.197 & 0.249 & 0.244 & 0.159 & 0.151 \\
0.27 & 0.22 & 0.20 & 0.17 & 0.14 \\
0.29 & 0.22 & 0.25 & 0.12 & 0.12 \\
0.226 & 0.188 & 0.265 & 0.159 & 0.162
\end{pmatrix}
\]

\[
= \begin{pmatrix}
0.2396 & 0.224 & 0.2384 & 0.1539 & 0.1443
\end{pmatrix}
\]

Evaluation results show that: That the ability of strong business growth of 23.96%, Accounted for 22.4% stronger, the middle level of 23.84 percent, 15.39% of the weak, weak accounting for 14.43%. By the largest membership in principle, the ability of strong business growth, to this end enterprises on the basis of this comprehensive weigh gains and losses, the use of enterprise has a great potential and the advantages of strong growth ability to vigorously develop the business.

## 5 Conclusion

More use of multi-level fuzzy comprehensive evaluation method, the growth of enterprises conducted a preliminary evaluation. However, business growth of the analysis and evaluation is, after all, a complicated system, China's enterprises to combine the specific situation, scientific, accurate and reasonable analysis and evaluation of its growth, but also the need for more in-depth study.

### References

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