Journal of Applied Sciences

ISSN 1812-5654

science alert

ANSInet
an open access publisher
http://ansinet.com

Journal of Applied Sciences 13 (21): 4769-4772, 2013
ISSN 1812-5654 / DOI: 10.3923/jas.2013.4769.4772

Empirical Study on Financial Risk Warning in Chinese Listed Steel Companies Based on Eva

Hong-Bo Wang, Xiao-Qing Li and Feng-Ru Xi
School of Business Administration University of Science and Technology, Liaoninganshan, China

Abstract: This study selects 30 listed steel companies as the samples in 2011. EVA is used to amend traditional financial indices. Logistic regression analysis is used to construct the model of financial risk warning and it is tested with the sample data for 2010. Finally we advance opinions and measures aimed at financial risk control of listed steel companies.

Key words: Financial risk warning, listed steel company, EVA, logistic regression analysis

INTRODUCTION

Research status of financial risk warning: The foreign began to study financial risk earlier. The studies are more perfect in risk formation mechanism, evaluation system and risk control research. Typical research results are as follows: Fitzpartrick (1932) earliest used of single variable analysis on financial crisis prediction. Ohlson (1980) was the first to apply Logistic model to financial risk warning research.

Relative to the study abroad, domestic research on financial warning in China started relatively late and mainly was the study of financial risk warning model. Wu and Huang (1986) earliest introduced financial risk by the economic problems in China in 1986. Yan and Shang (2009) used Logistic multivariate regression method and joined audit opinion. For Artificial Neural Network model, Qin and Tian (2011) established dynamic financial warning model based on function transform GM (1, 1) and neural network and provided a new method for financial risk warning.

From the top we know, financial risk warning research has made significant achievements by domestic and foreign. They created a complete system of theory and empirical methods. But in many literatures, its research macroscopic is relatively perspective, it has big difference in selection of indicators and subdivision of introductory. Therefore, this study will focus on the iron and steel industry to conduct financial risk warning.

Basic Theory of EVA: EVA (Economic Value Added) is submitted by American Stern Stewart in the 1990s. The senior editor AI. Ahbra of United States ⟨⟨fortune⟩⟩ magazine called it "a real revolution of modern company management". But, in China, due to the limitation of EVA calculation and adjustment method, it limited the study and promotion of EVA. After the issue of new guideline, it affects the calculation and adjustment of EVA, also affects the EVA warning effect. So, EVA is accepted by more and more enterprises and becomes an important indicator of modern enterprise evaluation.

The difference of EVA is to make up for the insufficient of traditional financial indicators what only consider the cost of debt capital but ignore the cost of equity capital. It makes full use of public information provided by companies. So this article introduces EVA to financial risk warning model, puts forward using EVA to fix financial risk warning indicators. The calculation method of EVA is as follows:

$$EVA = NOPAT-WACC\times IC$$

Among them: NOPAT for operating profit after taxes; WACC for weighted average cost of capital; IC for investment capital.

EMPIRICAL STUDY ON FINANCIAL RISK WARNING IN CHINESE LISTED STEEL COMPANIES BASED ON EVA

Study of samples

Selection and processing of the samples: Article is based on the A-share listed steel companies in China. In the process of sample selection, this article selects them according to the following principles:

Corresponding Author: Hong-Bo Wang, School of Business Administration University of Science and Technology, Liaoninganshan, China

- The samples must be the A-share listed companies three years ago
- Financial data of the samples are accurate, complete and efficient
- The samples in the last three years have no big litigations, arbitrations, false financial reports

Finally, we selected 30 sample companies, the composition of samples are shown in Table 1.

Amendment of financial index system with EVA: In this study, we choose debt paying ability, operation ability, profitability and development ability to study steel listed companies' financial risk, a total of 16 traditional financial indexes. In addition EVA is put into the financial warning system. This study uses EVA to modify traditional financial index and constructs the financial index system of steel industry listed companies. As shown in Table 2.

Source of data: The financial indicator data of 30 listed steel companies and EVA are calculated and sorted based on annual reports. Sources of data for this study mainly have: (l) Sina finance and economics (http://finance.sina.com.cn/); (2) 〈〈Securities Market Weekly〉〉, data has strong timeliness and authority.

Table 1: Sample selection

Stock code	Name of company	Stock code	Name of company	Stock code	Name of company
600005	武钢股份	600307	酒钢宏兴	000629	攀钢钒钛
600010	包钢股份	600399	抚顺特钢	000708	大冶特钢
600019	宝钢股份	600507	方大特钢	000709	河北钢铁
600022	山东钢铁	600569	安阳钢铁	000717	韶钢松山
002110	三钢闽光	600581	八一钢铁	000761	本钢板材
600117	西宁特钢	600782	新钢股份	000778	新兴铸管
600126	杭钢股份	600992	贵绳股份	000825	太钢不锈
600165	新日恒力	600808	马钢股份	000898	鞍钢股份
600231	凌钢股份	601003	柳钢股份	000932	华菱钢铁
600282	南钢股份	601005	重庆钢铁	000959	首钢股份

Filtration of financial risk warning indicators

Applicability test of factor analysis: Before factor analysis, we need to see whether the variables are suitable for factor analysis through KMO and Bartlett test. KMO is greater than 0.5 means that can accept the results of factor analysis. Bartlett test's significant probability is less than 0.05 and then it shows that variables are suitable for factor analysis. In Fig. 1, Kaiser-Meyer-Olkin is 0.534, Bartlett test's significant probability is. 000, so the variables are suitable for factor analysis.

Computing eigenvalue: According to the total variance explaining in Fig. 2, five common factors are extracted. The cumulative variance contribution rate of five common factors reaches 76.098%. It illustrates the 5 common factors can fully retain original variable information. It has good representativeness.

Filtering common factor: In this study, variance maximum method is used to do orthogonal rotation for the above five public factors, such as Fig. 3.

According to Fig. 3 the five factors can be named as follows:

- Factor 1 is name as short-term solvency factor
- Factor 2 can be named as operating factor
- Factor 3 is named as EVA factor
- Factor 4 is growth factor
- Factor 5 reflects the long-term debt paying ability, so is named as long-term debt paying factor

Constitution and test of logistic model

Cluster analysis of sample enterprises: This study selects the above five main factors, uses SPSS software to do cluster analysis for China's steel listed companies' financial risk type. They are divided into two kinds, one kind is secure and the other is risk. As shown in Fig. 4.

We can analyze the classification result of Fig. 5. Operating factors, EVA factors, growth factors, long-term solvency factor of the first kind are negative. It is worse than the second, so we will define the first type as the risk, the second type as secure.

Table 2: financial risk warning indicators amended by EVA

Indicator variable type	Indicator variable names
Solvency indicators	X1 flow rate, X2 quick ratio, X3 cash quick liabilities ratio, X4 asset-liability ratio, X5 equity ratio, X6 multiple of interest safeguard
Operating capacity indicators	X7 accounts receivable turnover ratio, X8 inventory turnover, X9 current assets turnover, X10 fixed asset turnover, X11 total asset turnover
Profitability Indicators	X12 main business profit margins, Xl3 EVA/sales, X14 total assets return rate
Development Capacity Indicators	X15 operating income growth rate, X16 total asset growth rate

取样足够度的 Kaiser-Meyer-Olkin 度量。		.534
Bartlett 的球形度检验	近似卡方	348.979
	df	120
	Sig.	.000

Fig. 1: KMO and Bartlett's test

	初始特征值			提取平方和载入			旋转平方和载入		
成份	合计	方差的 %	累积 %	合计	方差的 %	累积 %	合计	方差的 %	累积 %
1	4.458	27.863	27.863	4.458	27.863	27.863	3.588	22.423	22.423
2	2.916	18.225	46.089	2.916	18.225	46.089	2.794	17.464	39.887
3	2.042	12.760	58.849	2.042	12.760	58.849	2.492	15.573	55.460
4	1.682	10.511	69.360	1.682	10.511	69.360	2.102	13.140	68.600
5	1.078	6.739	76.098	1.078	6.739	76.098	1.200	7.498	76.098
6	.968	6.048	82.146						
7	.793	4.958	87.104						
8	.771	4.818	91.923						
9	.449	2.805	94.728						
10	.351	2.191	96.919						
11	.185	1.158	98.076						
12	.116	.726	98.802						
13	.083	.518	99.320						
14	.052	.328	99.648						
15	.044	.274	99.922						
16	.013	.078	100.000						

提取方法：主成份分析。

Fig. 2: Explaining total variance

	成份				
	1	2	3	4	5
流动比率	.952	.064	-.040	-.120	-.064
速动比率	.967	-.003	.009	-.087	.015
现金流动负债比率	.705	-.307	.184	-.005	.224
资产负债率	-.490	-.027	-.268	.714	.277
产权比率	-.456	-.200	-.320	.672	.217
利息保障倍数	-.083	-.094	.215	-.281	-.609
应收账款周转率	-.016	.659	-.076	.083	.123
存货周转率	.007	-.013	.075	-.235	.688
流动资产周转率	-.347	.817	.257	-.178	-.076
固定资产周转率	.741	.539	.185	.160	.007
总资产周转率	.276	.911	.174	.087	-.049
主营业务利润率	.022	-.323	.824	.035	.029
EVA销售收入	.058	.379	.870	.032	.021
总资产报酬率	.184	.379	.752	-.064	-.256
营业收入增长率	.051	.183	.305	.659	.023
总资产增长率	.081	.011	.017	.688	-.293

提取方法：主成分分析法。
旋转法：具有 Kaiser 标准化的正交旋转法。

Fig. 3: Rotating component matrix

Modeling: This study uses Logistic regression model. In company financial difficulty prediction, the model is as follows:

$$p = \exp(\beta_0 + \beta_1\chi_1 + \beta_2\chi_2 + \ldots + \beta_n\chi_n) / \left[1 + \exp(\beta_0 + \beta_1\chi_1 + \beta_2\chi_2 + \ldots + \beta_n\chi_n)\right] \quad (1)$$

案例号	钢铁上市公司	聚类	距离
1	武钢股份	2	1.395
2	包钢股份	1	.853
3	宝钢股份	1	3.362
4	山东钢铁	2	1.221
5	三钢闽光	2	2.816
6	西宁特钢	2	2.809
7	杭钢股份	1	2.540
8	新日恒力	1	1.348
9	凌钢股份	1	.769
10	南钢股份	1	.754
11	酒钢宏兴	1	2.147
12	抚顺特钢	1	1.676
13	方大特钢	2	1.709
14	安阳钢铁	2	3.399
15	八一钢铁	2	1.834
16	新钢股份	1	.714
17	贵绳股份	1	3.074
18	马钢股份	1	.802
19	柳钢股份	2	1.386
20	重庆钢铁	1	2.611
21	攀钢钒钛	2	2.372
22	大冶特钢	1	2.520
23	河北钢铁	1	1.302
24	韶钢松山	2	1.999
25	本钢板材	1	.807
26	新兴铸管	1	1.867
27	太钢不锈	2	.879
28	鞍钢股份	1	2.009
29	华菱钢铁	2	1.924
30	首钢股份	1	3.337

Fig. 4: Cluster members

	聚类	
	1	2
REGR factor score 1 for analysis 1	.41792	-.62688
REGR factor score 2 for analysis 1	-.23092	.34637
REGR factor score 3 for analysis 1	-.17140	.25710
REGR factor score 4 for analysis 1	-.00993	.01489
REGR factor score 5 for analysis 1	-.38462	.57693

Fig. 5: Final clustering centers

Among them: β for constant term, β for estimate parameters, X for financial risk warning variables. P is the occur probability of financial risk.

This study divides sample enterprises into two classes, so 0.5 as the dividing point is reasonable. p>0.5, it shows that the possibility of financial risk is bigger, or secure. Finally, FAC1_1, FAC3_1, FAC5_1 are extracted to construct Logistic model. The result of data processing is such as Fig. 6.

From the corresponding numeric of B column, model is as following:

$$P = \exp(-1.335-9.286FAC1+3.278FAC3+13.408FAC) / [1+\exp(-1.335-9.286FAC1+3.278FAC3+13.408FAC)] \quad (2)$$

		B	S.E.	Wals	df	Sig.	Exp (B)
步骤 1[a]	FAC1_1	-2.297	.967	5.639	1	.018	.101
	常量	-.876	.537	2.654	1	.103	.417
步骤 2[b]	FAC1_1	-7.051	3.964	3.164	1	.075	.001
	FAC5_1	9.168	4.805	3.640	1	.056	9583.964
	常量	-1.460	.984	2.203	1	.138	.232
步骤 3[c]	FAC1_1	-9.286	5.600	2.749	1	.097	.000
	FAC3_1	3.278	2.778	1.392	1	.238	26.510
	FAC5_1	13.408	6.743	3.955	1	.047	665586.974
	常量	-1.335	1.381	.935	1	.334	.263

Fig. 6: Variables of the equation

			已预测		
			是否为财务风险公司		
	已观测		1.00	2.00	百分比校正
步骤 1	是否为财务风险公司	1.00	15	3	83.3
		2.00	5	7	58.3
	总计百分比				73.3
步骤 2	是否为财务风险公司	1.00	16	2	88.9
		2.00	2	10	83.3
	总计百分比				86.7
步骤 3	是否为财务风险公司	1.00	17	1	94.4
		2.00	1	11	91.7
	总计百分比				93.3

Fig. 7: Classification

	是否为财务风险公司		百分比校正
	1.00	2.00	
是否为财务风险公司 1.00	5	1	83.3%
2.00	6	18	75. 0%
总计百分比			79.2%

Fig. 8: Predicted result of test samples

According to Fig. 7, prediction accuracy of model is as high as 93.3% after adding EVA in step 3. It shows that EVA is important in financial warning.

Test results of financial risk warning model: The model is used to test relevant indicators data of samples companies in 2010. As shown in Fig. 8, the total accuracy of test result is 79.2%, its effect is good. So, the model is valid.

CONCLUSION

This study uses EVA to modify financial indicators of 30 listed steel companies and build Logistic regression model. Through the test, model is effective and can provide the listed companies and its stakeholders a better warning signal. But given limitations of financial indicators and disunity of clustering classification standard; they certainly affect the accuracy of model forecast. So we should adjust factors according to change of industry and make the model more accurately predict enterprise financial risk. As a result enterprises realize healthy development.

REFERENCES

Fitzpartrick, P.J., 1932. A comparison of ratios of successful industrial enterprises with those of failed finns. Certified Public. Account., 10: 598-605.

Ohlson, J.A., 1980. Financial ratios and the probabilistic prediction of bankruptcy. J. Accounting Res., 18: 109-131.

Qin, X.L. and G.L. Tian, 2011. Corporate financial warning model based on grey theory and neural network. Stat. Decision, 16: 176-178..

Wu, S.N. and S.Z. Huang, 1986. Analysis indicators and prediction model of enterprise bankruptcy. China's Econ. Problems, 6: 36-37.

Yan, F.H. and H. Shang, 2009. Study of audit opinions in the financial crisis warning. Commercial Age, 13: 94-95.