International Journal of Investment Management and Financial Innovations
2017; 3(6): 51-57
http://www.aascit.org/journal/ijimfi
ISSN: 2381-1196 (Print); ISSN: 2381-120X (Online)

American Association for Science and Technology

Keywords
Gray Relational Model,
Comprehensive Financial Capacity,
Evaluation

Received: September 19, 2017
Accepted: November 8, 2017
Published: December 6, 2017

Evaluation of the Company's Comprehensive Financial Capacity Based on the Gray Relational Model: Take Electricity, Heat and Supply Industry as an Example

Zhibin Liu*, Xiaoning Li

Department of Economics and Management, North China Electric Power University, Baoding, China

Email address

liuzhibin771112@126.com (Zhibin Liu)

*Corresponding author

Citation

Zhibin Liu, Xiaoning Li. Evaluation of the Company's Comprehensive Financial Capacity Based on the Gray Relational Model: Take Electricity, Heat and Supply Industry as an Example. *International Journal of Investment Management and Financial Innovations.* Vol. 3, No. 6, 2017, pp. 51-57.

Abstract

The strength of the comprehensive financial capacity of enterprises has been more and more taken seriously in the community, and the investors' attention on the financial capacity of enterprises has gradually exceeded the financial performance. This paper chose 20 typical enterprises from electricity, heat and supply industry as the evaluation object, and selected 8 financial indicators to construct the evaluation index system of the company's comprehensive financial capacity, and combined with a standard of the industry index, the gray relational model was employed to evaluate the 20 enterprises. The evaluation results showed that the correlation of Neimenghuadian, Huitianredian, Huadiannengyuan and Huadian Bgu was of the higher degree, and their ranking were also more forward; while the correlation of Jidiangufen, Xinnengtaishan, Gansudiantou and Qianyuandianli was of lower degree, and ranked at the end, indicating that the higher relevance of the object to be evaluated with the evaluation criteria, the stronger the company's comprehensive financial capacity.

1. Introduction

The comprehensive financial capacity of an enterprise is a collection of strength that can respond freely to multiple external changes and violent external competition, and also can win over other opponents. It highlights that the strength of the enterprise's competitiveness is not only the foundation for business growth, but also the sources for the enterprises to have a competitive advantage. The company's comprehensive financial capacity is the embodiment of the core competence of the enterprise in the financial field. After the evaluation of its comprehensive financial capacity, it can help the enterprise enhance the comprehensive strength and maintain the competitive advantage, thus helping the enterprises to achieve the all-round development. This article has the following significance to evaluate the company's comprehensive financial capacity: (1) arouse the public to attach great importance to the financial capacity of the company; (2) help to guide the financial behaviors of enterprises; (3) help enterprises judge their own financial level and be committed to improving the company's comprehensive financial capacity; (4) help the government management

functions to improve the relevant system.

Evaluation refers to a comprehensive assessment in the case of multi-factor interaction, while the comprehensive evaluation refers to the evaluation of all the objects, and give an evaluation value to each evaluation object through a certain method according to the given conditions, and then to merit or sort, whose purpose is to sort out the evaluation object by a certain meaning, so as to pick out the best or the worst one or several. At present, the method of evaluating the comprehensive financial capacity of the company mainly includes analytic hierarchy process (AHP) [1-7], principal component analysis [8-11], factor analysis [12-15] and fuzzy evaluation method [16-21], and a small number of scholars use the entropy method [22-24] and data envelopment analysis (DEA) method [25-27] to evaluate it. However, these methods have some limitations. These evaluation methods are mainly to judge based on the independent evaluation of individual indicators, then use statistical methods to sum up, and the determination of its evaluation criteria exist a large subjectivity and uncertainty, which will affect the scientific of the comprehensive evaluation results, so some scholars have used the gray relational model [28-31] to evaluate this study.

The gray system theory holds that due to the complexity of objective things themselves, people's perception of objective things exist a wide range of grayness, thus there is an inaccuracy of the description of the object being evaluated. The purpose of the gray relational model is to use a certain method to reveal the relationship among the various indicators, so that the relationship can be changed from the "gray" to "white". In this paper, the sample data were processed and finally evaluated according to the method and principle of gray relational model, and a few better object of the evaluation were selected.

2. Method

The gray system is an intermediary system between the white and black whose information is not entirely clear, and the system does not have strict requirements for the sample size and any distribution. In the process of system development, if the trend of the two factors is consistent, that is, a higher degree of synchronous changes, a higher degree of correlation; on the contrary, the lower. Therefore, the gray relational analysis method is a multi-factor statistical analysis method, which measures the degree of correlation among the factors according to the similarity or dissimilarity of the trend between factors, that is, "gray correlation degree". For a factor between the two systems, the measure of the size of the correlation that changes with time or different objects is called the degree of relation, which reflects the order of the evaluation object relative to the ideal (standard) object, that is the evaluation order of the object, among which the evaluation object with the largest gray correlation degree is the best.

The main basis of gray comprehensive evaluation model: R=E*W. Among them:

E is the evaluation matrix of each index, that is, the correlation coefficient matrix,

$$\mathrm{E}=\begin{bmatrix}\varepsilon_{01}(1) & \varepsilon_{01}(2) & \cdots & \varepsilon_{01}(\mathrm{n})\\ \varepsilon_{02}(1) & \varepsilon_{02}(2) & \cdots & \cdots\\ \vdots & \cdots & \varepsilon_{0i}(\mathrm{j}) & \vdots\\ \varepsilon_{0m}(1) & \varepsilon_{0m}(2) & \cdots & \varepsilon_{0m}(\mathrm{n})\end{bmatrix}$$

Where $\varepsilon_i(\mathrm{j})$ is the correlation coefficient between the j[th] index of the i[th] of the program and evaluation criterion, i=1, 2,…, m; j=1, 2,…,n;

W is the weight assignment vector for the n evaluation indicators in this system,

$$\mathrm{W}=[w_1, w_2, w_3, \ldots, w_n]^T$$

And,

$$\sum_{i=1}^{n} w_i = 1;$$

R is the comprehensive evaluation result vector of m evaluation objects,

$$\mathrm{R}=[r_1, r_2, r_3, \ldots, r_n]^T$$

And,

$$R_i = \sum \varepsilon_{ij} w_j$$

The basic steps of the model are as follows:

(1) Assuming that there are m evaluation objects, and each evaluation object has n indicators, then determine the evaluation criteria by combining with the reality, finally build the matrix D in conjunction with the original data:

$$\mathrm{D}=\begin{vmatrix}x_{01} & x_{02} & \ldots & x_{0n}\\ x_{11} & x_{12} & \ldots & x_{1n}\\ \ldots & \ldots & x_{ij} & \ldots\\ x_{m1} & x_{m2} & \ldots & x_{mn}\end{vmatrix}$$

Where x_{0j} is the evaluation criterion of the sample and x_{ij} is the original value of the j[th] evaluation index of the i[th] evaluated object.

(2) Non-dimensionalize the samples. In general, the original variable sequence has a different dimension or magnitude, in order to ensure the reliability of the analysis results, the variable sequence need to be non-dimensionalized:

$$x'_{ij} = x_{ij}/x_{0j}$$

(3) Find the difference sequence, maximum difference and minimum difference. Calculate the absolute difference between the standard sequence and the remaining columns to form the absolute difference matrix:

$$\mathrm{D}=\begin{vmatrix}\Delta_{01}(1) & \Delta_{01}(2) & \ldots & \Delta_{01}(\mathrm{n})\\ \Delta_{02}(1) & \Delta_{02}(2) & \ldots & \Delta_{02}(\mathrm{n})\\ \ldots & \ldots & \Delta_{0i}(\mathrm{j}) & \ldots\\ \Delta_{0m}(1) & \Delta_{0m}(2) & \ldots & \Delta_{0m}(\mathrm{n})\end{vmatrix}$$

Where $\Delta_{0i}(\mathrm{j}) = |x_0(j) - x_i(j)|$, i=1, 2,…, m， j=1, 2,…,n. Where the maximum difference and the minimum difference are the maximum and minimum numbers in the absolute

difference matrix:

$$\max_{1\le i\le m,1\le j\le n}\{\Delta_{0i}(j)\} \triangleq \Delta(\max), \min_{1\le i\le m,1\le j\le n}\{\Delta_{0i}(j)\} \triangleq \Delta(\min)$$

(4) Calculate the correlation coefficient, and make the following transformation of the data in the absolute difference matrix to get the correlation coefficient matrix:

$$\varepsilon_{0i}(j) = \frac{\Delta(\min) + \rho\Delta(\max)}{\Delta_{0i}(j) + \rho\Delta(\max)}$$

Where the resolution coefficient ρ in the formula values in the range of (0, 1). The smaller the resolution coefficient, the more improved for the differences of the correlation coefficient.

(5) Calculate the degree of correlation. The degree of correlation between the comparison sequence and the standard sequence is reflected by the n correlation coefficients, the degree of correlation between the evaluation object and the evaluation criteria can be calculated according to the correlation coefficient and the proportion of their respective;

$$r_{0i} = \frac{1}{n}\sum_{j=1}^{n}\varepsilon_{0i}(j)w_j$$

(6) Sort the objects according to the correlation degree. The correlation degree between the comparison sequence and the standard sequence is sorted from small to large. The higher the correlation degree, the more consistent trend between the comparison sequence and the standard sequence.

3. Results and Discussions

This paper selected the 2016 annual data of 20 typical enterprises in the electricity, heat and supply industries from the Wind database, and evaluated the comprehensive financial capacity of the enterprises by analyzing the correlation degree of financial indicators. Taking into account the selected indicators should reflect the comprehensive financial capacity of enterprises and available, the financial indicators selected in this paper are as follows: (1) Quick ratio; (2) Interest coverage ratio; (3) Inventory turnover ratio; (4) Accounts receivable turnover; (5) Total asset turnover; (6) Return on Assets; (7) Profit margin; (8) Return on equity.

The above eight financial ratios reflect the company's solvency, profitability and operational capacity, of which 1, 3 is the moderate ratio, the other six indicators are the forward ratio, the eight financial indicators can be integrated to evaluate the comprehensive capacity of the 20 companies and make an sequence. The steps to process and evaluate the data are as follows:

(1) The original data and evaluation criteria obtained from the database are shown in Table 1.

Table 1. *The Evaluation Criteria and the Original Data of the Evaluation Object.*

Objects	1	2	3	4	5	6	7	8
X_0	38.6	2	14.5	10.2	0.5	3.6	7	4
Gansudiantou	0.6489	0.8526	521.3461	8.5278	0.0985	-0.7085	-7.1949	-2.4708
Jidiangufen	0.4105	0.9326	41.1769	4.1648	0.1664	0.1021	0.6136	0.2263
Xinnengtaishan	0.3617	0.9513	10.5680	4.5442	0.4630	-0.9261	-2.0001	-7.3304
Datangfadian	0.3038	1.0098	13.1685	7.9634	0.2204	0.7486	3.3970	-6.1914
Yinxingnengyuan	1.7271	1.0622	7.2667	3.1551	0.1489	0.1868	1.2548	0.5074
Jinshangufen	0.1584	1.2207	27.5164	11.9941	0.3232	0.4962	1.5352	0.5913
Huadiannengyuan	0.1893	1.3407	21.1141	7.7376	0.3454	0.6891	1.9950	4.5059
HuadianBgu	0.1893	1.3407	21.1141	7.7376	0.3454	0.6891	1.9950	4.5059
Zhangzedianli	0.6220	1.3716	10.4982	4.9840	0.2102	0.3504	1.6675	1.1727
Huayindianli	0.4737	1.4381	5.8486	3.7153	0.3276	0.9124	2.7855	4.6442
Qianyuandianli	0.5987	1.4405	758.9336	20.8713	0.1074	1.3419	12.4935	6.0606
Binhainengyuan	0.5937	1.4574	18.1512	3.1174	0.5370	0.3450	0.6423	1.1916
Kaidishengtai	1.0294	1.4696	0.8606	2.7993	0.1340	0.8927	6.6632	3.4666
Mindongdianli	0.3401	1.8495	0.3675	8.9871	0.1772	0.5315	2.9999	1.7379
Tongbaonengyuan	2.1034	1.9007	47.8022	22.1138	0.4688	0.6863	1.4639	2.1967
Guidongdianli	1.0955	2.0081	13.4404	25.2370	0.5148	2.3483	4.5615	7.8414
Tianfunengyuan	0.7822	2.0407	3.8383	16.3029	0.1981	1.6724	8.4424	6.6700
Jienengfengdian	0.9946	2.0492	7.9389	2.4219	0.0792	1.5065	19.0329	2.9906
Neimenghuadian	0.1339	2.1023	21.1820	10.2525	0.2358	1.5286	6.4813	3.2384
Huitianredian	0.4117	2.1396	3.0988	6.0464	0.3992	1.3218	3.3114	3.7765

Data source: Wind database (2016)

(2) Non-dimensionalize the variable sequence and the results are shown in Table 2.

Table 2. *Dimensionless Data.*

Index	1	2	3	4	5	6	7	8
X_0	1	1	1	1	1	1	1	1
X_1	0.016811	0.4263	35.9549	0.836059	0.197	-0.19681	-1.02784	-0.6177
X_2	0.010635	0.4663	2.839786	0.408314	0.3328	0.028361	0.087657	0.056575
X_3	0.00937	0.47565	0.728828	0.44551	0.926	-0.25725	-0.28573	-1.8326
X_4	0.00787	0.5049	0.908172	0.780725	0.4408	0.207944	0.485286	-1.54785
X_5	0.044744	0.5311	0.501152	0.309324	0.2978	0.051889	0.179257	0.12685
X_6	0.004104	0.61035	1.897683	1.175892	0.6464	0.137833	0.219314	0.147825
X_7	0.004904	0.67035	1.456145	0.758588	0.6908	0.191417	0.285	1.126475

Index	1	2	3	4	5	6	7	8
X_8	0.004904	0.67035	1.456145	0.758588	0.6908	0.191417	0.285	1.126475
X_9	0.016114	0.6858	0.724014	0.488627	0.4204	0.097333	0.238214	0.293175
X_{10}	0.012272	0.71905	0.403352	0.364245	0.6552	0.253444	0.397929	1.16105
X_{11}	0.01551	0.72025	52.34025	2.046206	0.2148	0.37275	1.784786	1.51515
X_{12}	0.015381	0.7287	1.251807	0.305627	1.074	0.095833	0.091757	0.2979
X_{13}	0.026668	0.7348	0.059352	0.274441	0.268	0.247972	0.951886	0.86665
X_{14}	0.008811	0.92475	0.025345	0.881088	0.3544	0.147639	0.428557	0.434475
X_{15}	0.054492	0.95035	3.296703	2.16802	0.9376	0.190639	0.209129	0.549175
X_{16}	0.028381	1.00405	0.926924	2.474216	1.0296	0.652306	0.651643	1.96035
X_{17}	0.020264	1.02035	0.26471	1.598324	0.3962	0.464556	1.206057	1.6675
X_{18}	0.025767	1.0246	0.54751	0.237441	0.1584	0.418472	2.718986	0.74765
X_{19}	0.003469	1.05115	1.460828	1.005147	0.4716	0.424611	0.9259	0.8096
X_{20}	0.010666	1.0698	0.21371	0.592784	0.7984	0.367167	0.473057	0.944125

(3) Calculate the difference sequence, as shown in Table 3.

Table 3. *Results of Differential Sequence.*

Index	1	2	3	4	5	6	7	8
Δ_{01}	0.983189	0.5737	34.9549	0.163941	0.803	1.196806	2.027843	1.6177
Δ_{02}	0.989365	0.5337	1.839786	0.591686	0.6672	0.971639	0.912343	0.943425
Δ_{03}	0.99063	0.52435	0.271172	0.55449	0.074	1.25725	1.285729	2.8326
Δ_{04}	0.99213	0.4951	0.091828	0.219275	0.5592	0.792056	0.514714	2.54785
Δ_{05}	0.955256	0.4689	0.498848	0.690676	0.7022	0.948111	0.820743	0.87315
Δ_{06}	0.995896	0.38965	0.897683	0.175892	0.3536	0.862167	0.780686	0.852175
Δ_{07}	0.995096	0.32965	0.456145	0.241412	0.3092	0.808583	0.715	0.126475
Δ_{08}	0.995096	0.32965	0.456145	0.241412	0.3092	0.808583	0.715	0.126475
Δ_{09}	0.983886	0.3142	0.275986	0.511373	0.5796	0.902667	0.761786	0.706825
Δ_{10}	0.987728	0.28095	0.596648	0.635755	0.3448	0.746556	0.602071	0.16105
Δ_{11}	0.98449	0.27975	51.34025	1.046206	0.7852	0.62725	0.784786	0.51515
Δ_{12}	0.984619	0.2713	0.251807	0.694373	0.074	0.904167	0.908243	0.7021
Δ_{13}	0.973332	0.2652	0.940648	0.725559	0.732	0.752028	0.048114	0.13335
Δ_{14}	0.991189	0.07525	0.974655	0.118912	0.6456	0.852361	0.571443	0.565525
Δ_{15}	0.945508	0.04965	2.296703	1.16802	0.0624	0.809361	0.790871	0.450825
Δ_{16}	0.971619	0.00405	0.073076	1.474216	0.0296	0.347694	0.348357	0.96035
Δ_{17}	0.979736	0.02035	0.73529	0.598324	0.6038	0.535444	0.206057	0.6675
Δ_{18}	0.974233	0.0246	0.45249	0.762559	0.8416	0.581528	1.718986	0.25235
Δ_{19}	0.996531	0.05115	0.460828	0.005147	0.5284	0.575389	0.0741	0.1904
Δ_{20}	0.989334	0.0698	0.78629	0.407216	0.2016	0.632833	0.526943	0.055875

From the data in the table above can obtain the largest difference and the minimum difference.

$$\Delta(\max) = 51.34025,\ \Delta(\min) = 0.00405$$

(4) The correlation coefficient can be calculated according to the difference sequence, the maximum difference and the minimum difference. The value of ρ is 0.5, and the results are shown in Table 4:

Table 4. *Results of Correlation Coefficient.*

Index	1	2	3	4	5	6	7	8
ε_{01}	0.963264	0.978294	0.423491	0.993811	0.96982	0.955605	0.926934	0.940866
ε_{02}	0.963041	0.979787	0.93327	0.977624	0.974821	0.963681	0.965831	0.964703
ε_{03}	0.962995	0.980137	0.989703	0.979011	0.997283	0.95346	0.952453	0.900762
ε_{04}	0.962941	0.981233	0.996593	0.991687	0.978835	0.970221	0.980498	0.909852
ε_{05}	0.964274	0.982216	0.981092	0.973953	0.973527	0.964533	0.969171	0.967257
ε_{06}	0.962805	0.985203	0.966364	0.993351	0.986568	0.967658	0.970638	0.968022
ε_{07}	0.962834	0.987477	0.982696	0.99084	0.988254	0.969616	0.973055	0.995254
ε_{08}	0.962834	0.987477	0.982696	0.99084	0.988254	0.969616	0.973055	0.995254
ε_{09}	0.963239	0.988064	0.989519	0.980623	0.978074	0.966183	0.971333	0.973356
ε_{10}	0.9631	0.98933	0.977439	0.975986	0.986902	0.971893	0.977237	0.993922
ε_{11}	0.963217	0.989376	0.333386	0.960992	0.970473	0.976302	0.970488	0.980481
ε_{12}	0.963212	0.989698	0.990442	0.973816	0.997283	0.966128	0.96598	0.973531
ε_{13}	0.96362	0.989931	0.964804	0.972666	0.972428	0.971691	0.998287	0.994989
ε_{14}	0.962975	0.997234	0.963572	0.995546	0.975621	0.968015	0.978378	0.978599
ε_{15}	0.964628	0.998227	0.918022	0.95663	0.997732	0.969587	0.970265	0.982896
ε_{16}	0.963682	1	0.997319	0.945839	0.999006	0.986792	0.986767	0.96409
ε_{17}	0.963389	0.999366	0.972307	0.977377	0.977173	0.979722	0.992193	0.97481
ε_{18}	0.963588	0.9992	0.982833	0.971304	0.968408	0.978002	0.937386	0.990421
ε_{19}	0.962782	0.998169	0.98252	0.999957	0.979986	0.978231	0.997279	0.992794
ε_{20}	0.963042	0.997446	0.970433	0.98454	0.992364	0.976095	0.98004	0.997986

(5) When calculating the correlation degree, taking into account the eight financial indicators had an important role on the evaluation of the company's comprehensive capacity, so this article gave the same weight to the eight indicators, and gave different values of ρ, then got the degree of correlation and finally sorted the companies. The results are shown in Table 5:

Table 5. *Results of the Rank.*

Objects	Name	$\rho = 0.5$		$\rho = 0.4$		$\rho = 0.1$	
		correlation degree	Rank	correlation degree	Rank	correlation degree	Rank
X_1	Gansudiantou	0.894011	19	0.879386	20	0.749196	20
X_2	Jidiangufen	0.965345	17	0.957111	17	0.850275	18
X_3	Xinnengtaishan	0.964475	18	0.956232	18	0.854572	17
X_4	Datangfadian	0.971482	15	0.964801	15	0.880306	14
X_5	Yinxingnengyuan	0.972003	14	0.965261	14	0.874804	15
X_6	Jinshangufen	0.975076	12	0.969075	12	0.888509	12
X_7	Huadiannengyuan	0.981253	3	0.976712	3	0.914677	4
X_8	HuadianBgu	0.981253	4	0.976712	4	0.914677	5
X_9	Zhangzedianli	0.976299	11	0.970574	11	0.893044	11
X_{10}	Huayindianli	0.979476	7	0.974504	7	0.906615	7
X_{11}	Qianyuandianli	0.893089	20	0.881462	19	0.781083	19
X_{12}	Binhainengyuan	0.977511	9	0.972094	9	0.899263	9
X_{13}	Kaidishengtai	0.978552	8	0.973385	8	0.903924	8
X_{14}	Mindongdianli	0.977493	10	0.972071	10	0.899219	10
X_{15}	Tongbaonengyuan	0.969748	16	0.962647	16	0.872949	16
X_{16}	Guidongdianli	0.980437	5	0.975775	5	0.914805	3
X_{17}	Tianfunengyuan	0.979542	6	0.974593	6	0.907319	6
X_{18}	Jienengfengdian	0.973893	13	0.967674	13	0.886342	13
X_{19}	Neimenghuadian	0.986465	1	0.983183	1	0.938256	1
X_{20}	Huitianredian	0.982743	2	0.978566	2	0.921645	2

As can be seen from the calculated degree of correlation and ranking order, when $\rho = 0.5$, the comprehensive capacity of the top ten companies ranked as followed:

Neimenghuadian > Huitianhuadian > Huadiannengyuan > HuadianBgu > Guidongdianli > Tianfunengyuan > Huayindianli > Kaidishengtai > Binhainengyuan > Mindongdianli

The geometric meaning of the degree of correlation is the similarity and consistency between the comparison sequence and the standard sequence curve. If the curvilinear shape of the two is close, the correlation degree of the two is larger; on the contrary, the correlation degree is smaller. According to the principle of gray relational model, the Neimenghuadian and evaluation criteria are the most close, which is the company with best comprehensive financial capacity, followed by is Huitianredian, and the third company is different because of the different values of ρ. The sorting results are basically the same when $\rho = 0.5$ or $\rho = 0.4$, but the last two companies ranked in reverse order, while when $\rho = 0.1$, the sorting results are quite different. This can have a more intuitive understanding of the role of the resolution coefficient, a smaller value of ρ can improve the distinguishing ability of the evaluation result (that is, the degree of correlation), which is a significant feature of the gray relational model.

As can be seen from the further analysis of the correlation coefficient table, the higher comprehensive capacity of Neimenghuadian is due to its financial indicators, such as interest coverage ratio, accounts receivable turnover, profit margin and return on equity, have a higher consistent with industry standards. While the Jienengfengdian has a higher correlation coefficient with the industry standard in the aspects of interest coverage ratio and return on equity, but the correlation coefficient of other indicators are at a low level, thus the correlation is low, and the comprehensive financial capacity is poor.

4. Conclusions

The traditional evaluation method is usually to analyze the individual indicators of the evaluation to make a final determination of the optimal, while because of the subjective selection of indicators and the impact of many external factors, the evaluation results will produce a lot of error. This paper employed the gray relational model to evaluate the company, and selected eight financial indicators of the evaluation object to compare with the evaluation criteria. The comprehensive financial capacity of the company was ordered by calculating the degree of correlation between the evaluation object and the evaluation criteria, and the evaluation result is more reliable. Moreover, the gray relational model is universal, and the number of objects to be evaluated is unrestricted. Before its application, it is necessary to carry out the corresponding qualitative analysis to confirm that the research problem meets the requirements of the gray relational model. Otherwise, the reliability of the research conclusion may be questionable.

As can be seen from the calculation results, the correlation of Neimenghuadian, Huitianredian, Huadiannengyuan and HuadianBgu was of the higher degree, and their ranking were also more forward, because most of the eight financial indicators of these companies were very close to industry standards; while the correlation of Jidiangufen, Xinnengtaishan, Gansudiantou and Qianyuandianli was of lower degree, and ranked at the end, whose indicators were more different from the industry standards. The above indicates that the higher relevance of the object to be evaluated with the evaluation criteria, the stronger the company's comprehensive financial capacity.

Through the results of correlation coefficient (Table 4), we can see that the higher the correlation coefficient, especially

the correlation coefficient whose proportion is large, the more advanced of the company's comprehensive financial capacity. This provides the direction for the development of other enterprises, that is, continuously improve the gap between themselves and the industry standards, including solvency, profitability and operational capacity. Only in this way can they comprehensively improve their own strength, and achieve farther and stable development.

Acknowledgements

The work is supported by the Fundamental Research Funds for the Central Universities under Grant No. 2017MS199.

References

[1] Khalid Hafeez; Yan Bing Zhanga and Naila Malakb (2002), Determining key capabilities of a firm using analytic hierarchy process, *International Journal of Production Economics*, 76 (1), 39-51.

[2] Xiaojun Deng (2010). Corporate governance and enterprise financial core competence evaluation model construction, *Market Modernization*, (15), 123-125.

[3] Hong Wang, Tao Zhao (2010), Research on comprehensive evaluation of Chinese finance companies based on BSC, *China Market*, (19), 112-113.

[4] Weiyang Yu (2014), Research on comprehensive evaluation and application of corporate financial risk, *Friends of Accounting*, (25), 2-8.

[5] Gang Zhao, Qun Zhang (2002), Comprehensive evaluation method and application of iron and steel enterprise competitiveness, *Iron and Steel*, (11), 74-76.

[6] Yong Han, Fei Lv, Shengdao Gan, Junxiong Kong (2017), Research on the hierarchical management performance evaluation of intrinsic value based on analytic hierarchy process-take the China's steel industry listed companies as an example, *Review of Economic Research*, (25), 93-106.

[7] Yue Wang, Xijing Chen, Yi Zhang (2016), Establishment and comprehensive evaluation of the evaluation index system of financial capacity of northeast pharmaceutical company, *Management and Administration*, (3), 131-134.

[8] Baocheng He, Hongtao Jiang (2012), The comprehensive evaluation on financial performance of the ceramic company based on principal component analysis，*Key Engineering Materials*, 512-515, 1098-1102.

[9] Xianguo Wu, Xiaoyan Pu (2011), Evaluation of financial capability of real estate enterprises based on principal component analysis, *Friends of Accounting*, (20), 64-66.

[10] Donglian Zhao, Chenghuan Liu (2013), Evaluation of financial capacity of listed companies based on principal component analysis：an evaluation on pharmaceutical manufacturing, *Communication of Finance and Accounting*, (2), 20-22.

[11] Rui Liu, Mengjing Zhao (2008), Research on the overall financial evaluation of listed companies based on comprehensive financial index, *Friends of Accounting*, (11), 93-95.

[12] Zanchun Xie (2011), Comprehensive evaluation on the financial condition of listed companies on the Growth Enterprise Market based on factor analysis, *Accounting Research*,(2), 58-60+70.

[13] Guangqi Ma, Ying Xue (2012), Evaluation of comprehensive financial capacity of listed commercial banks, *Accounting Monthly*, (32), 21-23.

[14] Ling Liu, Dingxiang Mao (1997), Application of factor analysis method in comprehensive financial analysis and evaluation of listed companies, *Systems Engineering*, (6), 11-16.

[15] Jing Chen (2016), Research on comprehensive capacity evaluation of gold industry listed companies, *Gold*, (1), 1-4.

[16] Qiao Ling Wu, Dong Xiao Niu, Chun Xiang Liu, Lei Lei Fan (2013), The fuzzy comprehensive evaluation and research of the executive ability in power supply company，*Applied Mechanics and Materials*, 401-403, 2310-2314.

[17] Tong Yu Jia (2014), Research on fuzzy evaluation in the enterprise competitiveness, *Applied Mechanics and Materials*, 556 - 562, 6536-6539.

[18] Ying Lu, Bingmei Zhao (2007), Application of fuzzy comprehensive evaluation method in comprehensive competitiveness evaluation of enterprises, *Journal of Liaoning Technical University*, (4), 611-613.

[19] Li Xiang (2013), Risk evaluation and control of enterprise logistics outsourcing: based on AHP-fuzzy comprehensive evaluation method, *Enterprise Economy*, (4), 72-75.

[20] Xiaohong Cai (2013), Application of fuzzy evaluation method in evaluating enterprise's comprehensive capacity, *Journal of Changchun Institute of Technology (Social Sciences Edition)*, (4), 46-48.

[21] Yuchen Guo (2017), Research on enterprise financial risk early-warning management based on fuzzy evaluation method-take Great Wall Motor Co., Ltd. as an example, *Hebei Normal University, Master Thesis.*

[22] Suhui Dong, Suyun Li (2014), Research on financial competitiveness of domestic airlines based on entropy method, *Market Forum*, (6), 61-64.

[23] Hao Chen (2017), Analysis of the comprehensive economic competitiveness of cities in Hebei province based on entropy method, *Modern Business Trade Industry*, (23), 10-11.

[24] Jiayu Zhang (2017), Operating performance evaluation of "internet plus agriculture" listed companies based on entropy method - take the DBN companies as an example, *Shenyang Agricultural University, Master Thesis.*

[25] Qiang Yin, Yi Wang (2013). Comprehensive evaluation of financial performance of listed companies: an empirical study based on DEA method, *Market Forum*, (12), 46-48.

[26] Xiaoying Peng, Qinghua Zhang (2016), Evaluation of enterprise comprehensive financial capacity based on factor analysis and DEA - take the coal listed companies as an example, *Coal Economic Research*, (9), 80-84.

[27] Jingqin Sun, Yanping Cui, Yanan Sun, Wenjun Jiang (2017), Evaluation of environmental protection investment efficiency of coal enterprises based on DEA – take the SH company as an example, *Journal of Shandong Institute of Business and Technology*, (5), 41-47.

[28] Lijuan Li (2013). Financial risk assessment of textile listed companies based on gray relation and fuzzy comprehensive evaluation method, *China Township Enterprise Accounting*, (6), 111-113.

[29] Mei Feng, Yaorong Cheng, Wenzhuan Zhou (2008), Comprehensive evaluation of logistics enterprises based on gray hierarchy model, *Logistics Technology*,(7), 60-62.

[30] Wei Wei (2011), Comprehensive evaluation model of internal control based on gray hierarchy analysis: evaluation on listed companies, *Management and technology of Small and Medium - sized Enterprises*, (2), 27-29.

[31] Hongbo Xu (2017), Financial performance evaluation of state-owned listed companies - based on TOPSIS- gray relational model, *China Journal of Commerce*, (27), 98-100.