Performance Empirical Analysis on China Non-ferrous Metal Listed Companies

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Abstract

Performance empirical analysis on China's listed companies is a question of common concern. This paper uses 13 companies' data of non-ferrous metal industry in 2011 and apply the factor analysis method to evaluate the companies' performance, and through extracting four main factors to evaluate the level of the management in listed companies. The result will provide basic proposal for enterprises' investment and management decision.

Keywords: factor analysis; non-ferrous metal industry; listed companies; performance evaluation

1. Introduction

In 2009, the State Council of the People's Republic of China issued the "national top ten industries revitalization plan", which had incorporated non-ferrous metal industry into the plan. Non-ferrous metal products have many species and wide application field, and they are in consanguineous correlation. In the process of developing economy and society, the non-ferrous metal products have played an important role. Propelling the adjustment and revitalization of non-ferrous metal industry must promote the industrial structure adjusted and optimized which has regarded the measures, such as controlling total amount, eliminating the backward, innovating technology and restructuring enterprises, as the key point.

The listed companies have played a decisive role in non-ferrous metal industry. And only to advance the reform of listed companies can we revitalize the non-ferrous metal industry. What's more, correctly evaluating the performance of the listed companies can provide them with reform views and make a value judgment of listed companies' management, operation ability and potential, and also can analyze their advantages and disadvantages.

This paper is by means of factor analysis to evaluate the performance of China's listed companies in non-ferrous metal industry.

2. The Basic Theory Of Factor Analysis

Factor analysis is through researching the internal dependency relationship of the matrix which contains multiple index , finding out the common factor which controls all of the variables, and calculating each index into a linear combination to reproduce the relevant relationship between the original variables and the factors. Factor analysis is using the original index of the

correlative matrix to establish the information into a factor model. The model will transfer the multiple index into a small amount of irrelevant comprehensive index(called "factor"). The small amounts of comprehensive index will restructure several original index from different aspects and the comprehensive index has covered most of the information(about 85%) about the original index.

We can define that there are "n" samples and "p" index and looking for "m" public factors. The model is as follows:

$$
\begin{cases}
X_1 = a_{11}F_1 + a_{12}F_2 + \ldots\ldots + a_{1m}Fm + \varepsilon_1 \\
X_2 = a_{21}F_1 + a_{22}F_2 + \ldots\ldots + a_{2m}Fm + \varepsilon_2 \\
\ldots \\
\ldots \\
\ldots \\
X_p = a_{p1}F_1 + a_{p2}F_2 + \ldots\ldots + a_{pm}Fm + \varepsilon_p
\end{cases}
$$

Where, $X=(X_1,X_2,\ldots\ldots,X_p)$' is the original index. $F=(F_1,F_2,\ldots\ldots, F_m)$' is the public factor of X. is the special factor.

In the factor analysis, we define each public factor as the variable linear combination, and then use the observed value of variable to estimate the value of each public factor, which is called score of factor. Comparing the score of factor of each sample can take a further analysis about the factors. Moreover, the comprehensive factor weight of factor analysis model is determined by the size of variance contribution rate of each comprehensive factor. And the greater the variance is, the more important the variables are. This method can avoid people determining the weight randomly, thus it can make the result of comprehensive evaluation relatively accurate and more objective and reasonable.[1]

3. Empirical Analysis Of Performance Evaluation On Listed Companies In Non-Ferrous Metal Industry

3.1. Index Selection

In order to comprehensively reflect the comprehensive performance evaluation of the sample companies, selecting index must take various kinds of index, such as profitability, debt level and debt paying ability, asset management ability and growth ability, into consideration. The chosen index must have meaning, measurability, controllability and practicability. Integrating all sorts of documents, this paper selects the following index: main business income X_1; earnings per share X_2; net asset per share X_3; total assets X_4; net profit X_5; return on assets X_6; total return on assets X_7; net profit growth rate X_8; main business income growth X_9; total assets turnover X_{10}; net profit margin X_{11}. There are 11 kinds of evaluation index in total.

3.2. Sample Selection

This paper regards the Year 2011 as the assessment of annual of performance evaluation on listed companies in non-ferrous metal industry, and takes 13 listed companies in non-ferrous metal industry as samples. According to their annual financial reports in 2011, we can get the original data(Table 1).

3.3. Factor Analysis Process

With the aid of software spss16.0, at first, we standardize the original data, and establish the matrix R of variable correlation coefficient. And then, we work out the eigenvalue and the contribution rate of R through the factor model (here p=11, n=13)(Table 2).

Table 1 The Original Data Of 13 Listed Companies In Non-Ferrous Metal Industry (In 2011)

	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}
Western Mining	82.22	0.80	4.25	157.86	17.26	57.20	18.32	12.15	5.93	69.62	19.82
Chalco	648.27	0.82	4.88	943.38	102.25	17.65	16.88	-9.74	17.51	89.34	13.42
Minmetals Development	764.91	1.29	5.17	332.54	10.63	24.87	5.71	100.32	11.20	310.57	1.25
Color Shares	27.72	0.87	2.85	79.33	5.04	30.39	15.85	51.63	96.06	96.89	9.27
Zhongjin Gold	53.85	0.92	3.68	37.75	2.57	24.88	26.87	73.41	108.16	485.41	2.29
Zhongjin Lingnan	65.33	1.65	4.90	79.34	12.05	33.63	18.72	6.17	26.40	109.13	14.59
Yunnan Copper	314.00	0.73	5.25	290.00	9.22	13.96	4.67	-23.48	9.73	156.96	2.68
Zhuzhou Smelter Group	93.14	0.16	4.90	0.63	0.79	3.07	8.62	-81.35	47.58	840.40	0.58
Aluminium Shares	26.21	1.05	4.02	33.67	3.80	26.06	12.02	673.22	7.91	85.42	13.44
Jiaozuo Wanfang	40.79	1.42	3.44	34.30	6.84	41.45	31.88	147.96	27.12	159.67	13.19
Huludao Zinc Industry	69.97	-0.26	2.58	86.95	-2.88	-10.06	-4.46	-219.49	34.16	114.88	-3.06
Jiangxi Copper	250.71	1.40	6.00	300.55	41.33	22.78	20.18	-10.34	65.16	169.69	9.98
Tongling Non-ferrous Metals	296.86	0.80	3.98	197.51	8.37	16.24	10.07	43.26	24.77	245.63	2.26

Note: The unit of each index is as follows: X_1(100 million yuan); X_2(yuan); X_3(yuan); X_4(100 million yuan); X_5(100 million yuan); X_6(%); X_7(%); X_8(%); X_9(%); X_{10}(%); X_{11}(%).
Data source: Securities Star Web Station www.stockstar.com,and some data has been sorted.

Table 2 The Eigenvalue And The Contribution Rate Of R

Initial Factor	Contribution Rate of Each Initial Factor			Main Factor Selected	
	Eigenvalue	Contribution Rate(%)	Cumulative Contribution Rate(%)	Contribution Rate(%)	Cumulative Contribution Rate(%)
1	3.423	31.118	31.118	31.118	31.118
2	2.919	26.533	57.650	26.533	57.650
3	1.559	14.174	71.824	14.174	71.824
4	1.346	12.233	84.057	12.233	84.057
5	0.643	5.844	89.901		
6	0.519	4.716	94.617		
7	0.358	3.259	97.875		
8	0.173	1.574	99.449		
9	0.052	.471	99.921		
10	0.008	.069	99.990		
11	0.001	.010	100.000		

According to Table 2, matrix of variable correlation coefficient has four big characteristic roots. They are 3.360, 3.025, 1.432, 1.159, and their cumulative contribution rate has reached 84.057%.

It shows that the first four main factors provide enough information expressed by the 11 original data. Thus, we select the first four main factors. The factor loading matrix after the four main factors rotating is listed below(Table 3).

Table 3 The Factor Loading Matrix After Variance Rotating To The Maximum

Index	Index F_1	Index F_2	Index F_3	Index F_4
Main Business Income X_1	-0.156	0.766	-0.299	0.355
Earnings Per Share X_2	0.859	0.109	-0.115	0.254
Net Asset Per Share X_3	0.212	0.485	-0.230	0.707
Total Assets X_4	-0.024	0.978	-0.102	-0.034
Net Profit X_5	0.184	0.937	0.059	-0.087
Return on Assets X_6	0.892	-0.061	-0.068	-0.139
Total Return on Assets X_7	0.845	-0.008	0.453	0.013
Net Profit Growth Rate X_8	0.508	-0.320	-0.478	0.028
Main Business Income Growth X_9	0.013	-0.225	0.883	0.048
Total Assets Turnover X_{10}	-0.329	-0.256	0.384	0.712
Net Profit Margin X_{11}	0.840	0.172	-0.157	-0.342

According to Table 3, the first main factor F_1 has more load on X_2, X_6, X_7, X_8 and X_{11}, and these several index basically reflect a company's operating efficiency. So this factor can be called the efficiency factor. The second main factor F_2 has more load on X_1, X_4 and X_5, and these index reflect a company's overall size. So this factor can be called the scale factor. The third main factor F_3 has more load on X_9, and this index reflects a company's growing potential. So this factor can be called the growth factor. The fourth main factor F_4 has more load on X_3 and X_{10}, and these a few index reflect a company's

capital turnover capacity. So this factor can be called the turnover factor.

Using each listed company's actual data of the original index and with the help of software spss16.0, we can calculate the scores of each listed company's four main factors, and respectively record them as Z_1, Z_2, Z_3 and Z_4. Moreover, we can calculate each listed company's total score Z through linear weighted sum which regards the contribution rate of main factors as the weight(Table 4). The formula of the total score Z is listed below:

$$Z=（31.118*Z1+26.533*Z2+14.174*Z3+12.233*Z4）/84.057$$

Table 4 The Score And Comprehensive Score Of Each Main Factor

Company	Z_1(Efficiency)		Z_2(Scale)		Z_3(Growth)		Z_4(Turnover)		Z(Comprehension)	
	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank
Chalco	0.02	8	2.83	1	0.19	6	-0.64	10	0.84	1
Jiangxi Copper	0.66	5	0.80	2	0.68	4	0.83	3	0.73	2
Zhongjin Gold	0.29	6	-0.67	11	1.94	1	0.57	4	0.30	3
Zhongjin Lingnan	0.97	2	-0.20	7	-0.20	8	0.13	6	0.28	4
Jiaozuo Wanfang	1.25	1	-0.61	10	0.25	5	-0.45	9	0.25	5
Western Mining	0.94	3	-0.05	5	-0.46	10	-1.00	11	0.11	6
Minmetals Development	-0.28	9	0.48	3	-1.18	12	1.50	2	0.07	7
Color Shares	0.18	7	-0.49	9	1.16	2	-1.20	12	-0.07	8
Yunnan Copper	-0.70	11	0.24	4	-0.89	11	0.41	5	-0.27	9
Tongling Non-ferrous Metals	-0.54	10	-0.10	6	-0.34	9	0.09	7	-0.27	10
Zhuzhou Smelter Group	-1.15	12	-0.69	12	0.69	3	1.67	1	-0.28	11
Aluminium Shares	0.68	4	-1.14	13	-1.83	13	-0.29	8	-0.46	12
Huludao Zinc Industry	-2.33	13	-0.40	8	0.00	7	-1.62	13	-1.23	13

3.4. Comprehensive Evaluation of Listed Companies' Performance in Non-ferrous Metal Industry

Looking from Table 4, the performance of listed companies in non-ferrous metal industry is influenced by various factors and we can use four factors to summarize them,which are efficiency factor, scale factor, growth factor and turnover factor. And different factor has different function.[3] [5] Taking a perspective from the overall business performance, Chalco has got the highest score and the following are Jiangxi Copper and Zhongjin Gold, and Huludao Zinc Industry is in the end.

Looking from the score of each factor, the highest score of efficiency factor is Jiaozuo Wanfang and the following are Zhongjin Lingnan and Western Mining,

and the lowest is Huludao Zinc Industry. Chalco has only ranked 8th. It shows that profitability and the overall operating efficiency of Jiaozuo Wanfang, Zhongjin Lingnan and Western Mining is higher, but the management efficiency of Huludao Zinc Industry is poorer. However, the score of Chalco's operational efficiency is relatively low, whose comprehensive ranking is the first. It maybe has a certain relationship with its huge overall scale.

The highest score of scale factor is Chalco and the lowest is Aluminium Shares. It shows that Chalco has the largest scale and the most small scale is Aluminium Shares. The scale factor has a big influence on listed companies in non-ferrous metal industry. The companies which have respectively got the first and the second place in the score of scale

factor, such as Chalco and Jiangxi Copper, have also respectively ranked first and second in comprehensive score. And the companies which have respectively got the 12th and the 13th place in the score of scale factor, such as Zhuzhou Smelter Group and Aluminium Shares, have also respectively ranked 11th and 12th in comprehensive score. This kind of phenomenon is in consistence with the policy of merger and reorganization in non-ferrous metal industry, which is encouraged by our government.

The highest score of growth factor is Zhongjin Gold and the following are Color Shares and Zhuzhou Smelter Group, and the lowest is Aluminium Shares. Because of the highest score of growth factor, Zhongjin Gold has ranked third in comprehensive score. It shows that the company has promising growth potential and development. However, the low-ranking companies, such as Aluminium Shares and Minmetals Development, have poor growth potential.

The highest score of turnover factor is Zhuzhou Smelter Group and the following are Minmetals Development and Jiangxi Copper. It shows that these three companies have strong capital turnover ability and fast capital operation efficiency. However, the lowest score owner is Huludao Zinc Industry. It shows that the company's capital operation efficiency is poorer than others.

4. Conclusion

According to the analysis, the performance of listed companies in non-ferrous metal is affected by multiple factors. Among them, the important factors are efficiency, scale, growth potential and turnover of funds. Therefore, in order to improve the performance of listed companies in non-ferrous metal industry, we should take efforts to encourage the merger and reorganization of enterprises, improve technology reforming, developing, and progressing, use two kinds of resources in domestic or international, and develop the ability of capital turnover.

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