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Research of Financial Early Warning on Enterprises Listed on the New Third Board Based on KLR Model

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Abstract: ***In the multi-level capital market in our country, enterprises listed on the New Third Board market are the most promising development enterprises and face the broadest financial risk, but the analysis of available literature on their financial crisis warning is scarce. By referencing KLR model which analyzes financial crisis, selecting a sample of enterprises listed on the New Third Board and adopting the method of comparative analysis, this article makes early warning on the enterprise's financial crisis from five aspects: the state of profitability, asset quality, debt risk situation, business growth and supplementary material. The empirical results show that the KLR model can be used in financial early warning analysis on enterprises listed on the New Third Board and it distinguishes enterprises with financial crisis from healthy ones with 100 percent accuracy.***

Keywords: the New Third Board; KLR; Enterprise Financial Crisis; Financial Crisis Warning

1. Introduction

With the development of the world economy, the degree of globalization of trade and the marketization of economy deepening, the operating risks faced by enterprises are increasing day by day. Therefore, the early warning of financial crisis is one of the important contents of modern enterprise financial management and the necessary guarantee for the good operation of enterprises. Early warning of financial crisis can not only help stakeholders to guard against potential financial risks, but also can effectively protect the interests of investors.

China's OTC transactions are developing rapidly.Taking the new third board market as an example, since expanding to the country in 2013, the new third board listed companies had rapid growth in the number. At the end of 2014 , the number of new third board listed companies was 1572. By the end of 2015 , the number of listed companies reached 5129.At the end of 2016 , the new third board listed companies' number reached to 10,163 , far more than the total number of listed companies in Shanghai and Shenzhen Market which are 3052 at the same period. With the rapid development of the new third board market, its potential risks can not be ignored. Compared with the main board market, the new third-board market enterprise assets are small, the financial foundation is weak, and the management level is relatively low, the anti-risk mechanism is not perfect, therefore, the new third board enterprises financial crisis early warning research has important practical significance. However, the existing financial crisis early warning model is mostly for the motherboard market and the GEM market while lack the financial early warning analysis for new third board market. Based on the above considerations, this paper takes the new third board listed companies as the sample, and uses the KLR signal analysis method to study the financial crisis early warning of the new third board enterprises.

2. Literature Review

There are many risks to the operation of the company, and financial risk is one of the major risks faced by the enterprises. Financial risk will lead to business difficulties, so that investors lose confidence in investment, and serious bankruptcy liquidation will also cause huge losses to investors. Because of this, domestic and foreign literature on the financial crisis early warning a lot of research.

From the foreign literature, corporate financial crisis early warning research started earlier, which can be traced back to the thirties of the twentieth century, and the study is also more mature. From the research point of view, there are five main methods of foreign research. First, through several variables to study the financial crisis. For example, Fitzpatrick (1932)[1] made the first study of financial early warning, he selected 19 companies as a sample, a single financial ratio analysis and forecast, got the conclusion that the net profit / shareholder equity and shareholder equity / debt ratio have high judgment ability. Thereafter, Beaver (1966) [2] selected 30 financial atios of 79 normal business and 79 abnormal companies in 1954-1964, the results showed that the protection rate debt (cash flow / total liabilities), assets-liabilities ratio(total liabilities / total assets) and the rate of return on assets (net income / total assets) have a strong ability to predict the financial crisis of the enterprise. Second, through the score model for analysis. In this regard, the American scholar Edward Altman [3] in 1968 for the first time applied multivariate statistical analysis method to the field of financial crisis early warning, and put forward the famous Z-Score Model. Altman chose 33 enterprises which filed for bankruptcy in 1946-1954 and the corresponding 33 normal enterprises, and selected 5 best warning financial ratios by research from 22 selected alternative financial ratios , on this basis, he got the famous Z-Score Model. In 1977 , the Z-Score model was modified by Altman , Haldeman and Narayanan [4] , and

the ZETA model suitable for long-term prediction was constructed. Third, using Logistic regression model for risk warning. Logistic regression model is a model obtained by the public to improve the linear regression analysis method. The model is a linear probability model, and the maximum likelihood estimation method is used to determine the financial condition and risk of the observed object by observing the conditional probability of the observed object. Fourth, using Probit method for analysis. The scholar Ohlson [5] first applied the Probit method to financial early warning in 1980. The solution of the model is divided into three steps. Firstly, the maximum likelihood function of the sample firm is determined. Secondly, the parameters are determined based on the maximum value of the maximum likelihood function. Thirdly, the probability of bankruptcy To solve. Fifth, the artificial neural network model (ANN) was used for analysis. Such as scholars Sharda and Odom [6] applied the artificial neural network model (ANN) to the corporate financial crisis warning for the first time. ANN is based on the characteristics of human brain neural network to abstract and simulate the formation of distributed processing system with a certain degree of self-learning ability, and the distribution of the sample characteristics are not limited.

From the domestic perspective, the study of corporate financial crisis early warning began in the eighties of the twentieth century, and until the mid-late 1990s, corporate financial data based on the establishment of corporate financial crisis early warning model was gradually developed. But in research methods , Basically these researches learn from foreign research methods, in particular, variable analysis, Logistics regression method, Z-Score model and neural network analysis method. For example, based on the combination of Beaver research and Fisher's Linear Decision analysis, Chen Jing (1999)[7] established the early warning univariate model, and selected 27 ST companies and similar size 27 non-ST companies in the same industry in the listed companies in China as samples. The results showed that the liquidity ratio and the asset-liability ratio have high prediction accuracy. Luo Xiaoguang and Liu Feihu (2011) [8] selected Logistics regression method, and selected the capital adequacy, liquidity, credit, profitability, development capacity as a research variable, to build a financial crisis for China's financial crisis early warning model. And Wu Shinong Lu Xianyi (2001) [9] Selected 70 ST companies and a corresponding 70 non-ST companies as samples, respectively Logistics regression model, Fisher Linear Decision Model and multiple linear regression models were analyzed, and the results were compared. The results showed that Logistics'effect of regression analysis model was best.

In comparison, the domestic large documents uses the Z-Score model method, such as Zhou Shouhua (1996)[10] took into account the changes in cash flow situation on the basis of Z-Score model. By selecting the 31 bankrupt companies and 31 non-bankruptcy company as a sample, he constructed the F- score model . On the basis of the Z-Score Model, Yang Shu'e and Xu Weigang (2003)[11] disposed the principal component analysis into the early warning of Enterprise Financial Crisis. By choosing 67 bankrupt companies and the corresponding 67 non-bankrupt companies as a sample, they established the Y- score model. On the basis of the Z-Score Model, Wang Huining and Zhang Zhenwei (2015)[12] eatablished a financial risk prediction mode applied to small and medium enterprises. The results showed that Altman 's Z-Score model can reflect the financial position. There are many researches using neural network analysis in China. Such as Yang Bao'an (2001) [13] introduced the neural network analysis method into the enterprise financial crisis early warning model, constructed the BP neural network early warning model and obtained the enterprise financial forecast accuracy rate as high as 95% , and further promoted the enterprise financial crisis early warning research. Li Fang (2015)[14] used the neural network to build enterprise financial crisis early warning model, and the results showed that net assets per share, asset-liability ratio and net operating cash flow per share these three financial indicators on the corporate financial crisis have a strong ability to predict.

It can be seen from the above literature, although the existing research using a variety of methods for corporate financial early warning, but these methods have their own advantages and disadvantages. In general, the model using single variable early warning is relatively simple and intuitive, but can not effectively reflect the comprehensive financial situation of the enterprise. If multiple univariate variables are used at the same time, there may be contradictory phenomena. The multivariable linear analysis model has comprehensive reflection of the financial situation of enterprises, with high prediction accuracy, but it needs to meet a variety of assumptions, while the sample demand is relatively large, and the calculation is complex. Although the neural network model has good self-learning ability and pattern recognition ability, and it is not necessary to consider the distribution characteristics of the variables and the premise assumptions. However, the model has the problem of difficult structure and low training efficiency. At the same time, the current scholars on the financial crisis early warning research is focused on the motherboard market and the GEM market, and the new third board market financial crisis early warning research are less. Based on the above considerations, this paper intends to use the KLR model which has good forecasting effect in the financial crisis early warning to analyze the financial crisis of the new third board enterprises in China, to provide supplementary for the early warning of financial crisis on enterprises.

Introduction to the KLR Model

The KLR model, also known as the signal analysis model, was created by the IMF 's three experts Kaminsky , Lizondo and Reinhart [15] in 1997 and fu rther refined by Kaminsky [16] in 1999 , which has become

one of the most important early warning theories. The theoretical basis of the KLR model is to study the signal theory of the economic cycle transition. The core idea is to first determine the economic variables that can predict the currency crisis by studying the causes of the currency crisis and then analyze the historical data and find out the economic variables which have significant relations to the monetary crisis, and these variables are regarded as the leading indicators for a currency crisis, and then each of the leading indicators was set a threshold value according to its historical data. At some point in time or time interval, if the threshold value of an indicator is broken, it means that the indicator issued an early warning signal; more warning signals indicate that the country has a greater possibility of currency crisis in the future. The KLR model sets the signal interval for 24 months after the signal is issued.

The key to KLR model's application is the selection of the first index and the determination of the threshold. According to Kaminsky (1997) KLR model, the performance of each of the leading indicators can be summarized as Table 1 .

Table 1: Shows of the first indicators'performance

	The crisis will take place within 24 months	The crisis will not take place within 24 months
Signal	A	B
No signal	C	D

In Table 1 , A represents the number of months that the indicator issues an early warning signal and the crisis occurs within the next 24 months, that is, the number of months the correct signals are issued. B represents the number of months that the indicator issues an early warning signal, but in the following 24 months there is no crisis, that is, the number of months the wrong signals are issued. C represents the number of months that the indicator does not issue a warning signal, but in the subsequent 24 months the crisis takes place, that is, the number of months the signals are not issued falsely. D represents the number of months that the indicator does not issue an early warning signal, and in the subsequent 24 months the crisis does not happen, that is, the number of months that the signals are not issued rightly. A perfect indicator needs to satisfy the condition A , D> 0 and B , C = 0 . There is no such perfect indicator in real life, but this can be used to measure the extent to which the first indicator approaches the perfect condition. (1) A / (A + B) indicates the proportion of the correct signal among all the warning signals issued by the indicator; (2) A / (A) + C) indicates the proportion that the crisis take place and the are warned rightly. (3) B / (B + D) represents the proportion of the noise signal. (4) [B / (B + D)] / [A / (A + C)] is the ratio of the noise signal to the effective signal.

By using KLR model on early warning of corporate financial crisis, on the one hand, people can examine a single indicator's degree on reflecting corporate financial crisis, so that enterprises can take timely risk prevention and control measures. On the other hand, through the establishment of synthetic indicators and analysis, the enterprise can effectively measure the degree of financial crisis they are facing.

3. Early warning Index System and Threshold

For the selection and effect of the financial indicators of enterprises, the literature has done a lot of research. Based on the financial delisting standards, Zhang Meixia (2015)[17] made empirical study on the policy's effect of China's new delisting system implementation. Based on the "enterprise performance evaluation standard value" formulated by the SASAC Statistical Evaluation Bureau of the State Council, this paper takes into account the survival and development of the enterprise and selects the enterprise financial crisis early warning index, and determines the threshold of each index. "Enterprise performance evaluation standard value" is given by the State Council SASAC Statistical Evaluation Bureau after it calculates by using mathematical statistics method on sample enterprise data in different industries, different sizes. It has high authority and objectivity. The indicators include profitability, asset quality, debt risk, operating growth and supplemental materials. Based on this, it is scientific and extensive to construct the enterprise financial crisis early warning index system.

This paper chooses 20 financial indicators as the leading indicators of the model, and constructs the enterprise financial crisis early warning system. The selected indicators cover the five aspects of profitability, asset quality, debt risk, operating growth and supplementary materials. The specific selection of financial indicators is shown in Table 2 .

Table 2: Enterprise financial crisis early warning index system

Target category	*Indicator name*	*Target category*	*Indicator name*
Profitability (X_1)	Return on net assets (%) X_{11}	Debt risk situation (X_3)	Asset - liability ratio (%) X_{31}
	Return on total assets (%) X_{12}		Interest multiplier X_{32}
	Sales (operating) profit margin (%) X_{13}		Quick ratio X_{33}
	Cash earnings coverage ratio the X_{14}		Cash flow liabilities ratio (%) X_{34}
	Cost of profit (%) X_{15}	Operating growth	Sales (sales) growth rate (%) X_{41}

	Capital gains (%) X_{16}	(X_4)	Capital appreciation and appreciation rate (%) X_{42}
Asset quality status (X_2)	Total asset turnover ratio (times) the X_{21}		Sales (sales) profit growth rate (%) X_{43}
	Accounts receivable turnover (times) X_{22}		Total assets growth rate (%) X_{44}
	Current asset turnover (times) X_{23}	Supplementary material (X_5)	Inventory turnover (times) X_{51}
	Cash Recovery of Assets (%) X_{24}		Capital accumulation rate (%) X_{52}

According to the relevant theory and materials, and based on our observation of reality, this paper holds that the above financial indicators, in addition to asset-liability ratio and corporate financial crisis has a positive correlation, the rest of the indicators are negatively correlated with the corporate financial crisis, Application should be done accordingly.

Due to the different research focus, the current scholars have not yet formed a unified standard to judge the financial crisis. This paper draws on the definition of " ST " stock from the judgment of financial crisis in China, and determines the enterprises with negative net profit for two consecutive fiscal years as enterprises with financial crisis. Based on the definition and the availability of data, this paper selected 95 enterprises with financial crisis (the net profit at the end of 2013 is positive, the end of 2014 and the end of 2015 corporate net profit are negative), and select the same period 95 enterprises with similar financial assets in the same industry which did not have financial crisis as a control sample.

4. KLR's Empirical Test on the Financial Crisis of the New Third Board Listed Enterprises

According to the above-mentioned enterprise financial early warning index system and the threshold of each index, this part will use the KLR model to test the financial crisis early warning method of the new third board enterprises. Specific empirical test process is as follows.

4.1 Single Indicator Early Warning Analysis

In this paper, a single indicator of the early warning analysis will take selected 190 new third board enterprises as a sample, and analyze the 20 financial indicators identified in the third part of the article. The situation of single indicator is shown in Table 3 . In this part, we need to calculate four ratios for each financial indicator: [B / (B + D)] / [A / (A + C)] , A / (A + B) , (A + C) / (A + B + C + D) and (A + D) / (A + B + C + D) , the specific meaning of each ratio, inspection and test results of the twenty standard financial indicators are described in detail after Table 3 .

Table 3: Individual indicators warning situation

index	*A*	*B*	*C*	*D*	$\frac{B/(B+D)}{A/(A+C)}$	$\frac{A}{A+B}$ *(%)*	$\frac{A+C}{A+B+C+D}$ *(%)*	$\frac{A+D}{A+B+C+D}$ *(%)*
X_{11}	190	14	0	176	0.07	93.14	50.00	96.32
X_{12}	190	20	0	170	0.11	90.48	50.00	94.74
X_{13}	23	4	167	186	0.17	85.19	50.00	55.00
X_{14}	126	101	64	89	0.80	55.51	50.00	56.58
X_{15}	190	95	0	95	0.50	66.67	50.00	75.00
X_{16}	105	35	0	89	0.28	75.00	45.85	84.72
X_{21}	135	34	55	156	0.25	79.88	50.00	76.58
X_{22}	112	64	78	126	0.57	63.64	50.00	62.63
X_{23}	145	63	45	127	0.43	69.71	50.00	71.58
X_{24}	169	113	21	77	0.67	59.93	50.00	64.74
X_{31}	53	36	137	154	0.68	59.55	50.00	54.47
X_{32}	189	78	1	112	0.41	70.79	50.00	79.21
X_{33}	188	190	2	0	1.01	49.74	50.00	49.47
X_{34}	169	108	21	82	0.64	61.01	50.00	66.05

X_{41}	131	73	59	117	0.56	64.22	50.00	65.26
X_{42}	101	48	42	94	0.48	67.79	50.18	68.42
X_{43}	157	63	33	127	0.40	71.36	50.00	74.74
X_{44}	130	71	60	119	0.55	64.68	50.00	65.53
X_{51}	147	95	43	95	0.07	93.14	50.00	96.32
X_{52}	134	60	56	130	0.11	90.48	50.00	94.74

[B / (B + D)] / [A / (A + C)] is the index of the noise- signal ratio, the ratio' effective range is [0,1] , and the smaller the better. If the ratio is greater than 1 , this indicating that the noise signal emitted by this indicator is more than the effective signal, the indicator should be removed. It can be seen from Table 3 that only the value of the X_{33} (quick ratio) indicator is greater than 1 in all 20 leading indicators, this indicates that the warning effect of X_{33} indicator is not good. A / (A + B) represents the ratio of correct indicators among all the issued warning signal indicators, the larger the ratio the better the effect of warning indicators. Except the value of X_{33}(quick ratio) index is less than 50%, the value of the remaining indicators are more than 50% , and there are a number of indicators whose value are more than 90% . Taking 50% as a standard, X_{33}(quick ratio) indicators should be removed. If A / A + B is regarded as the conditional probability, then (A + C) / (A + B + C + D) can be regarded as the unconditional probability, under normal circumstances the same index of the latter value is less than the former value. As can be seen from Table 3 , only X_{33}(quick ratio) indicators in this area is abnormal, indicating that its early warning capacity is poor, which is consistent with the initial noise- signal ratio judgment. (A + D) / (A + B + C + D) indicates the proportion of the correct warning of the index, the larger the ratio value, the better the warning effect of the index; the performance of each index in this area has great differentiation, the X- $_{11}$ (ROE), the X- $_{12}$ (ROA), the X- $_{51}$ (inventory turnover), the X- $_{52}$ prediction (capital accumulation) four indicators' correct rate reached 90% or more, the X- $_{16}$ (Capital rate of return)'s correct forecast ratio is also more than 80% . In addition to X_{33} (quick ratio)'s predicting correct ratio less than 50% , the remaining indicators' correct prediction rate can reach 50% -80% .

From the single indicator of early warning analysis, KLR model's financial crisis early warning effect is good, and some indicators' early warning accuracy rate are more than 90% . However, there is a need for improvement, since the noise-to- signal ratio of X_{33} (quick ratio) is greater than 1 , so the indicator should be removed. The improved model includes the remaining 19 indicators, and the following synthetic indicators of the construction and prediction will be based on these 19 indicators.

4.2 Early Warning Analysis of Synthetic Indicators

Kaminsky (1999) gave four synthetic indicators for the comprehensive consideration of early warning signals from individual indicators. Among the four synthetic indicators, the first indicator I_t^1 is a simple summation of the early warning signals for individual indicators, and the number of warning signals is used to measure the likelihood of a crisis. But the indicator ignores the characteristics of different indicators, simply to the number of signals to measure the number of the possibility of the occurrence of the crisis is not particularly good. Kaminsky (1999) also divides a single signal index into strong and weak signals by setting a strong threshold and a weak threshold, and weighted averaging the two signals, thus waiting for the second composite index I_t^2 . The third synthetic index I_t^3 is based on a single early warning indicators in the *t-s* to *t* period whether the issue of an early warning signal and sent to the assignment.

The above three indicators ignore the forecasting ability of each single index, in the actual operation process, the index with higher ability to predict should be given a greater weight. Thus, Kaminsky (1999) constructed the fourth synthetic metric with the weight of the noise- signal ratio as a weight:

$$I_t^4 = \sum_{i=1}^{n} \frac{S_{i,t}}{w_i} \qquad (1)$$

In the formula (1), W_i represents the noise- signal ratio, $S_{i,t}$ represents the value of index *i* at the period *t*, if the index *i* sent a signal at the period *t*, $S_{i,t}$ got a value of 1 , otherwise 0.

In order to convert the result to a percentage of 0% to 100% to visually represent the possibility of a financial crisis in a single firm, the reciprocal of the noise- signal ratio for each individual indicator in Table 3 is summed, and the proportion that the noise- signal ratio's reciprocal of each individual indicators occupies the sum determines the weight of each individual indicators, recorded as u_i . The weight percentage of the individual indexes U_I is shown in Table 4 below.

Table 4: Each single indicator weight

index	*Weights*	*index*	*Weights*	*index*	*Weights*	*index*	*Weights*
X_{11}	0.2169	X_{16}	0.0566	X_{31}	0.0235	X_{43}	0.0398
X_{12}	0.1518	X_{21}	0.0635	X_{32}	0.0387	X_{44}	0.0293
X_{13}	0.0919	X_{22}	0.0280	X_{34}	0.0250	X_{51}	0.0247
X_{14}	0.0199	X_{23}	0.0368	X_{41}	0.0287	X_{52}	0.0357
X_{15}	0.0320	X_{24}	0.0239	X_{42}	0.0334		

The possibility of enterprise financial distress is defined as P :

$$P = \frac{1}{m}\sum_{t=1}^{m}\sum_{i=1}^{n} u_i S_{i,t} \quad (2)$$

In the formula (2), m is the number of periods counted, and n is the number of statistics. In this paper, $m = 2$, $n = 19$. In this paper, the fourth synthetic index is used to analyze the P value obtained by the formula (2) to analyze the possibility of financial crisis. Meanwhile, by dividing the range of the value P, the paper also gives the extent of the financial crisis early warning companies are facing: $0 \le P \le 25\%$, no warning; $25\% < P \le 50\%$, light warning; $50\% < P \le 75\%$, middle warning; $75\% < P \le 100\%$, heavy warning.

Based on the data of 95 financial crisis enterprises and 95 non-financial crisis enterprises, the possibility of financial crisis (P) was obtained by using the fourth synthetic index respectively , and the enterprises were divided into different financial crisis early warning level according to the P value. Specific results are shown in Table 5 and table 6 , in which Table 5 shows the analysis of the financial crisis enterprise while Table 6 shows the analysis of non-financial crisis enterprises. Table 5 and Table 6 are sorted according to the order of P values from large to small.

Table 5: Financial crisis enterprise synthesis index analysis

Business code	P	Risk level	Business code	P	Risk level
430231.OC	96.25%	Heavy warning	836468.OC	77.69%	Heavy warning
831110.OC	92.51%	Heavy warning	830890.OC	77.54%	Heavy warning
430291.OC	91.75%	Heavy warning	837425.OC	77.44%	Heavy warning
430477.OC	90.81%	Heavy warning	835016.OC	77.24%	Heavy warning
430563.OC	90.80%	Heavy warning	836523.OC	77.23%	Heavy warning
831653.OC	90.34%	Heavy warning	832466.OC	77.10%	Heavy warning
430166.OC	90.10%	Heavy warning	833193.OC	77.08%	Heavy warning
831334.OC	88.62%	Heavy warning	834905.OC	76.73%	Heavy warning
430526.OC	88.37%	Heavy warning	831960.OC	76.44%	Heavy warning
430709.OC	87.46%	Heavy warning	430705.OC	76.27%	Heavy warning
830784.OC	86.74%	Heavy warning	835515.OC	76.24%	Heavy warning
830965.OC	86.47%	Heavy warning	837140.OC	75.39%	Heavy warning
430470.OC	86.01%	Heavy warning	830967.OC	75.23%	Heavy warning
430134.OC	85.00%	Heavy warning	833218.OC	75.04%	Heavy warning
833378.OC	84.76%	Heavy warning	430433.OC	74.54%	Middle warning
430548.OC	83.00%	Heavy warning	836376.OC	74.39%	Middle warning
831452.OC	82.71%	Heavy warning	831606.OC	73.98%	Middle warning
831838.OC	82.60%	Heavy warning	430729.OC	73.65%	Middle warning
831849.OC	82.56%	Heavy warning	836843.OC	73.28%	Middle warning
831301.OC	82.56%	Heavy warning	834360.OC	73.13%	Middle warning
430681.OC	82.11%	Heavy warning	834367.OC	71.98%	Middle warning
837123.OC	82.00%	Heavy warning	833268.OC	71.82%	Middle warning
834875.OC	81.96%	Heavy warning	430743.OC	71.79%	Middle warning
832589.OC	81.85%	Heavy warning	836308.OC	71.68%	Middle warning
832160.OC	81.85%	Heavy warning	835499.OC	71.23%	Middle warning
833681.OC	81.71%	Heavy warning	430635.OC	71.08%	Middle warning
831745.OC	81.12%	Heavy warning	835922.OC	70.59%	Middle warning
830844.OC	80.82%	Heavy warning	834726.OC	70.55%	Middle warning
836117.OC	80.76%	Heavy warning	831847.OC	70.46%	Middle warning
834423.OC	80.62%	Heavy warning	835932.OC	70.28%	Middle warning
430570.OC	80.55%	Heavy warning	836682.OC	70.09%	Middle warning
834354.OC	80.53%	Heavy warning	834888.OC	70.05%	Middle warning

833158.OC	80.48%	Heavy warning	834800.OC	69.46%	Middle warning
430763.OC	80.46%	Heavy warning	834224.OC	68.38%	Middle warning
830874.OC	80.32%	Heavy warning	835443.OC	66.25%	Middle warning
430434.OC	80.07%	Heavy warning	835898.OC	64.84%	Middle warning
834259.OC	79.54%	Heavy warning	831163.OC	64.61%	Middle warning
834556.OC	79.14%	Heavy warning	831667.OC	64.52%	Middle warning
430594.OC	79.04%	Heavy warning	837111.OC	64.40%	Middle warning
833489.OC	78.54%	Heavy warning	836848.OC	63.90%	Middle warning
835467.OC	78.41%	Heavy warning	835817.OC	63.80%	Middle warning
833101.OC	78.27%	Heavy warning	832256.OC	63.43%	Middle warning
835952.OC	78.24%	Heavy warning	830979.OC	62.81%	Middle warning
831497.OC	77.94%	Heavy warning	831685.OC	62.24%	Middle warning
832048.OC	77.86%	Heavy warning	837142.OC	61.98%	Middle warning
833736.OC	77.86%	Heavy warning	837697.OC	57.49%	Middle warning
831803.OC	77.82%	Heavy warning	836658.OC	55.50%	Middle warning
834657.OC	77.74%	Heavy warning			

Table 6: Non-financial crisis enterprise synthesis index analysis

Business code	P	Risk level	Business code	P	Risk level
831296.OC	48.27%	Light warning	835205.OC	19.05%	No warning
430537.OC	48.10%	Light warning	832796.OC	18.62%	No warning
831042.OC	46.19%	Light warning	835084.OC	18.47%	No warning
831558.OC	44.63%	Light warning	831603.OC	18.15%	No warning
831264.OC	40.32%	Light warning	837247.OC	18.14%	No warning
834477.OC	37.33%	Light warning	833593.OC	18.06%	No warning
833224.OC	36.96%	Light warning	837350.OC	18.06%	No warning
834074.OC	36.57%	Light warning	833236.OC	17.82%	No warning
834249.OC	36.34%	Light warning	835212.OC	17.76%	No warning
833606.OC	36.30%	Light warning	830868.OC	17.64%	No warning
831913.OC	36.11%	Light warning	832766.OC	17.31%	No warning
830848.OC	35.59%	Light warning	833346.OC	17.02%	No warning
831862.OC	34.91%	Light warning	833448.OC	16.82%	No warning
837023.OC	32.26%	Light warning	831532.OC	16.76%	No warning
430124.OC	30.66%	Light warning	430591.OC	16.73%	No warning
830953.OC	30.42%	Light warning	831089.OC	16.72%	No warning
831983.OC	29.91%	Light warning	831292.OC	16.63%	No warning
832078.OC	29.71%	Light warning	833318.OC	16.39%	No warning
831393.OC	29.24%	Light warning	833032.OC	16.33%	No warning
430201.OC	29.03%	Light warning	834550.OC	16.31%	No warning
834133.OC	26.94%	Light warning	831560.OC	16.25%	No warning
430220.OC	25.74%	Light warning	833749.OC	16.04%	No warning
834976.OC	25.56%	Light warning	430384.OC	15.99%	No warning
832092.OC	24.99%	No warning	832985.OC	15.82%	No warning
831149.OC	24.72%	No warning	833505.OC	15.58%	No warning
833457.OC	24.02%	No warning	833807.OC	15.58%	No warning
833205.OC	23.91%	No warning	836430.OC	15.13%	No warning
831179.OC	23.70%	No warning	834244.OC	15.12%	No warning
831272.OC	23.57%	No warning	831480.OC	14.98%	No warning
831288.OC	23.47%	No warning	832262.OC	14.95%	No warning
832733.OC	23.30%	No warning	833523.OC	14.88%	No warning
831117.OC	22.66%	No warning	430298.OC	14.79%	No warning
834219.OC	22.65%	No warning	833343.OC	14.19%	No warning
430316.OC	22.47%	No warning	836617.OC	14.07%	No warning
834588.OC	22.08%	No warning	430504.OC	14.06%	No warning
834746.OC	21.53%	No warning	833060.OC	13.83%	No warning
831384.OC	21.42%	No warning	831855.OC	13.77%	No warning
834961.OC	21.11%	No warning	830959.OC	13.77%	No warning

834774.OC	20.99%	No warning	430553.OC	13.77%	No warning
834910.OC	20.98%	No warning	836306.OC	13.66%	No warning
833397.OC	20.92%	No warning	832063.OC	13.38%	No warning
835097.OC	20.74%	No warning	831793.OC	13.30%	No warning
832607.OC	20.66%	No warning	430432.OC	12.77%	No warning
833663.OC	20.20%	No warning	832840.OC	12.65%	No warning
832934.OC	20.17%	No warning	831718.OC	11.85%	No warning
430473.OC	20.14%	No warning	832473.OC	11.46%	No warning
831605.OC	20.03%	No warning	832060.OC	11.39%	No warning
830972.OC	19.49%	No warning			

Table 5 and Table 6 show that KLR Model's fourth synthetic index can distinguish financial crisis enterprise and non-crisis companies well: each of the financial distress's possibility P of 95 financial crisis corporate is in excess of 50%, and these enterprises are middle warning or heavy warning; Each of the financial distress's possibility P of 95 non-crisis corporate is below 50%, and the degree of financial crisis warning of these enterprises is light warning or no warning. Two types of enterprises are accurately distinguished. Therefore, the fourth synthetic index has a high accuracy and differentiation, and it can accurately reflect the sample business financial crisis situation.

5. Conclusion

Through the above analysis, this paper draws the following conclusions. First, the KLR model can be used to study the response of individual financial indicators to the financial crisis of the new third board enterprises through single-index analysis. For example, through the single-index analysis, quick ratio sends out too many false signals and it should be removed; On the other hand the enterprise can be made as a whole for people to make synthetic index analysis to measure the likelihood of corporate financial distress, for example, with synthetic indicator analysis we can find out that the possibility of financial crisis corporate is 55.50% -96.25% range , while that of the non-crisis enterprises is 11.39% -48.27% . Second, KLR model showed a good effect in the empirical on the financial crisis of the new third board enterprises. In the use of synthetic indicators to analyze the enterprises, the probability P of crisis enterprise are all greater than 50% , while that of non-crisis enterprises are all less than 50%. KLR model has an effective measure on the crisis possibility of the two types of enterprises, and the two types of enterprises were accurately distinguish. Third, KLR model not only has a high degree of accuracy and differentiation, but also has a strong operability, and it is suitable for enterprise financial crisis warning.

Compared to the existing prediction model on enterprises' financial risk, KLR model has obvious advantages. Compared to univariate analysis model, KLR model ensures simple and intuitive advantages of the consolidated financial position while being able to effectively reflect the enterprise; Compared to multivariate linear model, KLR model does not need the restriction on assumptions and does not require complicated calculations, what's more, the amount of sample required is relatively loose; Compared to the neural network model, KLR model does not have the difficulty in determining structure and the problem of training Inefficient.

Although the KLR model shows a good early warning effect in the corporate financial crisis early warning, the method still has some shortcomings. For example, the KLR model set the signal interval of 24 months, and the time span is large. After the model sends out warning signal within this period of time, the company will be based on early warning tips to take certain measures to prevent the outbreak of financial crisis, which will affect to the accuracy of the model warning. In addition, the KLR model can only be used to predict whether a financial crisis will occur in the next 24 months based on financial data , but can not reflect the underlying causes of the crisis. These issues are subject to further research in the future.

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