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The Warning of the Listed Company According to the Market Quality Indexes

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Abstract

All listed companies in the Shanghai Stock Exchange in 2008 were ranked according to the total market capitalization, the revenue and the net profit. The countdown 100 listed companies were a class. The random extraction 100 listed companies were a class. The probability warning model of the market quality for the listed companies was established by the two types companies as categorical dependent variables and the price impacting index and the excess volatility rate as the independent variables that were selected among 11 market quality indexes by forward stepwise method. When the probability value was greater than 0.5, the market quality of the listed company will be warned. On the contrary, the listed company was excellent in the market quality. The accuracy rate of the model was 87.7%.

Key words: Price impacting index; Excess volatility rate; Likelihood value; Forward stepwise method; Logistic regression model

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INTRODUCTION

The company's business failure is manifested directly in financial difficulties in the real economic world. So the most academic defines the enterprise failure from a financial point. Camiched (1972) considered the company failure was the fulfilling enterprise business was disrupted, that is lack of the liquidity, lack of the interest, the debt default and lack of the funded. (Hu, 2001) However, the companies performance reflects not only in financial data, but also more the stock market quality in the capital environment. The Shanghai Stock Exchange has issued the China's first the market quality since 2006. The market quality caused a great concern in the domestic stock.[1] However, defining the listed companies warning literature with a market quality is few, then how to define the listed companies' market quality warning?

The logistic regression extends the multiple regression thinking. The dependent variable is binary. (Usually the case is set to 0 and 1) .Since the independents variables are $x_1, x_2, ..., x_p$, the logistic regression model is as follows:

$$\pi(x) = \frac{\exp(\beta_0 + \beta_1 x_1 + \beta_2 x_2 + ... + \beta_p x_p)}{1 + \exp(\beta_0 + \beta_1 x_1 + ... + \beta_p x_p)}.$$

Among the $\beta_0, \beta_1, ...\beta_p$ are the unknown constant. Hosmer, 2000)

1. MODEL

1.1 Sample Selection

All listed companies in the Shanghai Stock Exchange in

[1] Shanghai Stock Exchange Innovation Lab. Shanghai Stock Exchange Market Quality Report. (2008). Shanghai: Shanghai Stock Exchange.

2008 were ranked by the total market capitalization, the turnover and the net profit rankings. The post 100 listed companies were received as the bad company. Then the listed companies from the No. 600000 to No .600118 were selected randomly, which weed out the post 100 listed companies and the 7companies were excluded together. The 93 listed companies were normal companies.

1.2 Samples Source

The Market Quality Report in the Shanghai Stock Exchange (2009) (In fact it is the data of the market quality in 2008).

1.3 Sample Data Processing

The 200 listed companies were divided into two categories, the poor and the normal listed companies which were as the classification independent variables. The market quality index (the price impact index, the liquidity index, the large transaction costs, the total sale of 10 stalls, and the relative bid-ask spread, the relative effective spread, the volatility, the excess volatility, the earnings volatility and the pricing efficiency coefficient and the pricing error factor) were independent variables. These variables were used to structure the listed companies warning model for the Spss using the forward stepwise approach.

2. RESULT ANALYSIS

2.1 The First Step Is Invalid Model

The so-called invalid model has no any independent variables introduction and only has the constant. The 100 poor listed companies that have the non-missing values among the market indexes were 94. The invalid model made the 94 poor listed companies and the 93 normal companies listed as be warned, and the accuracy was 50.3%.

The constant value *B* was 0.011. The standard deviation was 0.146. The Wald value was 0.005 and the corresponding test probability was 0.942. The exp (*B*) was the *B* power of *e*. That was exp (*B*) = 1.011 whose the actual meaning was the ratio of the warning listed companies and no warning listed companies. That was:

$$\frac{50.3}{49.7}=1.011,$$

$$P=\frac{\exp(0.011)}{1+\exp(0.011)}=0.503,$$

Logistic(*P*)=0.011.

Among *P* is the warning company probability.

2.2 The Second Step Is the Effective Model

The model based on invalid to begin the independent variables introduction in the analysis. The maximum likelihood estimation forward stepwise was used by the variables selection

Using the score-based test statistics selected the independent variables. Using the maximum partial likelihood estimate of the likelihood ratio tests the results of the removing the independent variables.

Table 1
Step 1, 2 Variables

		B coefficient	Standard deviation	Wald wald	Freedom	Test probability	Exp (*B*)
Step 1	Price shocks index	VIII.145	.020	53.006	1	.000	1.157
	Constant	-5.658	.802	49.733	1	.000	.003
Step 2	Price shocks index	.167	.024	49.362	1	.000	1.182
	Excess volatility	.066	.023	8.700	1	.003	1.069
	Constant	-11.542	2.324	24.658	1	.000	.000

Table 1 outputed the parameters *B*, the standard deviation, the Wald, the Exp (*B*) etc. in the regression model every step. The Wald statistic is used to test whether the regression coefficients are significant and whether is the chi-square distribution. The greater is the Wald, the greater is the role of the independent variables. (Zhang, 2004) The price impact index was entered in the first step. The excess volatility was entered in the second step. The Wald of the price impact was 49.362. The Wald of the constant was 24.658. The Wald of the excess volatility was 8.700. Therefore the size that was from large to small of the independent variables impacting on the dependent variable was the price impact index, the constant, the excess volatility.

2.3 The Logistic Regression Equation

The Logistic Regression Equation is Logistic(*P*)=-11.542+0.167 the price impact index+0.066 the excess volatility.

Among *P* is the warning company probability.

When the price impact index and the excess volatility were brought into the model, if the probability is greater than 0.5, the company need be warned and if the probability is less than 0.5, the company need not be warned.

The price impact index measures a certain amount of shares to the market price impact level. The higher is the price impact index, the higher is transaction costs. The $A_1, A_2, A_3, ...A_k$ are respectively the selling prices of the stock *i* of the limited order book in the moment *t*. The $S_1, S_2, S_3, ...S_k$ are respectively the corresponding number of the $A_1, A_2, A_3, ...A_k$. The $B_1, B_2, B_3..., B_k$ are respectively the buying prices of the stock *i* of the limited order book in the moment *t*. The $D_1, D_2, D_3, ...D_k$

are respectively the corresponding number of the $B_1, B_2, B_3..., B_k$. Then the price impact index of purchasing Q value is

$$\frac{Q}{\frac{[\sum_{j=1}^{k-1} S_j + (Q - \sum_{j=1}^{k-1} S_j A_j) \Big/ A_k]}{\frac{(A_1 + B_1)}{2}}} - \frac{(A_1 + B_1)}{2},$$

among $\sum_{j=1}^{k} S_j A_j > Q \geq \sum_{j=1}^{k-1} S_j A_j$, (if k does not exist, using a null value).

Then the price impact index of buying Q value is

$$\left| \frac{Q}{\frac{[\sum_{j=1}^{k-1} D_j + (Q - \sum_{j=1}^{k-1} D_j B_j) \Big/ B_k] - \frac{(A_1 + A_2)}{2}}{\frac{(A_1 + B_1)}{2}}} \right|$$

among $\sum_{j=1}^{k} D_j B_j > Q \geq \sum_{j=1}^{k-1} D_j B_j$, (if k does not exist, using a null value). The buying and selling price impact index of the stock i in the moment t is the average of the buying price impact index an the selling price impact index. (Zhang, 2004)

The excess volatility measure the noise trading, the trading mechanism and is the approximate with the volatility index. The excess volatility is the difference of the day volatility and intra day volatility. The greater is the excess volatility, the greater is the casual volatility. The H_{it} was the highest price of the stock i on t day. The L_{it} was the lowest price of the stock i on t day. The P_{it} was the closing price of the stock i on t day. The P_{it-1} was the closing price of the stock i on $t-1$ day. The excess volatility of the stock i on t day is[2]:

$$\frac{(H_{it} - L_{it})}{P_{it-1}} - \frac{(P_{it} - P_{it-1})}{P_{it-1}}.$$

The group block and the model Chi-square and the excluding independent variable likelihood value test how much entered the independent variable impacts on the model.

If the price impact index was excluded, the likelihood value of the model was -128.14, the change of likelihood value was 151.676 and the test probability was 0. If the excess volatility was removed, the likelihood value was -57.298, the change was 9.992, and the test probability was 0.002 <0.05. These values indicated the two independent variables can not be excluded.

[2]Shanghai Stock Exchange Innovation Lab. Shanghai Stock Exchange Market Quality Report. (2007). Shanghai: Shanghai Stock Exchange.

The group block and the model Chi-square value can test whether the model fit increase significantly, when these variables enter into the regression equation. Because the model is only one chunk, so the chi-square of the model is the same as the block. When the price impact index was entered, the block and the model Chi-square value were 144. 635, the test probability was 0 that indicated the price impact index impacting the change on the dependent variable was obvious. As the excess volatility was entered, the block and model the Chi-square value were 154.627. The testing probability was 0 which indicated the excess volatility impacting the change on the dependent variable was obvious. The parameter values are seeked by the maximum likelihood in the logistic regression, so the overall regression equation is tested by likelihood value. The likelihood value is a probability, this function is (0, 1). When the value was taken for the natural logarithm, the number is negative. So the like value that is taken the natural log is multiplied by -2 natural log. That shall be -2log likelihood value. The larger is this value, the smaller is the likelihood values of the regression equation that also is on behalf of the worse fit degree. Otherwise the fitting degree is better. (Lin, 2007)

The Likelihood value was 114.597, the Cox & Snell *R* Square was 0.539 and the Nagelkerke *R* Square was 0.718 when the price impact index was entered. After the excess volatility was entered, the -2 Log Likelihood value was 104,605, the Cox & Snell *R* Square was 0.563 and the Nagelkerke *R* Square was 0.750. The -2 Log Likelihood value was gradually reduced after the variable was introduced, the coefficient of Cox & Snell *R* Square and Nagelkerke *R* Square was gradually increasing and were greater than 0.5, so the model fitting was good.

Since the price impact index was entered, the 13 among the normal 93 companies need to be warned and the 80 companies need not be warned in the regression model and the accuracy rate was 86.0%. The 82 among the 94 bad companies need be warned, the 12 companies need not be warned and the accuracy rate was 87.2% .The overall accuracy was 86.6%. Since the excess volatility was entered, the 13 among the normal 93 companies need to be warned and the 80 companies need not be warned and the accuracy rate was 86.0%. The 84 among the 94 bad companies needs be warned, the 10 companies need not be warned and the accuracy rate was 89.4% .The overall accuracy was 87.7%.

CONCLUSION

The market quality index more directly reflects the listed company's performance in the stock market than the financial indexes. The lower transaction costs, the high liquidity and low volatility are the market maturity mark. The greater is the price impact index, the greater

is the transaction costs. The excess volatility is the noise trader measure. Then these two indexes are the main factors affecting market quality. The investors can make a scientific analysis by the warning model. It provides the market organizer with a reference that changing the market environment. The system designers and the regulators can design the trading mechanism and the price system to improve the market and supervise the market according to the model.

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