Empirical Analysis of Financial Risk Evaluation of Innovative Small and Medium-Sized Listed Companies

Yafeng Li *, **Wei Yang**

School of Economics and Management, Liaoning University of Technology, Jinzhou Liaoning, 121001, China
* Correspondence author: Yafeng Li

Abstract: Innovative small and medium-sized enterprises in high growth are also facing high risks. Based on the characteristics of innovative small and medium-sized enterprises, this paper chooses financial indicators from four aspects: financing risk, investment risk, operational risk and income distribution risk, and constructs financial risk evaluation index system. This paper uses the innovative small and medium-sized listed companies listed on the GEM and small plates in Liaoning Province as the research object, and uses the factor analysis method to extract the principal component of the financial risk evaluation index. The clustering variables are clustered and the financial risk is clustered by extracting the three principal components as clustering variables. Based on the empirical analysis, this paper puts forward the financial risk control proposal of the innovative small and medium- sized listed companies in Liaoning province.

Keywords: innovative small and medium-sized enterprises; financial risk; factor analysis; cluster analysis

1. Introduction

Innovative small and medium-sized enterprises refer to small-scale enterprises with sound innovation mechanism and strong innovation ability. Innovative small and medium-sized enterprises have the characteristics of high conversion rate of innovation achievements, high proportion of intangible assets, large proportion of technology research and development expenses, high returns and high risks. In recent years, innovative small and medium-sized enterprises have developed rapidly, and their proportion in the national economy is increasing, which is an important new economic growth [1]. However, due to the uncertainty of environmental factors, the difficulty of the project and the comprehensive innovation ability of the innovation subject, the innovation activities may not reach the expected economic and technical indicators. Among the various risks faced by innovative small and medium-sized enterprises, financial risk is the most comprehensive. Financial risk is the concentrated expression of enterprise risk monetization, which runs through the operation of enterprise funds [2]. How to effectively control financial risks is an urgent problem for innovative small and medium-sized enterprises. Therefore, this paper takes the innovative small and medium-sized listed companies in Liaoning Province as the research object, carries out financial risk assessment, discusses the effective ways to control financial risks, and provides a useful reference for the sustainable and healthy development of innovative small and medium-sized enterprises.

2. Empirical Analysis of Financial Risk Evaluation of Innovative Small and Medium-Sized Listed Companies

2.1. Sample Selection and Data Sources

According to the definition of innovative small and medium-sized enterprises, there are 10 innovative small and medium-sized listed companies in Liaoning province, such as Yishida and Dalian Electric Porcelain. This paper selects these 10 companies as research samples. The financial data used in this research sample are mainly from the publicly disclosed annual financial reports of 10 innovative Small and medium-sized enterprises in Liaoning Province in 2016.

2.2. Construction of Evaluation Index System

According to the principles of comprehensiveness, operability and relevance [3], combined with the characteristics of innovative small and medium-sized listed companies in Liaoning Province, a large number of relevant literature was read to screen representative indicators. Using SPSS software for discriminant analysis and identification analysis of these indicators, respectively reflect the financial risks of innovative small and medium-sized listed companies in Liaoning province in four aspects. Nine financial indicators from four levels are selected to construct the financial risk evaluation indicator system of innovative small and medium-sized listed companies in Liaoning Province [4]. Among them, financing risk indicators are liquidity ratio X1, quick ratio X2 and asset-liability ratio X3; Operating risk indicators include total asset turnover rate X4 and current asset turnover rate X5. Investment risk indicators include net interest rate of equity (X6), proportion of intangible assets (X7) and proportion of R&D expenses (X8). The

risk index of income distribution is cash dividend payout rate X9, as shown in Table 1.

Table 1. Financial risk evaluation index system of innovative small and medium-sized listed enterprises

Financial risk	index	Variable definitions
financing risk	X1	current ratio
	X2	quick ratio
	X3	Assets and liabilities
operational risk	X4	total asset turnover
	X5	current asset turnover
investment risk	X6	net profit margin on equity
	X7	Proportion of intangible assets
	X8	Proportion of R&D expenses
incomedistribution risk	X9	Cash dividend payout ratio

2.3. Evaluation Model Construction

Due to the correlation of various indicators, factor analysis can extract representative factors from many variables, which can better analyze and reduce variables, and the extracted factors have complete information of the original data, so the factor analysis model is established. The weight is determined according to the proportion of variance contribution rate to total contribution rate obtained by factor analysis. The comprehensive factor score is calculated according to the weight calculation.

Table 2. KMO and Bartlett's test

2.4. Empirical Analysis of Financial Risk Evaluation

2.4.1. Variable test

Carrying out a variable test is a prerequisite for judging the applicability of factor analysis. The Bartlett sphericity test is the main method to test the degree of correlation between variables. If the corresponding associated probability Sig is less than the specified significance level α, the null hypothesis is rejected, that is, there is a strong correlation between the original variables, and the test results obtained by SPSS software are shown in Table 2.

Kaiser-Meyer-Olkin metricfor sampling adequacy.		0.510
Bartlett's sphericity test	approximate chi-square	79.661
	df	36
	Sig.	0.000

According to Table 2, it can be seen that the KMO value of 0.510 is greater than 0.5, which is more suitable for factor analysis. There is a correlation between variables, and factor analysis can be performed on the original data.

2.4.2. Factor extraction

Table 3. Common factor variance

Factor extraction is the second stage of factor analysis. Among all possible factors, the number of factors that meet the requirements is extracted according to the criteria that the extracted value of the common factor variance in the factor analysis is greater than 0.8 and the initial eigenvalue of the extracted factor is greater than 1, and the specific results are shown in Table 3.

	initial	extract
current ratio	1.000	.981
quick ratio	1.000	.981
Assets and liabilities	1.000	.937
total asset turnover	1.000	.829
current asset turnover	1.000	.554
net profit margin on equity	1.000	.565
Proportion of intangible assets	1.000	.895
Proportion of R&D expenses	1.000	.542
Cash dividend payout ratio	1.000	.955

From the results in Table 3, it can be seen that the initial value of the variance of the common factor is 1, and the extracted values of the current ratio, quick ratio, asset-liability ratio, cash dividend payout ratio, etc. are all greater than 0.8, indicating that the large value of the nine indicators. Part of the information is extracted, and

the results show that these variables are all explained by factors, so there is no need to perform factor extraction again.

The first three factors were extracted by principal component analysis, and the cumulative variance contribution rate reached 80%. The three factors

contained most of the information of the nine financial indicators. The specific results are shown in Table 4.

Table 4. Total variance explained

ingredients	initial eigenvalues			Extract sum of squares and load			Rotate Square and Load		
	total	% of variance	Cumulative %	total	% of variance	Cumulative %	total	% of variance	Cumulative %
1	3.693	41.032	41.032	3.693	41.032	41.032	3.425	38.060	38.060
2	2.033	22.594	63.627	2.033	22.594	63.627	1.988	22.086	60.146
3	1.512	16.802	80.428	1.512	16.802	80.428	1.825	20.282	80.428
4	.906	10.072	90.500						
5	.535	5.946	96.446						
6	.266	2.951	99.397						
7	.034	.383	99.780						
8	.020	.218	99.998						
9	.000	.002	100.000						

2.4.3. Factor naming

According to the rotation component matrix, find out the index with larger positive load, name the three extracted components, and the specific results as shown in Table 5.

Table 5. Rotation component matrix

	ingredients		
	1	2	3
current ratio	0.969	0.11	-0.176
quick ratio	0.969	0.117	-0.169
Assets and liabilities	-0.906	0.229	-0.254
total asset turnover	-0.331	-0.513	0.675
Current sset turnover	-0.382	-0.455	0.448
net profit margin on equity	0.166	-0.049	0.731
Proportion of intangible assets	0.597	0.721	0.14
Proportion of R&D expenses	0.079	-0.218	-0.699
Cash dividend payout ratio	-0.289	0.932	0.048

As can be seen from Table 5, the flow ratio and quick ratio of the principal component F1 are 0.969 and 0.969, with a relatively large positive load, so the first principal component is called the financing risk factor; In principal component F2, the cash dividend payout rate is 0.932, with a relatively large positive load, so the second principal component is called the risk factor of income distribution. The net interest rate of equity in principal component F3 is 0.731, which has a relatively large positive load, so the third principal component is called investment risk factor.

2.4.4. Calculating factor scores

(1) Component score covariance matrix

After factor analysis, the related component score covariance matrix is obtained. It can be seen that there is no correlation between the three principal components. The specific results are shown in Table 6.

Table 6. Component score covariance matrix

ingredients	1	2	3
1	1.000	0.000	0.000
2	0.000	1.000	0.000

| 3 | 0.000 | 0.000 | 1.000 |

(2) Factor score

The factor score ranking is calculated according to the corresponding factor score function, and the component score coefficient matrix is obtained by using SPSS software. Since the factor can reflect the correlation of the original variable, it is beneficial to replace the original variable with the factor to study the problem. The specific results are shown in Table 7.

Table 7. Component Score Coefficient Matrix

	ingredients		
	1	2	3
current ratio	.281	-.023	-.046
quick ratio	.281	-.019	-.041
Assets and liabilities	-.305	.158	-.166
total asset turnover	-.036	-.187	.323
current asset turnover	-.066	-.175	.195
net profit margin on equity	.088	.036	.426
Proportion of intangible assets	.141	.363	.182
Proportion of R&D expenses	.006	-.193	-.422
Cash dividend payout ratio	-.148	.527	.108

According to the factor score coefficient matrix in Table 7, the factor score calculation formula can be obtained. The three principal component factors show most of the information of the original variables and are evaluated from different perspectives. However, this is only a single-factor analysis, and an overall comprehensive score needs to be carried out. The next step is specific according to the overall comprehensive score. analyze. When calculating the overall comprehensive score, the weight needs to be calculated firstly, and the weight is calculated according to the variance contribution rate. The comprehensive score ranking is calculated according to the weight, and the calculation results are obtained.

According to the extracted three factor score coefficients, EXCEL is used to carry out the scoring of 10 innovative small and medium-sized listed companies respectively.

According to the score coefficient of the extracted three factors, EXCEL is used to calculate the score of 10 innovative small and medium-sized listed companies and rank them respectively. The comprehensive score ranking is calculated according to the three scores, as shown in Table 8.

Table 8. Factor Score Ranking

	F1	score ranking	F2	score ranking	F3	score ranking	F	score ranking
Eastar	1.0793	5	-0.0788	3	-0.0848	9	0.5106	5
Dalian Electric Porcelain	0.5298	7	-0.1973	4	0.4005	7	0.2991	9
Third Base Shares	18.2178	1	-1.5478	10	-2.4852	10	8.3358	1
Oak Shares	0.3864	8	-0.3277	5	0.6991	4	0.2521	10
Allview Communications	1.5415	3	-1.4136	9	1.2739	2	0.6579	3
Rongke Technology	1.3576	4	-1.3291	8	1.3124	1	0.5958	4
Blue Ying Equipment	0.0971	10	0.9454	1	0.8734	3	0.4976	6
Xintai Electric	0.7592	6	-0.4493	6	0.3542	8	0.3358	8
Del Shares	1.9615	2	-0.547	7	0.4679	6	0.9455	2
Xingqi Eye Drops	0.2515	9	0.6134	2	0.6134	5	0.4288	7

2.5. Empirical Results Analysis

2.5.1. *Evaluation factor analysis*

(1) Fundraising risk analysis

According to the factor scores, among the innovative small and medium-sized listed companies in Liaoning Province, the financing risk factor score of Third Base Co., Ltd. is 18.2178, and the financing risk of the company is small, while the financing risk factor score of Lanying Equipment is 0.0971, indicating that the company has a risk factor score of 0.0971. The financing risk is relatively high. In the financing risk factor, 5

companies have a score of less than 1, namely Dalian Insulators, Aoke, Lanying Equipment, Xintai Electric and Xingqi Eye Medicine, indicating that these companies have certain financing risks. When an enterprise has greater financing risk, the pressure to repay debt is greater, and financing may be required to repay debt, thus increasing the financing risk of the enterprise.

(2) Investment risk analysis

Among the innovative small and medium-sized listed companies in Liaoning Province, the investment risk factor score of Third Base Co., Ltd. is -2.4852, ranking last, indicating that the investment risk of the company is very high, while the investment risk factor score of Rongke Technology is 1.3124, ranking first position, indicating that the investment risk of the enterprise is relatively small. Except for Aowei Communication and Rongke Technology, the scores of other companies are generally less than 1, indicating that most companies have investment risks.

(3) Income distribution risk analysis

According to the factor scores, the income distribution risk factor score of Zhonglanying Equipment, an innovative small and medium-sized listed company in Liaoning Province, is 0.9454, ranking first, the income distribution risk factor score of the third base shares is -1.5478, ranking the last, indicating that the enterprise's income distribution risk is relatively high, and excessive use of cash to pay dividends may lead to the company's cash flow dilemma [5].

2.5.2. Comprehensive score analysis

The third base shares ranked first, with a comprehensive score of 8.3358, indicating that the financial risk of the enterprise is small and the financial situation of the enterprise is relatively good. Secondly, Del shares ranked second with a comprehensive score of

0.9455, and Aowei Communication ranked third with a comprehensive score of 0.6579, indicating that the financial risk of the company is relatively small and the overall operating situation is good. The last ranked Aoke shares has a comprehensive score of 0.2521, which has a larger risk of income distribution, investment risk and financing risk. Factors such as backward R&D technology, unreasonable capital allocation plan, and poor corporate earnings will increase the financial risk of the company [6].

2.5.3. Financial Risk Level Evaluation Based on Cluster Analysis

From the cluster analysis results in Table 9, it can be seen that the third base shares have less financial risk, indicating that the third base shares have a good financial situation, a high level of asset management, strong profitability, and a more reasonable income distribution plan. Companies with general financial risks include Aowei Communication, Rongke Technology, and Dell. These three companies have relatively good solvency and profitability. Financial risks mainly come from risk distribution for income. When making income distribution plans, enterprises should pay attention to the combination of these three companies. Financing needs and cash flow [7]. Companies with higher risks include Esta and Lanying Equipment. These two companies have reasonable income distribution plans. Financial risks mainly come from financing risks and investment risks. The liquidity of corporate assets is insufficient and the ability to obtain profits is weak. Companies with very high financial risks include Xingqi Eye Medicine, Xintai Electric, Dalian Electric Porcelain, and Aoke Co., Ltd., which reflects that the company's financial risk awareness is not strong enough, and there are many problems in the financing, use and distribution of funds. .

Table 9. Cluster analysis results

type	Number of cases	Risk level	company name
1	1	less	Third Base Shares
2	3	general risk	Aowei Communication, Rongke Technology, Del Co., Ltd.
3	2	high risk	Yi Shida, Lan Ying equipment
4	4	very risky	Xingqi Eyedrops, Xintai Electric, Dalian Electric Porcelain, Aoke Co., Ltd.

3. Suggestions on Financial Risk Control of Innovative Small and Medium-sized Listed Companies in Liaoning Province

3.1. Improving Solvency

The weak liquidity of corporate assets will increase the risk of financing, and also affect the operating conditions of the company and reduce the ability of the company to refinance [8]. Therefore, according to the current situation of innovative small and medium-sized listed companies in Liaoning Province, it is necessary to formulate a reasonable financing plan, reasonably arrange the debt maturity structure, and appropriately control the debt scale. At the same time, properly improving asset

liquidity can enhance the solvency of enterprises and reduce financing risks [9].

3.2. Increasing Technological Innovation and Enhance Profitability

Innovative small and medium-sized listed companies should pay attention to new product research and development, increase investment in research and development, improve product quality and competitiveness, so as to expand sales revenue and obtain higher returns [10]. At the same time, it is necessary to strengthen enterprise cost management, reduce operating costs, and save various expenses to expand profits, thereby reducing enterprise investment risks [11].

3.3. Reasonable Determination of Cash Dividend Payout Ratio

According to the income distribution risks of innovative small and medium-sized listed companies in Liaoning Province and the payment method of cash dividends, most companies with high income distribution risks tend to pay dividends by cash dividends, so the cash dividend payment rate should be appropriately reduced. Appropriately adopting methods such as converting to increased share capital can save a lot of cash and reduce the risk of corporate income distribution [12].

Acknowledgements

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