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A New Method of Dynamic Comprehensive Evaluation and Classification

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Abstract: Dynamic comprehensive evaluation is generally considered the static evaluation value in the same time point and then time dimension assembled by ideal point method. But samples has not been classified and pointed out shortages. Through the study of the improvement of ideal point method can overcome the shortcomings of this method and put forward improvement measures for samples. It has carried on the empirical analysis and is worth extending for good effect.

Key words: Principal component analysis, ideal point, dynamic comprehensive evaluation, classification

INTRODUCTION

The existing of dynamic comprehensive evaluation of the principle is mainly through this mode that static evaluation matrix multiplied by the weight plus change value matrix multiplied by its corresponding weight and then use ideal point method sort, or other methods such as grey matrix method, projection pursuit model, wavelet neural network, construct the objective function, the introduction of speed characteristics and so on (Helbig and Engelbrecht, 2013; Liu *et al*., 2010; Guo *et al*., 2007).

Looking from the existing literature at home and abroad at present research on comprehensive evaluation method two prominent problems still exist.

Firstly, dynamic comprehensive evaluation of the existing literature, only two targets are solute calculation value and rankings without classification, this will make the evaluation result not perfect and even make the decision makers made the wrong decision. Secondly, they just do the evaluation and did not put forward advantages and disadvantages of each sample and did not provide direction for sample improvement. Through study, problems can be solved very well by improving the ideal point method to evaluate samples and classification (Chen *et al*., 2004).

DYNAMIC COMPREHENSIVE EVALUATION AND CLASSIFICATION PRINCIPLE INTRODUCTION

Dynamic comprehensive evaluation is generally considered the static evaluation value in the same time point and then time dimension assembled by ideal point method (Table 1).

The proposed decision sample is $N_i\{N_1, N_2, ..., N_m\}$ i = 1, 2, ..., m and p_j $\{P_1, P_2, ..., P_n\}$ j = 1, 2, ..., n as the index composed of each sample. Different time sets of indicator is T_t $\{T_1, T_2, ...T_q\}$ t = 1, 2, ...q and $\lambda^{(t)}$ is the power of T_t For:

$$0 < \lambda^{(t)} < 1, \sum_{t=1}^{q} \lambda^{(t)} = 1$$

The moment T_t, the sample N_i's static comprehensive evaluation value is $X_i^{(t)}$.

Firstly, the static evaluation value matrix of different time different sample can be expressed as:

Table 1: Dynamic comprehensive evaluation and classification

Classification standard sequence		Distance and classification
Ideal point sequence	$Z^{+(t)} = (Z^{+(1)}, Z^{+(2)}, ..., Z^{+(t)}, ...Z^{+(q)})$	Ideal point sequence distance First type
Sdvanced average sequence	$\xi^{+(t)} = (\xi^{+(1)}, \xi^{+(2)}, ..., \xi^{+(q)})$	Advanced average sequence distance Sec type
Average value sequence	$O = (o^{(1)}, o^{(2)}, ..., o^{(t)}, ..., o^{(q)})$	Average value sequence distance Third type
Lagging average sequence	$\xi^{-(t)} = (\xi^{-(1)}, \xi^{-(2)}, ..., \xi^{-(t)}, ...\xi^{-(q)})$	Negative ideal point distance Fourth type
Negative ideal point sequence	$Z^{-(t)} = (Z^{-(1)}, Z^{-(2)}, ..., Z^{-(t)}, ...Z^{-(q)})$	Lagging average sequence distance

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$$A=\begin{bmatrix} & N_1 & N_2 & \dots & N_m \\ T_1 & X_1^{(1)} & X_2^{(1)} & \dots & X_m^{(1)} \\ T_2 & X_1^{(2)} & X_2^{(2)} & \dots & X_m^{(2)} \\ \dots & \dots & \dots & \dots & \dots \\ T_q & X_1^{(q)} & X_2^{(q)} & \dots & X_m^{(q)} \end{bmatrix}$$

In this study, the static evaluation value is obtained by using principal component analysis. This method is so common that it is no need to describe.

Secondly, before time dimension assembled, we need to fix static value by the following method. The change value of N_i 's static evaluation from $T_{(i-1)}$ to T_i is calculate by a formula. Set B is the growth matrix of A, B = $(Y_i^{(t)}$ and

$$Y_i^{(t)}=\begin{cases} 0, i=1,2,\dots,m; t=1 \\ X_i^{(t)}-X_i^{(t-1)}, i=1,2,\dots,m; t=2,3,\dots,q \end{cases}$$

Because T_i is the base period, all samples change value is zero, so $Y_i^{(1)}$. The matrix C is calculated by the static evaluation value matrix A multiplied by a weight plus change value matrix B multiplied by its corresponding weight:

$$C=(Z_i^{(t)})_{q\times m} Z_i^{(t)}=\alpha * X_i^{(t)}+\beta * Y_i^{(t)}$$

$$,\alpha+\beta=1, 0<\alpha,\beta<1\alpha,\beta$$

will be decided through full considering important degree of this two aspects of evaluation objects.

Thirdly, applying ideal point method to calculate matrix C.

The ideal point sequence and the negative ideal point sequence are in the following:

$$\overset{+(t)}{Z}=(\overset{+(1)}{Z},\overset{+(2)}{Z},\dots\overset{+(t)}{Z},\dots,\overset{+(q)}{Z})$$

$$\overset{-(t)}{Z}=(\overset{-(1)}{Z},\overset{-(2)}{Z},\dots,\overset{-(t)}{Z},\dots\overset{-(q)}{Z})$$

At the same time, adding positive static value in each time and then divided by the number of its corresponding positive value as advanced average point $\xi^{+(t)}$, the advanced average sequence is:

$$\overset{+(t)}{\xi}=(\overset{+(1)}{\xi},\overset{+(2)}{\xi},\dots\overset{+(t)}{\xi},\dots,\overset{+(q)}{\xi})$$

Similarly adding negative static value in each time and then divided by the number of its corresponding negative value as lagging average point $\xi^{-(t)}$, the lagging average sequence is:

$$\overset{-(t)}{\xi}=(\overset{-(1)}{\xi},\overset{-(2)}{\xi},\dots\overset{-(t)}{\xi},\dots,\overset{-(q)}{\xi})$$

and set O = (0, 0,, ...0, .., 0) as the average value sequence.

According to the ideal point method, the formula of sample point Ni to the ideal sequence and to the negative ideal sequence are respectively in the following:

$$\overset{+}{d}_i=[\sum_{t=1}^{q}\lambda^{(t)}(C_i^{(t)}-\overset{+(t)}{C})]^{1/2}$$

$$\overset{-}{d}_i=[\sum_{t=1}^{q}\lambda^{(t)}(C_i^{(t)}-\overset{-(t)}{C})]^{1/2}$$

The S_i value is a relatively close to degree of evaluation objects with ideal solution for:

$$S_i=\overset{-}{d}_i/(\overset{-}{d}_i+\overset{+}{d}_i), i=1,2,\dots,m$$

S_i as the final dynamic comprehensive evaluation value of evaluation objects N_i.

At the same time, the ideal sequence, the advanced average value sequence, the average value sequence, the lagging average sequence and the negative ideal sequence respectively calculate the distance to the ideal sequence and to the negative ideal sequence. So all samples are divided into 4 classes.

CASE ANALYSIS

Establishment of the index system: Due to the risk of banking is highly concentrated, so, the establish of bank index system should take profitability, growth ability, financial capability and safety. According to the importance, sensitivity, general, typical and operability of the comprehensive evaluation index, we selected the following 12 indicators and established bank evaluation index system, the specific content is in the following Table 2 (Chi *et al*., 2009; Wang and Cheng, 2010; Tan *et al*., 2010).

Selection of the sample: At present, domestic listed Banks mainly have three types, including state-owned commercial banks, the national small and medium-sized joint-stock commercial banks and city commercial banks, the total number is 16, the specific content is in the following Table 3.

The case used sample, shown in Table 4 dates from 2010-2012, from HeXun.com and the sample financial statements.

Principal component analysis is a method of comprehensive evaluation that is made by sample relative position to find out advantages and disadvantages of the sample and the condition of the gap and reasons. If the

Table 2: Establishment of the index system

Level indicators	Secondary indicators	Level indicators	Secondary indicators
Profitability	Rate of return on equity (X1)	Financial capability	Liability-asset ratio (X7)
	Operating Profit Margin (X2)		Rights coefficient (X8)
	Earnings per share(X3)	Operational capabilities	Net cash flows from operating activities (X9)
Growth Ability	Growth rate of main operating (X4)		Earnings quality business activities (X10)
	Expansion rate of net assets (X5)		Capital adequacy ratio (X11)
	Expansion rate of earnings per share (X6)		Non-performing loan ratio (X12)

Table 3: Banks in 2010-2012, the annual static evaluation score and ranking

In 2010			In 2011			In 2012		
Banks	Total score	Ranks	Banks	Total score	Ranks	Banks	Total score	Ranks
Bank of china	-0.1284	9	Bank of china	0.3292	5	Bank of china	-1.3826	16
ABC	-0.9448	14	ABC	-0.2130	8	ABC	-1.2012	13
ICBC	-0.0706	8	ICBC	0.5459	4	ICBC	-0.8981	11
China construction bank	0.01174	7	China construction bank	1.1205	3	China construction bank	-1.2076	14
Bank of communications	-0.3189	10	Bank of communications	0.2299	6	Bank of communications	-1.0208	12
China CITIC bank	-0.4371	11	China CITIC bank	-0.2372	9	China CITIC bank	-1.3227	15
SPD Bank	0.5878	4	SPD bank	-0.4830	12	SPD bank	0.3396	7
China everbright bank	-0.6242	13	China bverbright bank	-0.2414	10	China everbright bank	0.6481	4
Bank of ningbo	1.5797	2	Bank of ningbo	2.2261	1	Bank of ningbo	0.5790	5
Bank of beijing	0.4175	5	Bank of beijing	-0.9324	14	Bank of beijing	0.3209	8
Bank of nanjing	1.4700	3	Bank of nanjing	1.7967	2	Bank of nanjing	-0.6977	10
Ping An bank	0.2769	6	Ping An bank	-0.1904	7	Ping an bank	1.7682	2
China minsheng bank	-0.4791	12	China minsheng bank	-0.2628	11	China minsheng bank	0.1973	9
Industrial bank	1.7223	1	Industrial bank	-0.7194	13	Industrial bank	2.5235	1
Hua xia bank	-1.5572	16	Hua xia bank	-1.7003	16	Hua xia bank	0.5705	6
China merchants bank	-1.5057	15	China merchants bank	-1.2685	15	China merchants bank	0.7836	3

Table 4: Sample bank list

State-owned commercial banks:
ICBC, china construction bank, bank of china, ABC, bank of communications.
National small and medium-sized joint-stock commercial banks: china merchants bank, Hua xia bank, china cITIC bank, china everbright bank, china minsheng bank, SPD bank, Industrial bank, ping an bank
City commercial banks: bank of nanjing, bank of ningbo, bank of beijing

direction of index system is not positive, it is not an effective conclusion. As a result, the analysis will have to account for the strength index in the index system of reverse index and appropriate indicators for positive change.

The intensity of reverse index positive Eq.:

$$\begin{cases} 1/X_j, X_{ij} > 0 \\ 1/(\max_i |X_{ij}| + X_j + 1), X_{ij} \le 0 \end{cases}$$

X_j as the appropriate indicator, its reverse Eq.:

$$1/(|X_j - E| + 1)$$

E as the ideal value.

Data processing: Data were handled by the IBM SPSS Statistics 19. Factor extraction method selected standard is characteristic value ≥ by principal component method. The sample variance in each year of the cumulative rate respectively reached 86.448, 86.448 and 86.448%, all meet requirements. The annual sample banks static total score and ranking, respectively as follows: Set $\alpha = 0.5, \beta = 0.5, \lambda^{(2010)} = \lambda^{(2011)} = \lambda^{(2012)} = 1/3$, the results of the ideal point method dynamic comprehensive evaluation and classifications from 2010-2012 are follows.

CONCLUSION

From the Table 5 dynamic comprehensive evaluation ranking results and classifications, we can draw following conclusions. Firstly, as a whole, all samples are not blow the lagging average value but they are below the advanced average value completely, so there are still a lot of room to improve. Sec, in addition to China CITIC Bank, state-owned commercial Banks' performance is generally lower than other types of Banks, they are below the average value. By analyzing standardized date and the corresponding weights we learned that China CITIC Bank's many large weight dates are negative and far below average which are worth to improve. The detail result is in the above Table 5.

Table 5: Dynamic comprehensive evaluation ranking results and classifications

Samples and classifications	Si	Rank
Ideal point sequence	1	
Advanced average sequence	0.681	
Ping an bank	0.646	1
Industrial bank	0.620	2
China merchants bank	0.534	3
China everbright bank	0.524	4
Bank of ningbo	0.514	5
Hua xia bank	0.503	6
China minsheng bank	0.459	7
SPD bank	0.455	8
Bank of beijing	0.450	9
Average value sequence	0.428	
Bank of nanjing	0.404	10
China construction bank	0.372	11
ICBC	0.358	12
Bank of communications	0.336	13
ABC	0.313	14
Bank of china	0.312	15
China CITIC bank	0.282	16
Lagging average sequence	0.192	
Negative ideal point sequence	-1	

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