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Research on the Risk Early Warning Model Construction of the Enterprise Group

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Abstract: Enterprise group facing the uncertainty of external environment is more and more great for rapid development of the social, economic and science and technology, which may damage to social public or the customer's benefits, if the group does not deal with crisis management or crisis management is not successful, it is a disadvantageous position to the enterprise, therefore enterprise group to keep sustainable development of the competitive advantage, must be risk warning system to the group. This study sets about research design from method. Conduct a comprehensive evaluation of the risks faced by the group by means of the establishment of the risk index system , screening and evaluation methods and the group risk warning signal system and group risk warning model. Early warning signal system and fuzzy comprehensive evaluation method are applied to the group's quantitative and qualitative early warning.

Key words: Enterprise group, risk early warning,indicator system,warning signal system

INTRODUCTION

With the rapid development of social, economic and science and technology, enterprise groups face the uncertainty of the external environment is growing, resulting in the risk of enterprise groups is greater than ever, it is due to a series of dangerous events, It is because of a series of dangerous events, which may be detrimental to the interests of the public or customers. If group processes improper and it ultimately will affect the Group's image (Xu, 2013a). If the group does not to deal with the crisis or crisis management is not successful (Shang and Li, 2011), they will be placed in a unfavourable position, how to maintain a sustainable competitive advantage in the changing environment of competition (Huang, 2012), fully predict and identify the risk of enterprise groups has become an important task for the enterprise groups strategic management (Yongyi *et al*., 2004; Song and Xiaoping, 2010; Ordonez *et al*., 2000). Therefore, it is necessary for us to search on the group's risk warning.

CONSTRUCTION AND EVALUATION OF THE GROUP RISK INDEX METHOD

Construction of group risk early warning index system:

- Design principles: Follow the scientific system integrity level , taking into account and practical
- Risk early warning index system method

A System of Indicators, according to the evaluation of information characteristics of the object and its environment to determine the specific choices is various, normalized to the dimensionless 0 to 1 value. The non-linear changes it contains:

$$X'_{nj} = \left(\frac{x_{ij} - x_{minij}}{x_{maxij} - x_{minij}}\right)^k \quad (1)$$

If k = 1, then on to the extreme value of linear transformation.Where x_{minij} and x_{maxij} can also change for the best value or standard value, depending on what kind of transformation. To interpolation, linear interpolation Eq. is:

$$X_{ij}' = (H - L)\left(\frac{x_{ij} - x_{minij}}{x_{maxij} - x_{minij}}\right) + L \quad (2)$$

where, H is the highest normalized value, L is the lowest value. If H = 1, L = 0, then it is linear transform equestion.

Evaluation of early warning indicator system:

- Determine the evaluation of the object set, the factor set and evaluation set:
  - Object set: $O = \{o_1, o_2, \cdots, o_l\}$
  - Factor set: $U = \{u_1, u_2, \cdots, u_m\}$
  - Decisions set $V = \{v_1, v_2, \cdots, v_n\}$
- Adopt the experts consultation method and analytic hierarchy process (ahp) or "relative importance relevant registration method", etc.

- By a single factor fuzzy evaluation to obtain the fuzzy comprehensive evaluation matrix:

$$\underset{\sim}{R} = \begin{bmatrix} R_1 \\ R_2 \\ \vdots \\ R_m \end{bmatrix} = \begin{bmatrix} r_{12} & r_{12} & \cdots & r_{1n} \\ r_{21} & r_{22} & \cdots & r_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ r_{m1} & r_{m2} & \cdots & r_{mn} \end{bmatrix} \quad (3)$$

Each evaluation of the object should be to establish a comprehensive evaluation matrix $\underset{\sim}{R}$ in which $R_i = (r_{i1}, r_{i2}, \cdots, r_{in})$. For the single factor evaluation of the i factor u_i, so r_{ij} is the frequency distribution of $i(1 \le i \le m)$ factor u_i in $j(1 \le j \le n)$ number of reviews v_j, generally normalized to meet the:

$$\sum_{j=1}^{n} r_{ij} = 1$$

- Composite operator can be obtained evaluation results: $\underset{\sim}{B} = \underset{\sim}{A} \bullet \underset{\sim}{R}$
- Calculation of the scores of each evaluation object . Comprehensive evaluation of the results of $\underset{\sim}{B}$ translate into comprehensive score M, so be sorted according to the value of M size , which can pick out the best

Here, this study uses fuzzy clustering analysis of indicators of screening

① set up for points index collection:

$$X = \{X_1, X_2, \cdots X_n\} \quad \bigcup_{i=1}^{n} X_i = X$$
$$X_i \cap X_j = \Phi, (i \ne j)$$

where, X_i refers to a non-dimensional processing

- The organization expert score for each indicator $X_i(i = 1, \cdots, n)$ according to pilot and lagging index classification

Make sure the X_i is A_i (i = 1, 2 1 is strong signal, 2 is weak signal), grade of membership and the partition matrix:

$$U_{2n} = \begin{bmatrix} u_{11} & u_{12} & \cdots & u_{1n} \\ u_{21} & u_{22} & \cdots & u_{2n} \end{bmatrix} \quad (4)$$

$$0 \le U_{ij} \le 1(i = 1, 2, = 1, 2, ..., n),$$
$$\sum_{i=1}^{2} u_{ij} = 1, \sum_{j=1}^{n} u_{ij} > 0$$

- To determine the cluster center, known by the physical center of gravity, the center of $X_1, X_2, \cdots X_n$ is their weighted arithmetic average, namely:

$$V = \frac{\sum_{j=1}^{n} u_{ij} x_j}{\sum_{j=1}^{n} u_{ij}} (i = 1, 2) \quad (5)$$

In order to strengthen the contrast of affiliate degree that belongs to all kinds,you can pull open the class of the weight, so take the following equestion:

$$V_i = \frac{\sum_{j=1}^{n} (u_{ij})^m x_j}{\sum_{j=1}^{n} (u_{ij})^m} (i = 1, 2) \quad (6)$$

m is the positive integer and m can be into 1 or 2 and other positive integers. Exact numerical value depends on the precision of the requirements and the higher precision is, the greater the value is:

- Searching for the optimal differentiation matrix, you can determine the subordination degree and get a new differentiation matrix according to the clustering center, index and distance solved by the equestion Ordonez *et al.* (2000)
- Account optimal differentiation matrix

If:

$$\max\left\{\left|u'_{ij} - u_{ij}\right|\right\} < \varepsilon(\varepsilon = 10^{-4})$$

is true, it indicates decomposable matrix U′doesn't improve a lot.

Comparable to U. Therefore, you adopt U′ as the optimal differentiation matrix. If it is not true, you should repeat the steps above. This study can sift out the chosen indication system $Y = \{y_1, y_2, \ldots, y_m\}$ according to optimal differentiation matrix.

Define the indicator values of the group risks warning:

- Ensure the evaluation index set $Z = \{Z_1, Z_2, \cdots, Z_n\}$
- Ensure the evaluation set $W = \{W_1, W_2, \cdots, W_n\}$
- Evaluation and membership $u = \{u_1, u_2, \cdots, u_n\}$
- Evaluation system to establish fuzzy matrix

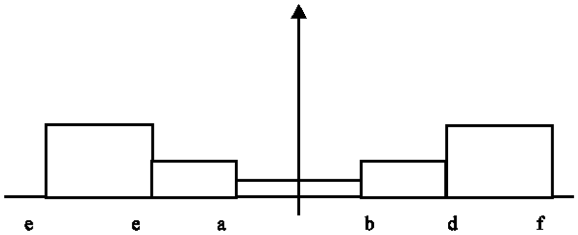

Fig. 1: Chart of warning threshold value

$$R = \begin{bmatrix} r_{11} & r_{12} & \cdots & r_{1n} \\ r_{21} & r_{22} & \cdots & r_{2n} \\ \vdots & \vdots & \vdots & \vdots \\ r_{n1} & r_{n2} & \cdots & r_{nn} \end{bmatrix} \quad (7)$$

Calculating fuzzy comprehensive membership set value B = R•U^T. Calculating the whole membership U = W•B.

EARLY WARNING SIGNAL SYSTEM RISK GROUP CONSTRUCTION

If x is supposed to be the indicator, its security domain is [X_a, X_b], elementary risk area is [x_c, x_d],high risk areas are [x_e, x_c] and [x_d, x_f],basic alarm standards is in

When $X_a \le X \le X_b$, no $X_b \le X \le X_d$ alarm is sent.

When $X_c \le X \le X_a$ or ,the first-scale warning is sent.

When $X_e \le X \le X_c$ or $X_d \le X \le X_f$,the second-scale warning is sent.

When X>X_f or X>X_e, the third-scale warning is sent. According to group risk early warning in Fig. 1: if one occasional or one-time fluctuation of one or more of the indexes caused warning but it soon returned to normal, the safety area is in stablility over time.And it is because of the possibility caused by accidental changes,just as suddenly leap into danger zone and keep too long, you can think index changed very greatly and it has a negative influence on the group (Hanxia *et al*., 2008; Chow and Chan, 2008); If it further moves to the high danger zone, it shows the group faces serious risks,you shall immediately give warnings and take quick steps to prevent further deterioration of the situation.

With assets and profit as an example, the profit rate of assets in 5% as a red light district and the yellow light zone to the critical line, with 2% as the yellow light area and the green zone to the critical line, with 0 as a green light and blue light zone to the critical line, with -5% as a division of shallow blue light and blue light zone to the critical line (Xu and Han, 2008; Yang, 2011; Huang, 2010).

Light blue zone, said the group economy is in a slightly cold state.

Table 1: Sheet of warning regional score value

Index	P_1	P_2	P_3	P_4	P_5	P_6	P_7	P_8	P_9	P_{10}	P_{11}	P_{12}
Overheat	5	5	5	5	1	1	5	5	1	5	1	5
High	4	4	4	4	2	2	4	4	2	4	2	4
Normal	3	3	3	3	3	3	3	3	3	3	3	3
Low	2	2	2	2	4	4	2	2	4	2	4	2
Lower	1	1	1	1	5	5	1	1	5	1	5	1

Table 2: Indicators warning results of the fourth quarter in 2003

Index	Predictive value	Region of Predictive	Score	Weights
	3.4%	Yellow	4	0.2126
	122.67%	Yellow	4	0.1065
	0.46	Green	3	0.0329
	0.64	Green	3	0.0338
	87%	Light blue	2	0.0605
	0.84%	Red	5	0.1099
	136%	Red	5	0.0591
	6.14%	Green	3	0.1141
	13.11	Yellow	4	0.0597
	60.21	Green	3	0.0604
	114037	Green	3	0.1255
	32145	Green	3	0.0249

Blue zone, said the group economy in a supercooled state.

According to the above steps can be calculated from the fourth quarter of 2003 group quantitative early warning to establish comprehensive early warning index:

- Its divided region is based on early warning and the indicators through the forecast data are score (1 points, 2 points, 3 points, 4 points, 5 points)
- Calculation of weighted average value W_1, which W_i is the index weight of I:

$$W_1 = \sum w_i \bullet F_i / 5 \quad (8)$$

- In accordance with the experience to judge, to take out of the 86, 72, 48 and 34 as the critical point of W_1
  - $W_1 \ge 86\%$ For red light district, said the group of rapid economic growth
  - $72\% \le W_1 < 86\%$ as the Yellow Zone, said the group economy is in a slightly hot state.
  - $48\% \le W_1 < 72\%$ as the Green Zone, said that in the normal group economy
  - $34\% \le W_1 < 48\%$ For the light blue area, said the group economy is in a coolish state
  - $W_1 < 34\%$ For the blue light, indicating that the Group, the economy is in a supercooled state

The fourth quarter of 2003 (Table 2), the Group's quantitative early warning indicators $48\% \le W_1 = 0.7313$ can be calculated according to the above steps (Table 1). As a result of warning display for the yellow light, group economy are in a rapid development period:

- Factors early warning. It is taken for non-quantifiable factors indicators of early warning. It has two forms, one when risk of X appears, alerts, otherwise, do not sound the alarm. Let $0 \le P(X) \le P_b$ alerts; $P_a \le P(X) \le P_c$ issued primary alarm; $P(X) < P_c$, issue of higher alert. Where the probability of P (X) is caused by the wrong factors
- Comprehensive evaluation. It will be on two methods to come up with a comprehensive alarm mode, which is the relevant data processing method, multiple indicators or factors summarized as a comprehensive indicator, then the scope of the range according to the value index where to determine the issue what kind of alarm

RISK WARNING MODEL ESTABLISH AND VALIDITY TEST OF THE CORPORATION GROUP

Risk warning model establish of the corporation group:

- On the quantity and time processing:

$$\bar{X} = \begin{cases} X_{k+1} & n = 2k+1 \\ X_k + X_{(k+1)/2} & n = 2k \end{cases} \quad (9)$$

Type $\bar{X}$ is evaluation results, $\{X_i\}$ is experts score value and $\{X_i\}$ arranges from big to small, n is experts, formula expert scoring results arranged from big to small and the evaluation results obtained digits(Shen, 2006).

- Compared to rank answer processing

A field with m evaluations (object), n experts to participate in the evaluation, setting an expert k gives the value score set:

$$\{X_{i(j)}\}^{(k)}$$

set:

$$\{X_{i(j)}\}^{(k)}$$

said the k experts on the field of i gives the score order value and its value is j (I, j = 1, 2, ..., m, k = 1, 2, ..., n).

According to the sequence score:

$$B_{i(j)(k)} = m - x_{i(j)}^{(k)+1}$$

can be set into the base score set:

$$\{B_{i(j)}\}^{(k)}$$

where $B_{i\,(j)\,(k)}$ means article k expert on the field I of at the position j corresponding to the base score (I, j = 1, 2, ..., m, k = 1, 2, ..., n). Then using the following formula to calculate the importance of a research field:

$$S_i = \sum_{j=1}^{m} B_{i(j)} N_j \quad i = 1, 2, ..., m \quad (10)$$

$$K_i = \frac{S_i}{n} \sum_{j=1}^{m} j \quad i = 1, 2, ..., m \quad (11)$$

Type :m: Field S_i : Field values
n: Expert number $B_{i\,(j)}$: In field row score
N_i: In favor of i field in article one:

$$\left(\sum_{j=1}^{m} N_i = N \right)$$

N_i: Domain important degree index of field i.

Finally, according to the size of order of k_i, this study can see by the Eq. 1, 2 , currently score processing methods on sequence score processing is based on the statistical average basis, according to the theory of statistics that, when participation in the evaluation of many experts, the statistical results are true, but in the practical work, the number experts is often not too much, so this will have a certain impact, making individual expert opinion on the evaluation results of the extreme influence and it may make the evaluation results that deviate from the correct track (Xu, 2010; Qin, 2003).

- Group risk prediction model validity inspection:
    - First calculate the consistency index (Consistency index):
    - Secondly, to find a row corresponding to the average random consistency index (random index).
    - Third, calculate the consistency ratio C.R. (Consistency ratio)

$$C.R. = C.I./R.I.$$

When C.R.<0.1, consistency of judgment matrix is acceptable. When C.R.≥0.1 due correction for the judgment matrix. For the first order and second-order matrix always consistency of C.R. = 0.

Fourth, overall consistency the test, from top to bottom layer consistency test. If you have already obtained consistency index $C.I._j^{(k)}$, k-1 layer on the element j is criterion, the average random consistency index $R.I._j^{(k)}$ consistency ratio of $C.R._j^{(k)}$, j = 1, 2, ..., n_{k-1}, k ayer composite indicator $C.I.^{(k)}$, $R.I.^{(k)}$, $C.R.^{(k)}$ should be:

$$C.I.^{(k)} = (C.I._1^{(k)}, \ldots, C.I._{nk-1}^{(k)})\, w^{(k-1)}$$
$$R.I.^{(k)} = (R.I._1^{(k)}, \ldots, R.I._{nk-1}^{(k)})\, w^{(k-1)}$$
$$C.R.^{(k)} = C.I.^{(k)} / R.I.^{(k)}$$

$C.R.^{(k)}<0.1$ hierarchical structure has consistency overall satisfaction in all of the above judgment level layer k. In fact, overall consistency test can often be omitted (Tsinghua University Press, 2003; Haiting and Jihong, 2004).

CONCLUSION

On the basis of corresponding obligations made by the corporation, this study should strengthen the development and development of the risky warning mechanism. No matter how perfect the risky warning mechanism is, its role is limited, it can only to a certain degree give the protection. The corporation wants to be in an invincible position in the international market and develop smoothly, it is not enough to only depend on the risky warning mechanism. This study should pay more attention to how to improve the competitiveness of the corporation, otherwise, people may hold that the risky warning mechanism is nothing but retarded.

The factors facing with corporation is changeable and the model of the risky warning mechanism should base on the previous data. The incompleteness of the data leads us to employ other countries's date which is no suitable to our practical situations. So the risky warning mechanism can not totally reflect the current risky situations. What's more important is that some aspects of the risky warning mechanism should be changed according to the practical situations. In our country, it is still need further inspection and perfection to decide which indexes are more representative, how to set the more reasonable and scientific marginal value. So this essay is just setting an example for us to collect more details by the operation of the historical data, further conduct statistical analysis and perfect our index system, thus this study can calculate a more accurate marginal value close to index and build a more effective risky warning mechanism.

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