The Empirical Research on FDI and Enterprise Financial Crisis, Agent Problems and Credit Risk—The Risk Warning from the Listed Companies of Science and Technology in Taiwan

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Abstract

Construct the warning models of technological enterprise credit risk by the statistical analysis method and find out the factors influencing the company performance in order to achieve the effectiveness of warning in advance and risk management. Based on the empirical analysis, take the question of agency into consideration, distinguish whether the operation right and the ownership are the same and compare their differences. The empirical results show that the separation of the ownership and the management rights and the factors affecting the performance of the company which are the indexes of "financial structure, solvency, operation capacity, profitability and cash". Studies have shown that the professional managers can reduce the debt ratio to improve the total asset turnover ratio, the cash flow per share and business gross margin, reinvestment ratio and the rate of business income. And the professional managers can also implement the business diversification to reduce business risk, enhance profitability and improve the performance of company.

Key words: Financial crisis; Question of agency; Credit risk model; Financial risk management

INTRODUCTION

Taiwan and the mainland of China have signed the Memory of Understanding about the cross-strait cooperation in financial supervision (Memory of Understanding, MOU) on November 16, 2009. Its main contents include the information exchanges of cross-strait financial supervision agencies, the implementation of the obligation of confidentiality of information, the execution of the financial inspection, the sustainability of keeping contact and the crisis management, the open of the securities market about the investment in Taiwan of the QD II, etc. (Lai, 2010). On June 29, 2010 Taiwan and the mainland of China have signed the Economics Cooperation Framework Agreement (Economics Cooperation Framework Agreement, ECFA）again. The cooperation projects include the preferential purchasing, the standardization of the specifications of products, the cooperative research and development of the technology, etc. Due to the opportunities for the mainland to go to Taiwan increased, in order to identify the business risk of local cooperative enterprises, we need to get the approval of credit review. How to use the method of statistical analysis to establish effective credit risk assessment model for the mainland of China and providing the reference of decision analysis for the investors in mainland who come to Taiwan to invest, operators, financial institutions and so on to choose the cooperators deliberately become an important issue under the background of everyday close exchanges of cross-strait economic.

The credit risk refers to the occurrence of the credit events because of the cooperative partner's default or the change of credit rating, etc. cause a potential risk of loss (Altman, 1977). The credit risk may happen due to the asymmetry of information or lack of the ability to evaluate the credit risk of the other party. Therefore, it is difficult to judge the partner's default probability. Or due to the awareness of credit risk with long-term formative process for the counterpart is weak, or due to being unfamiliar with the control techniques and procedures of credit risk, all these factors will improve the credit risk in the transaction (Altman, 1998). Because the opportunities for the high-tech enterprises to participate in the capital markets are relatively large, in addition, the open of global market brings the intense competition and the unpredictable risks increase; the enterprises of science and technology have a greater chance to have the risk of financial crisis (Chen, 1983). This study has collected the data information of small and medium-sized Taiwan's listed enterprises of science and technology from 2010 to 2012. It has the first attempt to distinguish whether the operation right and ownership are separated (namely, the presence of agency problems). Using the SPSS statistical software and the analysis of logistic regression, it constructs the warning model in advance of the credit risk and finds out indicators of science and technology factors which affect the company performance. We hope that we can predict the possibility of probability in advance before the occurrence of the financial crisis in the company so that achieve the goal of warning in advance and effective risk management, and improve the company performance (Chen & Wang, 2004). It also can provide the theoretical reference and decision analysis for the investors in mainland who come to Taiwan to invest, operators, financial institutions, academic research units and government agencies and so on to evaluate the cooperative partners.

1. THEORETICAL FOUNDATION AND REVIEW OF THE LITERATURE

The Credit risk is always one of the themes which various scholars in different fields are keen to study. The enterprise credit risk research scholars Beaver (1966, p. 71) think that if one of the four things, namely being unable to pay special stock dividends, bond defaults, bank account overdraft, the declaration of company's bankruptcy, happens, it is considered to be the company with financial crisis. Deakin (1972, p. 167) think that the company with the closure, bankruptcy, insolvency or liquidation is considered to be the crisis company. Dun and Bradstreet (1988, p. 59) believes that the company conforms to one of the following things, the company with reorganization, bankruptcy or termination of operation, the enforcement of the termination of operation, termination of operation because of the arrestment of responsible person, the reorganization or restructuring of the company

with application or enforcement, insolvency and so on, is the financial crisis the company. Whitaker (1999, p. 123) thinks that the company will have enough money to pay the debt until the cash flow exceeds the current debt. Therefore, we consider the company which the cash flow of the company in one year is less than current maturity of long-term debts to be the company in the financial crisis. Pastena and Ruland (1986, p. 102) think that the situation without the ability to repay debt which the happening of the net present value of the company is negative, is considered to be the condition of financial crisis. Lin and Huang (2009, p. 23) have defined the following situations, such as bank runs, bankruptcy, the accountant's views, takeover, the suspension of trading, restructuring, external assistance, delisting, financial stress shutdown, the net value per share less than 5 Yuan or negative equity, etc, as the happening of financial crisis.

Berle and Means (1932, p. 141) have noticed that the company's competitive advantage is the company's ownership in the hands of shareholders and the company's control in the hands of the operator. But the interests pursued by the operators may run counter to the interests of shareholders. When the operators have held the relevant information of business and the shareholders and creditors are relatively lack of the information, the problems of information asymmetry will arise. Jensen and Meckling (1976, p. 305) believes that the agency relationship refers to a contract entrusted by the managing people has authorized the agents to perform a service. When the interests of the target between the managing people and the agents is not the same, with the result of the happening of the conflicts of interest the problems of agency will arise. When the managing people's welfare has reduced because of the problems of agency, the so-called agency costs will arise. The research of Lieu et al. (2008, p. 1060) has found that when the ownership and the right of management are held by the same person, the agency problems can be reduced. This can avoid the situation of asymmetric information and conflict of interest to improve the performance of the company. Yu and Liang (2011, p. 1441) with empirical study has found that non-financial indicators can also be used as the observation index of the company performance and can provide the investors with the observation of the company performance to further determine investment strategies. Xu (2009, p. 102) has pointed out that family business can reduce the agency costs of supervise managers because of the interests of the family in line with corporate interests. And investment efficiency is comparatively good. The research results of Li and Ma (2006, p. 69) have found that family members have served as general manager. This dual role between shareholders and managers may also reduce the conflicts between shareholders and managers.

Throughout related literature, some scholars have done a lot of research on risk identification, agency problems and the influence of performance. But the risk identification and the warning model under the agency problem has not been taken seriously. The risk warning

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model and construction of the high-tech listed companies has not been covered by anybody. Therefore, in view of the information about Taiwan listed enterprises with science and technology, considering the operation right and ownership are separated or not, this paper has found out the factors influencing the company performance to improve the ability to predict the credit risk model, reduce the probability of financial crisis, and then enhance the value of the company.

2. THE EMPIRICAL MODEL BUILDING

2.1 Data Sources and Sample Characteristics

This paper has taken Taiwan listed companies with science and technology in 2010-2012 as the sample of the research. And it has taken Taiwan Economic Journal (TEJ), the observatory on public information, and the Securities and Futures Trading Commission as the main data sources. It has considered whether the right of management and ownership of the company with science and technology are separated. If the right of management

and ownership of the company are not separated, that is to say, the chairman of the board and the general manager are the same person, the agency problem will not be produced; If the right of management and ownership of the company are separated, that is to say, the chairman of the board and the general manager are different persons, the agency problem will be produced (Buraj & Lee, 2009). By using the statistical software SPSS and the analysis logistic regression, we can build the credit risk model of the companies with science and technology. And we can find out the variables affecting the performance of the companies with science and technology and achieve the purpose of warning in advance and risk management.

2.2 The Selection of Variables

Based on the financial information of Taiwan listed companies with science and technology in 2010-2012, I have selected 28 financial indicators and the indicator of agency problems (whether the chairman of the board and the general manager are the same person or not), namely a total of 29 indicators, as the independent variables to analyze. The characteristics of indicators can be seen in Table 1.

Table 1
Operational Definition of Indicators

Category	Code	Indicators Names	Indicators Defined
Financial Structure	X_1	Debt Ratio	Total Debt / Total Assets
	X_2	Long-term Capital Adequacy Ratio	(Shareholders' Equity + Long-term Debt) / Fixed Assets
	X_3	Own Funds Ratio	Net Worth / Total Assets
Debt-paying Ability	X_4	Current Ratio	Current Assets / Current Liabilities
	X_5	Quick Ratio	Quick Assets / Current Liabilities
	X_6	Times Interest Earned	(Pre-tax Net Profit + Interest Expense) / Interest Expense
	X_7	Rate of Interest Expense	Ebit operating Net Cash / Interest Expenses
	X_8	Accounts Receivable Turnover	Net Sales / Average Accounts Receivable
	X_9	Inventory Turnover Ratio	The Average Cost of Sales / Average Inventory
	X_{10}	Fixed Asset Turnover Ratio	Net Sales / Average Total Fixed Assets
Operation Capacity	X_{11}	Shareholders' Equity Turnover Ratio	Net Sales / Average Net Worth
	X_{12}	Total Asset Turnover Ratio	Net Sales / Average Total Assets
	X_{13}	Cash Flow Adequacy Ratio	Operating Activities Net Cash Flow / Total Liabilities
	X_{14}	Cash Re-investment Ratio	(Operating Activities Net Cash Flow - Cash Dividend) / (Gross Fixed Assets + Long-term Investments + Other Assets + Operating Funds
	X_{15}	Business Gross Profit Rate	Sales Gross Profit / Net Sales
	X_{16}	Operating Expenses Rate	Operating Expenses / Net Sales
	X_{17}	Operating Profit Rate	Operating Profit / Net Sales
	X_{18}	Pretax Net Interest Rate	Pre-tax Profit / Net Sales
	X_{19}	After-tax Net Interest Rate	After-tax Net Profit / Net Sales
Profitability	X_{20}	Rate of Return on Equity	After-tax Profit and loss / The Net Amount of Average Stockholders' Equity
	X_{21}	Earnings Per Share	After-tax Net Profit / The Weighted Average Number of Shares
	X_{22}	Non-operating Income Rate	Net Non-operating Income / Net Operating Income
	X_{23}	Financial Lever Exponent	Total Liabilities / Total Shareholders' Equity
	X_{24}	Return on Total Assets Ratio	[After-tax Net Profit + Interest Expense (1 - Income Tax Rate)] / Average Total Assets
	X_{25}	Retention Ratio	After the Distribution of Surplus / After-tax Net Profit
	X_{26}	Cash Flow Ratio	Operating Activities Net Cash Flow / Current Liabilities
Cash Flow	X_{27}	Cash Flow Per Share	Operating Activities Net Cash Flow / The Weighted Average Outstanding Shares
	X_{28}	Degree of Dependence on Borrowing	Debt Financing Activities Net Cash Flow / (Total Liabilities + Stockholders' Equity
Agency Problem	X_{29}	The Chairman of the Board Doubles as General Manager	A Virtual Variables, Chairman and General Manager are 0, aren't 1

Note. The Source of the Data: The research was compiled in the August of 2013.

2.3 Model Design

According to the analysis of the characteristics of Logistic regression, the dependent variable y of Logistic regression is a binary number and it can only take 1 or 0 with the condition of the probability of events, namely $P(y=1|xk_i)$ (Zmjewski, 1984). The dependent variables and the respective variables are nonlinear relationship. By calculating the independent variable, we can predict that the probability of the dependent variable falls between 0 and 1. The model is as follows:

$$y = \alpha + \beta Xi + \gamma Di + \Sigma i, \qquad y = \begin{cases} 1, \text{if } (y>0) \\ 0, \text{if } (y<0) \end{cases} \qquad (1)$$

Y is the variables of actual observation. When y=1, there was a financial crisis; When y = 0, there was no financial crisis.

That is to say, $\quad P_i^1 = \dfrac{1}{1+e^{-Z_i}}$ (2)

Because the calculated results don't necessarily fall between 0 and 1, we must use Logistic distribution for conversion. After conversion, we can make its value of fall in between 0 and 1(Ohlson, 1980). After the conversion, the formula is as follows:

$$P_i^1 = P(Y=1) = \frac{1}{1+e^{-X,\beta}} = \frac{1}{1+e^{-Z_i}} = \frac{e^{Z_i}}{1+e^{Z_i}} \qquad (3)$$

So the model of Logistic regression is as follows:

$$P_i^1 = \frac{e^{z_i}}{1+e^{Z_i}} \qquad (4)$$

Among them, when P_i^1, it is classified as the probability of the i company with financial crisis. When P_i^0, it is classified as the probability of the i company with normal financial affairs. When a_i, it is the intercept of the i company. When $\beta_{k,i}$, it is the sensitivity of the i company for the item K, financial variables. When $X_{k,i}$, it is the item K of the i company, namely financial variables.

$$P_i^0 = P(Y=0) = 1 - P(Y=1) = 1 - P_i^1 \qquad (5)$$

Due to the setting of the split point will affect the accuracy of classification; the general scholars will mostly set the split point as 0.5. For this reason, this study sets the split point as 0.5 (Chen, 2008). If $P_i^0 > P_i^1$, the probability value of the company i with normal financial affairs is more than 0.5. On the contrary, If $P_i^0 < P_i^1$, the company i is classified as the probability of the company with financial crisis.

2.4 Significant Consistency Assay

There are 28 Financial Indicators and 1 indicators of agency problem from the previous year to the first three years. By making use of the norm of assay of the company in crisis (K-S assay), we have found that except the debt ratio (X_1), own funds ratio (X_3) and other 2 variables continuously have showed normal distribution characteristics in the first three years of the company in financial crisis, the rest of variables among the 29 variables can't meet the normal distribution characteristics. Therefore, this research has its rationality to set up the Logistic model of abnormal sexual hypothesis to estimate. The research has collected 236 companies in total including the companies with financial crisis and the companies without financial crisis. By making use of the assay of the average number between the companies with financial crisis and the companies without financial crisis (M-U assay), we can know from the results of the assay (seen in detail in the following table) that from the previous year to the first three years of the companies with financial crisis, 20 variables among the 29 variables used in the research have reached significant consistency assay. These have showed indicator variables selected in this study is credible.

3. THE ANALYSIS OF THE MODEL OF LOGISTIC REGRESSION

3.1 The Same Person of Chairman and General Manager

3.1.1 The Previous Year of the Occurrence of Credit Risk

Logit (p) = 3.867 - 0.052X_5 - 0.338X_{22} - 0.199X_{24} (6)

The financial variables which have passed the significant assay include quick ratio (X_5), non-operating income rate (X_{22}), and the rate of return on total assets (X_{24}). The empirical results show that if the estimation values β of regression parameter are all negative, the quick ratio, operating income rate, the rate of return on total assets will increase, which will reduce the probability of the occurrence of the company's financial crisis. Therefore, if the company with science and technology is committed to improve the quick ratio, non-operating income rate, the rate of return on total assets, the occurrence of the risk of the financial crisis will significantly decline.

Table 2
The Analysis of Logistic Regression about the Same Person of Chairman and General Manager (The Previous Year)

Code	Variables Names	Estimation Value β	Expected Direction	Meeting Expectation	The Value p	The Structure of Indicator
X_5	Quick Ratio	-0.052	—	V	0.003***	Debt Paying Ability
X_{22}	Non-operating Income Rate	-0.338	—	V	0.015**	Profitability
X_{24}	The rate of Return on Total Assets	-0.199	—	V	0.001***	Profitability
α	Constant	3.867			0.009***	

Notes. ***, **, * respectively stand for the passing of the significant assay of 1%, 5 and 10%.

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3.1.2 The Second Year Before the Occurrence of Credit Risk

$$\text{Logit}(p) = 1.287 - 0.018X_{13} - 0.047X_{14} - 0.219X_{21} \quad (7)$$

The financial variables which have passed the significant assay include cash flow adequacy ratio (X_{13}), cash re-investment ratio (X_{14}), earnings per share (X_{21}). And their symbols are all as the expected results. The empirical results show that if the estimation values β of regression parameter are all negative, cash flow adequacy ratio, cash re-investment ratio, earnings per share will increase, which will reduce the probability of the occurrence of the company's financial crisis. Because when the cash flow gets better, the debt proportion of enterprise operating activities net cash flow, and the cash reinvestment rate which is used to pay will increase. In this way the operating ability of the company will enhance. Then the earnings per share will increase. And the profitability of the companies with science and technology will strengthen. The possibility of the occurrence of the financial crisis about the companies with science and technology will decline.

Table 3
The Analysis of Logistic Regression About the Same Person of Chairman and General Manager (The Second Year Before the Occurrence of Credit Risk)

Code	Variables Names	Estimation Value β	Expected Direction	Meeting Expectation	The Value p	The Structure of Indicator
X_{13}	Cash Flow Adequacy Ratio	-0.018	—	V	0.001***	Operating Ability
X_{14}	Cash Re-investment Ratio	-0.047	—	V	0.032**	Operating Ability
X_{21}	Earnings Per Share	-0.219	—	V	0.071*	Profitability
α	Constant	1.287			0.001***	

Notes. ***, **, * are defined as the former table.

3.1.3 The Third Year Before the Occurrence of Credit Risk

$$\text{Logit}(p) = 0.475 - 0.011X_{26} \quad (8)$$

The financial variables which have passed the significant assay only include the cash flow ratio(X_{26}). And its symbol is as the expected result. The empirical results show that if the estimation values β of regression parameter are all negative, there are only the warning signs of cash flow ratio in the third year before the occurrence of credit risk of the companies with science and technology. Therefore, how to increase the net cash flows from operating activities to improve the financial indicators and educe the risk of financial crisis should be a topic for the industrial company with science and technology to strive for.

Table 4
The Analysis of Logistic Regression About the Same Person of Chairman and General Manager (The Third Year Before the Occurrence of Credit Risk)

Code	Variables Names	Estimation Value β	Expected Direction	Meeting Expectation	The value p	The Structure of Indicator
X_{26}	Cash Flow Ratio	-0.011	—	V	0.016**	Cash Flow
α	Constant	0.475			0.045**	

Notes. ***, **, * are defined as the former table.

3.2 The Different Persons of Chairman and General Manager

3.2.1 The Previous Year of the Occurrence of Credit Risk

$$\text{Logit}(p) = 0.254 - 0.088X_6 \quad (9)$$

The variables which have passed the significant assay only include times interest earned (X_6). And its symbol is as the expected result. The empirical results show that if the estimation values β of regression parameter about the times interest earned is negative, the times interest earned will increase. The possibility of the company's occurrence of the financial crisis will decline. That is to say, they also show that the ability of paying the interest with the surplus produced by operating activities is higher, the debt paying ability of the companies with science and technology is stronger, and there are more securities for the creditors. In this way, the company performance will be improved.

Table 5
The Analysis of Logistic Regression About the Different Persons of Chairman and General Manager (The Previous Year)

Code	Variables Names	Estimation Value β	Expected Direction	Meeting Expectation	The Value p	The Structure of Indicator
X_6	Times Interest Earned	-0.088	—	V	0.000***	Debt Paying Ability
α	Constant	0.254			0.243	

Notes. ***, **, * are defined as the former table.

3.2.2 The Second Year Before the Occurrence of Credit Risk

$$\text{Logit}(p) = -3.641 + 0.084X_1 + 0.001X_2 + 0.098X_9 - 0.032X_{10} - 1.435X_{12} - 0.017X_{13} - 0.064X_{15} + 0.57X_{18} - 0.707X_{19} - 0.243X_{20} + 0.576X_{24} + 0.031X_{25} + 0.028X_{26} - 0.487X_{27} \quad (10)$$

The variables which have passed the significant assay include debt ratio (X_1), fixed asset turnover ratio (X_{10}), total asset turnover ratio (X_{12}), cash flow adequacy ratio (X_{13}), business gross profit rate (X_{16}), after-tax net Interest rate (X_{19}), rate of return on equity (X_{20}), cash flow per

share (X_{27}). And their symbols are all as the expected results. And only the symbols of long-term capital adequacy ratio (X_2), inventory turnover ratio (X_9), pretax net interest rates (X_{18}), return on total assets ratio (X_{24}), retention ratio (X_{25}), and cash flow ratio (X_{26}) are not as the expected results. The empirical results show that the estimation values β of regression parameter of debt ratio, long-term capital adequacy ratio, inventory turnover ratio, pretax net interest rates, return on total assets ratio, retention ratio, cash flow ratio are all positive, but the estimation values β of regression parameter of fixed asset turnover ratio, total asset turnover ratio, cash flow adequacy ratio, business gross profit rate, after-tax net Interest rate, rate of return on equity, cash flow per share are all negative. They show that if debt ratio, long-term capital adequacy ratio, inventory turnover ratio, pretax net interest rates, return on total assets ratio, retention ratio, cash flow ratio increase, the possibility of the company's occurrence of the financial crisis will rise. While if fixed asset turnover ratio, total asset turnover ratio, cash flow adequacy ratio, business gross profit rate, after-tax net Interest rate, rate of return on equity, cash flow per share increase, the possibility of the company's occurrence of the financial crisis will decline.

Table 6
The Analysis of Logistic Regression About the Different Persons of Chairman and General Manager (The Second Year Before the Occurrence of Credit Risk)

Code	Variables Names	Estimation Value β	Expected Direction	Meeting Expectation	The Value p	The Structure of Indicator
X_1	Debt Ratio	0.084	+	V	0.004***	Financial Structure
X_2	Long-term Capital Adequacy Ratio	0.001	—		0.036**	Financial Structure
X_9	Inventory Turnover Ratio	0.098	—		0.023**	Operating Ability
X_{10}	Fixed Asset Turnover Ratio	-0.032	—	V	0.086*	Operating Ability
X_{12}	Total Asset Turnover Ratio	-1.435	—	V	0.075*	Operating Ability
X_{13}	Cash Flow Adequacy Ratio	-0.017	—	V	0.005***	Operating Ability
X_{15}	Business Gross Profit Rate	-0.064	—	V	0.055*	Profitability
X_{18}	Pretax Net Interest Rate (ROS)	0.570	—		0.017**	Profitability
X_{19}	After-tax Net Interest Rate	-0.707	—	V	0.012**	Profitability
X_{20}	Rate of Return on Equity (ROE)	-0.243	—	V	0.002***	Profitability
X_{24}	Return on Total Assets Ratio (ROA)	0.576	—		0.000***	Profitability
X_{25}	Retention Ratio	0.031	—		0.002***	Profitability
X_{26}	Cash Flow Ratio	0.028	—		0.045**	Cash Flow
X_{27}	Cash Flow Per Share	-0.487	—	V	0.003***	Cash Flow
α	Constant	-3.641			0.021**	

Notes. ***, **, * are defined as the former table.

3.2.3 The Third Year Before the Occurrence of Credit Risk

Legit (p) = 0.998 + 0.048X_1 - 1.784X_{12} + 0.064X_{14} - 0.051X_{15} - 0.586X_{21} - 0.076X_{22} + 0.181X_{23} + 0.306X_{24} - 0.808X_{27} (11)

The variables which have passed the significant assay include debt ratio (X_1), total asset turnover ratio (X_{12}), business gross profit rate (X_{16}), earnings per share (X_{21}), non-operating income rate (X_{22}), financial lever exponent (X_{23}), cash flow per share (X_{27}). And their symbols are all as the expected results. And only the symbols of cash re-investment ratio (X_{14}), return on total assets ratio (X_{24}) are not as the expected results. The empirical results show that the estimation values β of regression parameter of debt ratio, cash re-investment ratio, financial lever exponent, return on total assets ratio are positive, but the estimation values β of regression parameter of total asset turnover ratio, business gross profit rate, earnings per share, non-operating income rate, cash flow per share are negative. They show that if debt ratio, cash re-investment ratio, financial lever exponent, return on total assets ratio increase, the possibility of the company's occurrence of the financial crisis will rise. While if total asset turnover ratio, business gross profit rate, earnings per share, non-operating income rate, cash flow per share increase, the possibility of the company's occurrence of the financial crisis will decline.

But it is worth noting that the companies with science and technology in the first three years of the occurrence of financial crisis don't need to keep too much cash in hand. In order to reduce cash reinvestment ratio, the companies can make the excess cash appropriately invest in the areas beyond the realm of this industry. The implement of diversification can reduce business risk.

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Table 7
The Analysis of Logistic Regression About the Different Persons of Chairman and General Manager (The Third Year Before the Occurrence of Credit Risk)

Code	Variables Names	Estimation Value β	Expected Direction	Meeting Expectation	The Value p	The Structure of Indicator
X_1	Debt Ratio	0.048	+	V	0.002***	Financial Structure
X_{12}	Total Asset Turnover Ratio	-1.784	—	V	0.000***	Operating Ability
X_{14}	Cash Re-investment Ratio	0.064	—		0.013**	Operating Ability
X_{15}	Business Gross Profit Rate	-0.051	—	V	0.014**	Profitability
X_{21}	Earnings Per Share	-0.586	—	V	0.056*	Profitability
X_{22}	Non-operating Income Rate	-0.076	Undecided	V	0.012**	Profitability
X_{23}	Financial Lever Exponent	0.181	+	V	0.030**	Profitability
X_{24}	Return on Total Assets Ratio	0.306	—		0.000***	Profitability
X_{27}	Cash Flow Per Share	-0.808	—	V	0.000***	Cash Flow
A	Constant	0.998			0.226	

Notes. ***, **, * are defined as the former table.

3.3 The Test of the Fit of the Model

As shown in Table 8, the predictable accuracy with different persons of chairman and general manager about the operation right and ownership (namely, the occurrence of agency problems) of the previous year, the previous second year and the previous third year are respectively 97%, 91% and 88.1%. Except for the previous year, the predictable accuracies with the same person of chairman and general manager about the operation right and ownership (namely, no agency problems) are respectively increased to 96.1%, 92.2%, 92.2%. Visibly reducing the agency problems can improve the predicable ability of the previous second year and the previous third year. The empirical results show that the Logistic regression model can be effectively applied to the prediction of financial risk.

Table 8
The Test of the Fit of the Logistic Model

The Same Person of Chairman and General Manager	The Previous Year	The Previous Second Year	The Previous Third Year
The Log Likelihood Probability(Likelihood)	39.220a	78.938a	115.392a
Cox & Snell R2	0.613	0.403	0.113
Nagelkerke R2	0.820	0.540	0.152
Predictable Correct Ratio%	96.10	92.20	92.20
Different Persons of Chairman and General Manager	The Previous Year	The Previous Second Year	The Previous Third Year
The Log Likelihood Probability(Likelihood)	125.366	64.979	106.879
Cox & Snell R2	0.403	0.606	0.475
Nagelkerke R2	0.538	0.810	0.634
Predictable Correct Ratio%	97.00	91.00	88.10

Note. The source of data: Getting by the study and arrangement

CONCLUSION AND ADVICE

By verification and comparison analysis of financial variables and agency problems in 2010-2012 from Taiwan 263 companies with the normal financial and financial crisis in science and technology industry, the empirical results have shown that:

(1) Most of financial and non-financial variables of the two groups, the companies with normal financial and the companies in financial crisis have significant differences. The variables which make the operation right and ownership not separated and make the statistics have significant explanation include quick ratio (X5), cash flow adequacy ratio (X13), cash re-investment ratio (X14), earnings per share (X21), non-operating income rate (X22), the rate of return on total assets (X24), cash flow ratio (X26); The variables which make the operation right and ownership separated and make the statistics have significant explanation include debt ratio (X1), long-term capital adequacy ratio (X2), times interest earned (X6), inventory turnover ratio (X9), fixed asset turnover ratio (X10), total asset turnover ratio (X12), cash flow adequacy ratio(X13), cash re-investment ratio (X14), business gross profit rate (X15), pretax net interest rate (X18), after-tax net Interest rate (X19), rate of return on equity (X20), earnings per share(X21), non-operating income rate (X22), financial lever exponent (X23), return on total assets ratio (X24), retention ratio (X25), cash flow ratio (X25), cash flow per share (X27).

(2) The empirical results have pointed out that if the operation right and ownership are not separated, that is to say, chairman and general manager are the same person, only the cash flow ratio has significantly influenced the probability of the occurrence of financial crisis in the third year before the company's occurrence of financial crisis. The variables which have increased in the second year before the company's occurrence of financial crisis are the three items, namely cash flow adequacy ratio, cash re-investment ratio and earnings per share. The variables which have increased in the previous year before the company's occurrence of financial crisis are the three items, namely quick ratio, non-operating income rate and

the rate of return on total assets. Therefore, the factors affecting the performance of the company are mainly "financial structure, debt paying ability, operating ability, profitability and cash flow".

(3) If the operation right and ownership are separated, that is to say, chairman and general manager are different persons, debt ratio and other nine explanatory variables has significantly influenced the probability of the occurrence of financial crisis in the third year before the company's occurrence of financial crisis. The variables which have increased in the second year before the company's occurrence of financial crisis are debt ratio and other thirteen explanatory variables. The variable which has reduced in the previous year before the company's occurrence of financial crisis is only one that is times interest earned. Therefore, the factors affecting the performance of the company are mainly "financial structure, debt paying ability, operating ability, profitability and cash flow".

(4) If the operation right and ownership are not separated, we can know that the cash flow rate is only significant financial variable. Therefore, the companies with science and technology should improve the cash flow ratio as early as possible to reduce the possibility of the credit crisis and the occurrence of financial crisis. If the operation right and ownership are separated, the five items, such as debt ratio, total asset turnover ratio, business gross profit rate, the rate of return on total assets, cash flow per share, in the third year and in the second year before the company's occurrence of financial crisis are all significant financial variables. Therefore, the professional managers in the industry of science and technology should reduce the cash re-investment ratio, debt ratio, increase non-operating income rate, and improve total asset turnover ratio, cash flow per share and business gross profit rate. And they can implement the business diversification to enhance profitability and improve the performance of company.

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