Study on Financial Risk Warning of a Company Based on Efficacy Coefficient Method

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Abstract: This paper takes a hydropower company A as an empirical study, where we extract 10 financial indicators through correlation analysis and construct a financial risk warning system based on efficacy coefficient method. This paper conducts a detail study on the financial risk of company which based on the financial data of company A in 2017, and puts the data into the financial risk warning level table to analysis the financial risk of company A. Finally, we analyze and throw out some relevant suggestions based on the warning results.

1. Introduction

Financial risk warning, refers to the method of detecting, diagnosing and alarming the financial risks existing in the production and operation activities of enterprises.The enterprise financial risk warning system can timely discover the risk factors that existing in the enterprise operation and management activities, and remind the managers of the factors that may cause the financial crisis in advance, so that the managers can take measures to avoid the financial crisis in time.

2. Establishment of the financial risk warning system of company A based on the efficiency coefficient method

2.1 Profile of Company A

Company A is a limited company which was established by the former State Economic and Trade Commission after the approval of the State Council, with the approval of the paper of State Economic and Trade Enterprise Reform [2002] No. 700. The main business includes electricity production, operation and investment; power production technical consultation; hydropower project maintenance and repairment.

2.2 Specific steps for the construction of financial risk warning system based on efficiency coefficient method

2.2.1 Design and adjustment of evaluation criteria and formulas for warning indicators

Considering that the traditional efficiency coefficient method has certain limitations in the setting level of satisfactory value and impermissible value, the study is based on the financial risk warning research and combined with the operational situation of the research object company A. It also adjusts the formula of the efficacy coefficient method which refers to the paper “The implementation rules for the comprehensive performance evaluation of central enterprises”, issued by SASAC in 2006, where offers a set of five-level evaluation criteria (excellent 1.0, good 0.8, average 0.6, lower 0.4, worse 0.2). The related adjustments are shown as follows:

Enterprise comprehensive scoring value=Σ Single indicator scoring value (Formula 1)

Single indicator scoring value=basic scoring value of the corresponding level + adjustment value (Formula 2)

Basic scoring value of one level higher=index weight × standard coefficient of one level higher (Formula 3)

Basic scoring value of the corresponding level=index weight× standard coefficient of the corresponding level (Formula 4)

Adjustment value=efficacy coefficient × (basic scoring value of one level higher - basic scoring value of the corresponding level) (Formula 5)

Efficacy coefficient= (actual value of single indicator - standard value of the corresponding level)/ (standard value of one level higher - standard value of the corresponding level) (Formula 6)

2.2.2 Selection of financial risk assessment indicators

We eliminate the highly correlated evaluation indicators by the way of the correlation analysis in econometrics and select some more effective evaluation indicators. In order to describe the correlation between variables accurately, Pearson's simple correlation coefficient was used in conjunction with SPSS Statistics software for analysis. On the basis of using complete available data as much as possible in the selection of data samples, 16 quarterly reports of company A from 2014 to 2017 were selected as samples for correlation analysis.

Pearson's simple correlation coefficient: sample correlation coefficient r, total correlation coefficient p and its formula are as follows:

$$\rho = \frac{\mathrm{E}[X-E(X)][Y-E(Y)]}{\sqrt{\mathrm{D}(X)}\sqrt{D(Y)}} \quad (1)$$

$$\mathrm{r} = \frac{\sum_{i=1}^{n}(x_i-\bar{x})(y_i-\bar{y})}{\sqrt{\sum_{i=1}^{n}(x_i-\bar{x})^2}\sqrt{\sum_{i=1}^{n}(y_i-\bar{y})^2}} \quad (2)$$

(1) Selection of solvency indicators

Table.1. Correlation analysis of solvency indicators

		Current ratio	Quick ratio	Cash flow ratio	Interest multiplier	Debt Asset ratio	Property ratio
Current ratio	Pearson correlation	1	.998**	.869**	.595*	-.790**	-.783**
	Sig. (two-tailed)		.000	.000	.015	.000	.000
	Number of cases	16	16	16	16	16	16
Quick ratio	Pearson correlation	.998**	1	.873**	.602*	-.777**	-.773**
	Sig.(two-tailed)	.000		.000	.014	.000	.000
	Number of cases	16	16	16	16	16	16
Cash flow ratio	Pearson correlation	.869**	.873**	1	.386	-.706**	-.700**
	Sig.(two-tailed)	.000	.000		.140	.002	.003
	Number of cases	16	16	16	16	16	16
Interest multiplier	Pearson correlation	.595*	.602*	.386	1	-.391	-.461
	Sig.(two-tailed)	.015	.014	.140		.134	.073
	Number of cases	16	16	16	16	16	16
Debt Asset ratio	Pearson correlation	-.790**	-.777**	-.706**	-.391	1	.956**
	Sig.(two-tailed)	.000	.000	.002	.134		.000
	Number of cases	16	16	16	16	16	16
Property ratio	Pearson correlation	-.783**	-.773**	-.700**	-.461	.956**	1
	Sig.(two-tailed)	.000	.000	.003	.073	.000	
	Number of cases	16	16	16	16	16	16
**. At the 0.01 level (two-tailed), the correlation is significant.							
*. At the 0.05 level (two-tailed), the correlation is significant.							

Through the correlation analysis, it can be clearly seen that the correlation between the first three indicators are highly correlated. considering the quick ratio against the inventory with poor liquidity and the unrealizable deferred expenses as the basis of the reimburse current liability, and it's information response wider than the cash ratio, select The quick ratio indicator; the correlation between the property ratio and the asset-liability ratio of 0.956, considering that the asset-liability ratio is more focused on the ability of the company's overall assets to pay debts, the equity ratio only

basis on the stockholders' equity is less representative of the company's overall situation than the asset-liability ratio; Number of times interest earned is less relevant to other indicators. Therefore, after comprehensive consideration, quick ratio, number of times interest earned, and the asset-liability ratio are selected for further analysis and research.

(2) Index selection of operation capacity

Table.2. correlation analysis of operational capability indicators

		Accounts receivable turnover rate	Inventory turnover rate	Total asset turnover rate	Current assets turnover rate	Cash flow ratio
Accounts receivable turnover rate	Pearson correlation	1	.828**	.928**	.975**	.835**
	Sig.(two-tailed)					
	Number of Cases	16	16	16	16	16
Inventory turnover rate	Pearson correlation	.828**	1	.801**	.874**	.556*
	Sig.(two-tailed)	.000		.000	.000	.025
	Number of Cases	16	16	16	16	16
Total asset turnover rate	Pearson correlation	.928**	.801**	1	.975**	.852**
	Sig.(two-tailed)	.000	.000		.000	.000
	Number of Cases	16	16	16	16	16
Current assets turnover rate	Pearson correlation	.975**	.874**	.975**	1	.811**
	Sig.(two-tailed)	.000	.000	.000		.000
	Number of Cases	16	16	16	16	16
Cash flow ratio	Pearson correlation	.835**	.556*	.852**	.811**	1
	Sig.(two-tailed)	.000	.025	.000	.000	
	Number of Cases	16	16	16	16	16
**. At the 0.01 level (two-tailed), the correlation is significant.						
*. At the 0.05 level (two-tailed), the correlation is significant.						

In the operational capability indicators, accounts receivable turnover reflects the cash recovery rate and management efficiency of the enterprise. The inventory turnover rate mainly reflects the sales level of the enterprise. In the table, the correlation between the total asset turnover rate and the current asset turnover rate reaches to 0.975, and the account receivable turnover rate reaches to 0.928. Both are strong, so this article excludes the total asset turnover rate indicator. Finally, this paper selects the accounts receivable turnover rate, inventory turnover rate and cash flow ratio.

(3) Profitability Indicator selection

Table.3. Correlation analysis of profitability indicators

		ROTA	Operating profit margin	Sales margin	ROE
ROTA	Pearson correlation Sig.(two-tailed)	1	.673**	.556*	.945**
			.004	.025	.000
	Number of Cases	16	16	16	16
Operating profit margin	Pearson correlation Sig.(two-tailed)	.673**	1	.959**	.630**
		.004		.000	.009
	Number of Cases	16	16	16	16
Sales margin	Pearson correlation Sig.(two-tailed)	.556*	.959**	1	.490
		.025	.000		.054
	Number of Cases	16	16	16	16
ROE	Pearson correlation Sig.(two-tailed)	.945**	.630**	.490	1
		.000	.009	.054	
	Number of Cases	16	16	16	16
**. At the 0.01 level (two-tailed), the correlation is significant.					
*. At the 0.05 level (two-tailed), the correlation is significant.					

As shown in the above table, the correlation between the return on equity and the return on total assets reached to 0.945, and the correlation between sales profit margin and net profit margin is 0.959. Considering that the return on equity is more popular among investors, it is measuring the

profitability of the company's own assets. Compared with return on total assets, return in equity is more persuasive, so return on total assets is excluded. The sales profit margin is more affected by the income tax than that of net profit margin. Finally, this paper selects the return on equity and the sales profit margin for profitability research.

(4) Development capability indicator selection

Table.4. Correlation analysis of development capability indicators

		Operating growth rate	Net profit growth rate	Net asset growth rate	Total asset growth rate
Operating growth rate	Pearson correlation Sig.(two-tailed)	1	.322 .223	.953** .000	.965** .000
	Number of Cases	16	16	16	16
Net profit growth rate	Pearson correlation Sig.(two-tailed)	.322 .223	1	.378 .149	.283 .288
	Number of Cases	16	16	16	16
Net asset growth rate	Pearson correlation Sig.(two-tailed)	.953** .000	.378 .149	1	.984** .000
	Number of Cases	16	16	16	16
Total asset growth rate	Pearson correlation Sig.(two-tailed)	.965** .000	.283 .288	.984** .000	1
	Number of Cases	16	16	16	16

**. At the 0.01 level (two-tailed), the correlation is significant.

As shown in the above table, the correlation between the growth rate of net assets and the growth rate of main business income is 0.953, while the correlation between the growth rate of net assets and total asset growth rate is 0.984. After the comparative analysis of financial data availability and industry financial data, this paper finally selected the total asset growth rate and business growth rate as the financial indicators to measure the operating capability of companies. Because the comparability and the authority of availiability that between net profit growth rate and net assets growth rate is lower than the previous two indicators.

Finally, the study selected 10 financial indicators to conduct the analysis after the two-step financial indicator selection. The indicators are quick ratio, interest multiplier, cash flow ratio, debt assets ratio, inventory turnover, accounts receivable turnover, return on net assets, sales profit margin, total assets growth rate and operating growth rate.

2.2.3 Determine the evaluation index of Index weight

Based on the importance principle, determine the weights of each financial indicator, refer to the "Detailed Implementation Rules for Central Enterprise Comprehensive Performance Evaluation" issued by the State-owned Assets Supervision and Administration Commission [2006] No. 157, and use the most important basis for the evaluation of the indicator weight table in the "Rules". The ranking method of each indicator sets up the following table:

Table.5. Index weight

comment content	weight	Specific evaluation index	**weight**
Profitability status	34	Roe Return on sales	20 14
Asset quality status	22	Accounts receivable turnover Inventory turnover	12 10
Debt risk situation	22	Quick ratio Cash flow ratio Number of times interest earned Debt asset ratio	5 5 5 7
Operating growth	22	Total asset turnover Operating growth rate	12 10

2.3 Determination of financial risk assessment indicator standards

The 2018 version of the "Enterprise Performance Evaluation Standard Value" is prepared by the State-owned Assets Supervision and Administration Commission of the State Council based on the operating status of state-owned enterprises in 2017. In this table, there are industry standard values for some important financial indicators of the power production industry, and each indicator is divided into excellent value, good value, average value, lower value and difference value. In this paper, the design weights of each indicator are 1.0, 0.8, 0.6, 0.4, and 0.2 respectively. The standard values of specific indicators for large enterprises in some power production industries are as follows:

Table.6. Electricity production industry evaluation index data

Project	excellent value	good value	average value	lower value	difference value
1, Profitability status					
Roe (%)	12.4	9.4	6.6	1.3	-6.9
Return On Total Assets (%)	10.1	7.8	4.5	0.9	-0.1
Sales (business) profit margin (%)	18.3	14.9	12.0	6.8	-2.0
Surplus cash protection multiple	6.6	4.4	1.7	0.4	-0.5
Cost and profit margin (%)	13.8	8.4	6.1	0.4	-8.9
Return on capital (%)	12.8	10.2	7.3	0.6	-5.2
2, The quality of assets					
Total asset turnover rate (times)	0.5	0.4	0.3	0.2	0.1
Accounts receivable turnover rate (times)	13.1	10.0	7.4	4.7	2.5
Non-performing asset ratio (%)	0.3	1.2	2.1	4.4	8.7
Current assets turnover rate (times)	3.3	1.9	1.3	0.6	0.5
Cash recovery rate of assets (times)	10.4	7.7	5.0	2.6	-1.5
3, The debt risk situation					
Debt Asset ratio (%)	49.5	54.5	59.5	69.5	84.5
Interest multiplier	5.4	3.7	2.2	0.5	-1.3
Quick ratio (%)	93.0	66.9	44.8	25.4	15.9
Cash current debt ratio (%)	42.2	29.2	16.2	8.7	-4.0
Interest-bearing debt ratio (%)	45.3	58.1	71.8	85.8	91.2
Contingent debt ratio (%)	0.1	0.8	5.4	12.1	22.9
4, Operating growth					
Sales (business) growth rate (%)	20.3	11.9	2.9	-6.5	-18.9
Capital preservation and appreciation rate (%)	108.0	104.3	101.3	96.9	90.2
Sales (profit) growth rate (%)	4.8	-2.4	-9.9	-17.5	-27.4
Total asset growth rate (%)	11.2	7.4	3.0	-2.4	-10.0
Technology investment ratio (%)	1.9	1.2	0.9	0.3	0.1
5, Supplementary information					
Inventory turnover rate (times)	19.7	15.7	10.9	5.0	2.0
Two gold accounts for the proportion of current assets (%)	27.0	36.1	41.4	49.8	65.0
Cost expenses as a percentage of total operating income (%)	70.2	87.1	97.6	109.2	117.8
Economic rate of increase (%)	8.2	5.2	2.4	-1.6	-4.5
EBITDA rate (%)	35.1	25.9	16.1	1.6	-11.9
Capital accumulation rate (%)	21.1	13.7	8.5	-1.1	-8.9

2.4 Division of financial risk warning level

The results of enterprise risk warning need to be concluded through the evaluation of specific indexes. Therefore, the division of financial risk level is an important step in the financial risk early warning system. The article uses the 2017 financial data to do the specific research on A company's financial risk. After the final data is obtained, it is substituted into the financial risk warning rating

table to determine the financial risk of Company A. The specific financial risk warning level evaluation table is shown in the following table:

Table.7. Financial risk warning level evaluation form

Comprehensive score	Warning level	Level Information
[0.85,1]	Safe	The financial situation of the enterprise is good, the fund movement is in a good condition, the business operation of the enterprise is running well, and there is basically no possibility of financial crisis in the foreseeable period.
[0.7,0.85]	Light	The financial situation of the enterprise is ordinary, the fund movement is ordinary, the business operations of the enterprise are generally running, and there is a possibility of a small financial crisis in the foreseeable period.
[0.5,0.7]	Medium	The financial situation of the enterprise is poor, the fund movement is inferior, the business operations of the enterprise are operating poorly, and there is a serious financial crisis in the foreseeable period.
[0.3,0.5]	Heavy	The financial situation of the company is very poor, the fund movement is very poor, the business activities of the company are running poorly, and there is a serious financial crisis in the foreseeable period.
[0, 0.3]	Serious	The financial situation of the enterprise is extremely severe, the fund movement is in a dilemma, and the operation of the business activities is restricted. The enterprise will almost have a financial crisis.

2.5 Evaluation results of financial risks of Company A

Based on the 2017 financial data of Company A, the calculation is based on the financial risk early warning system based on the efficacy coefficient method. The specific calculation process is as follows:

Table.8. A company's 2017 financial risk warning single indicator score table

Financial ability	Single indicator	Actual value of individual indicators	Standard coefficient	Index weight	Basic point	Inefficiency factor	Adjustment point	Single score
Profitability indicator	ROE	16.48	1	20	20	0	0	20
	ROS	54.00	1	14	14	0	0	14
Operating capacity indicator	turnover	15.86	1	12	12	0	0	12
	Inventory turnover	55.91	1	10	10	0	0	10
Solvency indicator	Quick ratio	17.06	0.2	5	1	0.1221	0.1221	1.1221
	Cash flow ratio	66.48	1	5	5	0	0	5
	Interest multiplier	5.34	0.8	5	4	0.9647	0.9647	4.9647
	Debt Asset Ratio	54.74	0.8	7	5.6	0.048	0.0672	5.6672
Development ability research	Total asset growth rate	0.17	0.4	12	4.8	0.4759	1.1422	5.9422
	Operating growth rate	2.47	0.4	10	4	0.9543	1.9086	5.9085

According to the data in Table 9, it is found that the score of Company A is 0.8461 in 2017. In addition, it can be concluded that the financial risk warning level of Company A in 2017 is at "low-level warning". Company A has a potential financial crisis in a foreseeable future period. There are also other different risks in the four major capabilities of an enterprise:

The coefficient of profitability index is 1, which shows that the profitability of enterprises is outstanding. The total profit of company A is 26.654 billion yuan in 2017. From 2007 to 2017, the net profit of company A grew from 5.4 billion yuan to 22.274 billion yuan, which showed an increase of more than four times. It also showed that the income level of company A kept growing at a stable level.

The coefficient index of enterprise operation ability is 1. The turnover rate of accounts receivable and inventory reached a high-level of the industry. In 2017, the proportion of accounts receivable in total accounts receivable is 99.87% and the recovery rate of accounts receivable is almost 100%. In

recent years, electricity market have showed an oversupply. Company A showed an outstanding performance in forecasting water and raining conditions. Company A adopts a series of measurements such as scientific optimal dispatch of hub power stations and operation mode, which ensures safe and stable operation of the enterprises.

Table.9. A company's 2017 financial risk early warning evaluation results

Financial ability	Single indicator	Single score	Single index weight	Single index analysis coefficient	Indicator class analysis coefficient	Comprehensive score
Profitability indicator	ROE	20	20	1	1	0.8461
	ROS	14	14	1		
Operating capacity indicator	Accounts receivable turnover	12	12	1	1	
	Inventory turnover	10	10	1		
Solvency indicator	Quick ratio	1.1221	5	0.2444	0.7615	
	Cash flow ratio	5	5	1		
	Interest multiplier	4.9647	5	0.9929		
	Debt Asset Ratio	5.6672	7	0.8096		
Development capability indicator	Total asset growth rate	5.9522	12	0.4952	0.5391	
	Operating growth rate	5.9086	10	0.5909		

The coefficient index of enterprise's solvency is 0.7615, which belongs to the category of light warning. The quick ratio is low, and the current assets of enterprises is low. Enterprises should pay attention to the status of enterprise's capital. Cash flow ratio, earned interest multiples and asset-liability ratio are at an acceptable level. Company A has a high proportion of fixed assets, a high cost of hydroelectric power stations, a long-cycle of construction and a large amount of enterprise funds. The ratio of debt funds to equity funds showed a severe problem, and enterprises should solve the fund problem to ensure a low-level of debt ratio.

The coefficient index of enterprise development ability is 0.5391, which shows that this enterprise belongs to the category of central warning. This indicates that the growth rate of enterprises becomes slow. The profit growth rate and total assets growth rate of the company are lower than the average level of the industry, because the Three Gorges Reservoir and Xiluodu Reservoir in 2017 is 6.6% and 4.8% lower than the average level of the data in other recent years.

3. Conclusions and Suggestions

3.1 Conclusions

Firstly, the financial indicators and data in this paper can be obtained from the published financial reports.the conclusion is objective. Secondly, the calculation formula of efficacy coefficient method is relatively simple. Time occupancy and workload level are also at a low level, and human cost value is low. Relevant enterprises will increase the frequency of using the early warning analysis. Meanwhile, the weights of indicators will change with the development of enterprises and market environment, so that enterprises can pay attention to financial conditions timely and effectively.

The deficiencies of this paper will be showed in the followings. This paper analyzed the financial indicators without considering the non-financial aspects. Moreover, this paper discusses the internal factors of the enterprise, which assumes that the external environmental factors of the enterprise remain unchanged. All of these factors could bring uncertainty to the result of this conclusion.

3.2 Suggestions

The first step is to establish a professional committee of risk early warning system to improve the level of financial risk management of all the relevant enterprises. Company A improves the level of financial risk management by setting up a new risk management committee under the board of

directors. The risk early warning department is alongside the audit committee, so that the financial risk problems can be timely reported to the BOD. In addition, the risk management committee will play an important role in non-financial risk early warning, which will cover the shortages where financial data can not be quantified concretely, and fulfill the responsibility of enterprise risk management.

The second step is to establish a database of financial risk analyzing. Financial risk early warning is a monitoring system in the business activities of enterprises. While this system plays the role of pre-warning. Managers will not ignore the result of the analysis. Every company relies on its own information system to establish a financial risk database. In the establishment of the database, the company should organize employees to conduct the research on the other enterprises in the industry and enrich the database by analyzing relevant typical cases. Meanwhile, it is important to collect and record the warning signs of risks and the detailed process of effective measurements in the course of the company's operation to facilitate the inheritance and accumulation of experience.

The third step is to establish a responsibility center. In the specific implementation, it is important to apply the responsibility cost control system in cost accounting, which refines the responsibility for company A, and formulates specific responsibility plans for each responsibility center in the current period combined with budget department. For those departments that fail to complete the plan timely or their budget exceed that was planned, warnings from "mild early warning" to "severe early warning" should be given according to their specific conditions, and they should be included in the financial risk database. For a large enterprise like Company A, it is not enough to rely solely on the macro financial risk analysis through the overall financial data analysis. Therefore, Company A should combine financial early warning with non-financial early warning and macro early warning with micro-control. The predictability and monitoring of the responsibility center can help company A to improve risk early warning system accurately from the employers to employees and from the outsiders to insiders.

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