Does Timely Stock Market Information Accurately Diagnose Corporate Distress? Evidence from Taiwan

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Abstract

This study explores whether timely market information affects the ability to predict corporate distress using Taiwan as the example. Two definitions of financial distress are employed. Our sample consists of companies that fell into financial distress and went bankrupt during the 1990 – 2005 period.

It is found that the model that includes market information does improve model accuracy, as well as outperform other models in the existing literature. But, among all financial ratios and corporate governance variables, the debt ratio and stock pledge ratio are the most robust indicators. As for market indicators, the usage ratio of leverage for the long position is positively related to financial distress, indicating that individual investors still expect a positive future for companies even if they are on the verge of bankruptcy.

Keywords: Market information, corporate governance, financial distress, early warning system.

Introduction

In models designed to predict corporate bankruptcy, financial ratios have most commonly been used (Beaver 1966; Altman,1968; Ohlson, 1980, among others),[1] but in much of the past decade, particularly since the 1997 Asian crisis and the 2001 Enron scandal, A> the predictive power of corporate governance has also been considered. Johnson *et al*. (2000), for instance, report that corporate governance variables have better explanatory power for the Asian crisis than macroeconomic variables. They also point out that poor economic prospects at that time aggravated agency problems, which in turn caused stock markets to crash and currencies to depreciate, especially in countries with weak corporate governance. Lee and Yeh (2004) find that financial distress is related to weak corporate governance, particularly the percentage of directors occupied by the controlling shareholder, the percentage the controlling shareholders shareholding pledged for bank loans (pledge ratio) and the deviation of control away from cash flow rights. Interestingly, their evidence strongly suggests that these three variables are positively related to the risk of financial distress the following year.

Almost in parallel, numerous recommendations have been made to expand the role of market forces to encourage safer, sounder banking systems, as well as prompt bank supervisors to make greater use of market information to improve the assessment of bank financial conditions.(Berger, Davies and Flannery, 2000; Flannery 1998 & 2001; Feldman and Levonian, 2001; Curry, Elmer and Fissel, 2002 & 2003; Evanoff and Wall, 2000; Gropp, Vesala and Vulpes, 2006; and Distinguin, Rous, and Tarazi, 2006). But, with the exception of Claessens, Djankov and Klapper (1999), very few studies have used market information to predict corporate distress. Employing a Tobin's Q to determine the market's perception of the future growth of firms, Claessens et al. (1999) studied corporate bankruptcies in East Asian countries and included analyses of ownership structure at the firm level, judicial systems and market data. They found that firms that were in distress had lower Tobin's Q, which may have affected their ability to access credit during subsequent periods of financial distress and increased their likelihood of entering bankruptcy.

While most of the above research studies have focused on developed countries, specifically the U.S.A. and Europe, few -- other than that of Claessens et al. (1999) --

have investigated emerging markets and corporate financial distress, and Lee and Yeh (2004) though it focuses on developing country but did not discuss the role of market data..

The present study departs from most of the earlier research in that certain phenomena characteristic of emerging markets are investigated and observed. First, unlike the American and European stock markets, the Taiwan Stock Market is predominantly controlled by individual investors (over 75%.[2]). This is particularly relevant here because individual investors likely rely on market information, like that reported in newspapers, due to a shortage of professional specialists. Secondly, in Taiwan, like in many emerging markets, bankruptcy information is generally released by the media well ahead of its release by the authority. The delay period may be one week, one year, or even three years. Thus, if a prediction model traces actual data from the authority one year back, the information may tell very little since the bad news for a specific company has, in all likelihood, already become well known by the public. Thirdly, stock prices and trading volume are dramatically volatile right before a newspaper release reports that a company is about to go bankrupt. And the leverage volumes for long positions by individual investors reach their highest point just before distress, revealing that individual investors are easily manipulated by market information reported in the media. (*Fig 1 to Fig 3*).[3]

Therefore, the first contribution that this study makes to the extant literature is that it explores whether timely market information as reported in the media improves the predictive power of corporate distress using Taiwan as the example. The second contribution is that it considers two dates as the announcement date of corporate distress: one is the officially announced date by the Taiwan Stock Exchange, and the other is the date it is reported in the press. The former is a straightforward definition and has commonly been adopted in previous studies. But, it is worth noting that rather than do nothing until that information is officially announced, investors in Taiwan tend to react to relevant information as soon as any bankruptcy news is reported in the media.   And the third contribution of this research is that it uses quarterly data rather than annual data as this fully captures market information. Furthermore, in another departure from previous studies that mostly investigate one year before distress, this study extends the

study period to three years ahead to determine even earlier warning signs.

This paper is structured as follows. The next section presents a more extensive review of the literature, and this is followed by a discussion of the data and the methodology we employ. We then describe and analyze the empirical results. Finally, we review the conclusions we draw and discuss some important policy implications.

Hypothesis Development

Financial Ratios

Financial ratios have long been used to predict bankruptcy. Beaver (1966) is credited with being the first to propose the univariate model to obtain the probability of predicting bankruptcy using financial ratios. Of 6 financial ratios he selected from among 29, he concluded that the best predictive variable is cash flow against total debt, followed by debt ratio and return on assets.

Altman (1968) proposed the well-known and most-widely used multiple discriminant analysis method to select the five most predictive financial ratios and constructed the z-score, or zeta model, in his bankruptcy prediction model. Altman used factor analysis and obtained the most representative dependent factors, namely liquidity, profit, debt solvency, financial leverage and turn-over rate. Despite the positive results of his study, Altman's model had one key weakness: it assumed the variables in the sample data were normally distributed. But as Sheppard (1994) put it, "If all variables are not normally distributed, the method employed may result in the selection of an inappropriate set of predictors".

Ohlson (1980) and Zavgren (1985) later introduced a logit model that corrected for this problem, and in their use of logit analysis, their models are considered "more robust".[4] Further, logit analysis actually yields the probability (in terms of a percentage) of bankruptcy, and the probability calculated might be considered a measure of the effectiveness of management in the sense that it would not lead a company to the verge of bankruptcy.

During the 1980s and 1990s, the trend was to use logit analysis in lieu of multiple discriminant analysis.[5] More recently, logit analysis has been compared to a more advanced analytical tool, neural networks. Research has found that the two approaches perform similarly,[6] but by any measure, neural networks do not require and do not produce any rules or construct a black box model with which to generate the learned information. For this reason, neural networks have not proven to be very convincing.

Corporate Governance Variables

Although some empirical results support the hypothesis that weak corporate governance tends to reduce corporate value,[7] whether it can accurately predict a higher probability of financial distress remains an open question.[8]

Claessens *et al*. (2002), La Porta *et al*. (2002) and Lemmon and Lins (2003) examine the relationship between firm value, ownership structure and the strength of legal institutions. Collectively, they determine that firm value is positively related to investor protection measures and to the cash flow rights held by the controlling shareholder, and they seem to agree that firm value is negatively related to the deviation of control rights from cash flow rights.

Lee and Yeh (2004) find that firms with weak corporate governance are vulnerable to economic downturns and that the probability of their falling into financial distress increases. They adopt three variables to proxy for corporate governance risk, namely the percentage of directors occupied by the controlling shareholder, the percentage the controlling shareholders shareholding pledged for bank loans (pledge ratio) and the deviation of control away from cash flow rights.

Market Indicators

All corporations operate under governance systems designed to reduce agency problems among shareholders, debt-holders and managers. Importantly, various

principals' ability to obtain timely and accurate information about a firm's financial state significantly affects the efficacy of corporate governance. In this regard, most of the existing literature has focused on the prediction of such large events as actual bank closures and sharp downgrades by rating agencies or by official sources (supervisory ratings). Studying U.S. banks, Berger, Davies and Flannery (2000) suggest that, in terms of predicting future changes in performance, supervisory assessments are generally less accurate than either stock or bond market indicators. Gunther, Levonian and Moore (2001) show that the inclusion of a market indicator, such as expected default frequency (EDF), improves the predictive power of a model that is based on accounting ratios and CAMEL ratings. Along similar lines, Curry, Elmer and Fissel (2003) show that the prediction of a CAMEL (supervisory) rating downgrade to the lowest levels can be significantly improved by adding market variables to the set of accounting indicators. Yet, they find that this predictive power is only significant for banks in the greatest financial distress.

Studying European banks, Gropp, Vesala and Vulpes (2006) compare the properties of stock markets and subordinated debt data as early indicators of Fitch/IBCA downgrades to C or below which reflects severe financial distress. They also show that beyond the information conveyed by a composite score variable based on accounting data, the equity market-based distance to default (KMV, 2003) significantly improves predictions up to an 18-month time horizon. Distinguin, Rous, and Tarazi (2006) specify a logit early warning model which they use to test if market-based indicators add predictive value to models that rely on accounting data. And they confirm that the use of market-related indicators does indeed improve the accuracy of the predictive power, which is consistent with previous findings in the literature.

Although some researchers employ market variables to explore the the role of supervision in the banking industry, (Beaver, McNichols and Rhie, 2005), it is still not so common in the field of corporate governance, except for Claessens et al. (1999), as mentioned earlier.

Data and Methodology

Sample

This study collects data for Taiwan listed companies that encountered financial distress between January 1990 and September 2005, together and a matching sample consisting of companies considered to be in good shape during the same period. Financial distress is defined in two ways. The first is defaults on loan principal/interest payments, loan term renegotiations that extend the cash payment schedule and renegotiation for reduced principal and interest payments. As for the second definition of financial distress, when the net worth of a company falls below half of its capital stock, it is required by the Taiwan Stock Exchange to reclassify its stock trading to the 100 per cent margin. Article 211 of the Corporation Law also specifies that a loss of more than half of capital stock as one of the conditions of bankruptcy. Thus, we also include companies that are traded at 100 per cent margin in the sample of financially distressed firms. Based on the monthly reports of the Taiwan Stock Exchange, 52 companies fall into our financial distress sample. Since the nature of the banking industry is unique and well-researched, we exclude companies in the banking industry from our sample.

In order to track the history of companies longer, in this study, data are collected for the three-year period before distress. This decides the matching principle. During the process of data treatment, it is found that many companies were in distress during their honeymoon period, implying that investing in new stocks entailed high risk. Moreover, the data set is further constrained by adopting quarterly data, which is discussed in more detail shortly. All the above conditions limit the matching principle to a one-to-one basis. The matching sample is chosen on the condition that the firms were in the same industry and of comparable size and that they did not go into financial distress during the sampling period. The sampling technique employed controls the influences of industry and size factors on financial distress.

Unlike previous work, this study uses two dates for the identification of the time point of corporate distress. One is the officially announced date given by the Taiwan Stock Exchange, while the second is the date reported in the press. The former is a

straightforward definition and has commonly been adopted in previous studies. But, rather than not do anything until the information is officially announced, investors tend to quickly react to relevant information whenever any bankruptcy news appears in the media. And in order to fully capture such market information, this study adopts quarterly, not just annual, data.

Operating Variables

The accounting financial ratios and corporate governance variables along with market data selected previously are further defined and calculated in the following. Variables 1–6 are related to the accounting financial ratios, variables 7–10 are related to ownership structure, and variables 11–18 are related to market information.

A. Financial ratios

1. Return on assets (earnings before interest and after tax)

Altman (1968) suggested that this ratio can adjust a company's earnings for varying income tax and market adjustments for leveraging due to borrowings. These adjustments allow for more effective measurements of a company's utilization of its assets.

2. Net worth growth ratio

This ratio indicates the growth rate for net worth, i.e. shareholder equity. The higher the ratio, the greater is the shareholder profit that is generated.

3. Cash flow ratio

Beaver (1966) claimed that the best predictive variable is cash flow against total debt. The cash flow ratio measures a company's ability to repay short-term debt using short-term operational cash flow. The more operating cash flow a company has, i.e., liquid liability, the less likely it is that that company will fall into distress. Here, capital flow is defined as net operating cash flow against liquid liability.

4. Debt ratio

Beaver (1966) and Ohlson (1980), among others, suggested using debt ratio to predict financial distress. The debt ratio measures the relationship between funds provided by creditors and the total assets of a company. A relatively high debt ratio indicates there is less coverage for creditors. This ratio is an important indictor for measuring the capital structure of a company. If the capital structure is not sound enough and if a liquidity problem should arise, the company will not likely be able to repay its debt. Therefore, debt default may occur, and financial bankruptcy will follow. Here, the debt ratio is defined as total debt against total assets.

5. Turnover frequency of total assets

This ratio measures the use efficiency of corporate assets, i.e. how much performance is generated by one dollar invested, and it allows for a more effective measurement of a company's utilization of its assets. The ratio is defined as net operating revenue against average total assets.

6. Sales growth rate

This ratio, the growth rate of a company's sales revenue, measures a company's ability to remain profitable. A positive sales growth rate means that the company is experiencing growth and is worth investing in.

B. Corporate governance variables

7. Shareholding ratio of large shareholders

Owning 10 percent or more of a public company's outstanding shares is defined as being a large shareholder. But this could have one of two effects. The higher the shareholding ratio is, the more confidence a large shareholder has in the company, or alternatively, the higher is the possibility that the large shareholder can manipulate the company's internal operations. Thus, the relationship between this ratio and financial distress is uncertain.

8. Shareholding ratio of managers

A higher shareholding ratio of managers indicates that the interest of a manager coincides with that of shareholders. And in order to maximize shareholders' value, managers pay more attention to managerial operations. Corporate governance, therefore, may very well be strengthened, which in turn should decrease the probability of financial distress.

9. Shareholding ratio of the boards and directors

Similar to the above two ratios, if the shareholding ratio of the boards and the directors remains high, it signifies that the boards and directors are confident in the company's future. And, as a result, the boards and directors are likely more committed to monitoring the company. Hence, corporate governance may be strengthened, which in turn should decrease the probability of financial distress.

10. Stock pledge ratio

In Taiwan, directors, supervisors, managers and large shareholders (that own 10 per cent or more of a company's outstanding shares) in public companies are obliged to report to the Securities and Futures Commission (SFC) the percentage of their shareholdings that are pledged for loans and credits. These data matter since pledging for loans effectively reduces the personal funds required for shareholding. In other words, the degree of personal leverage expands, and to a certain degree, overinvestment in the stock market by the largest shareholder also represents a risk for companies. As a consequence, corporate governance may be weakened, which in turn would increase the probability of financial distress.

C. Market indicators

For all of the market indicators, data originally reported on a daily basis are converted to a quarterly basis. For instance, if financial bankruptcy occurs on May 2, 2000, the model adopts data for one quarter ahead; that is, all market information is collected between February 2nd , 2000 and May 1st for the average level or change rate.

11. Stock price volatility change

Generally speaking, stock price is a leading indicator of a company's fundamentals. Hence, a change in stock price may reveal the efficiency of market information. A greater change in stock price volatility may imply that the company's operations are not in good shape or that a special interest group has deliberately raised the price. From the perspective of the Merton model, the more volatile the stock price is, the higher is the default probability of the company.

To calculate change in stock price volatility, first of all, daily returns are collected and further generated on the basis of the standard deviation of specific quarters. Finally, we compare that with the previous three-quarter volatility average. The rationale for choosing three quarters is to obtain one-year data.

12. Stock turnover change rate

Turnover refers to the frequency of buy and sell. Stock with a relatively high stock turnover change rate shows that that specific stock is highly liquid. Trading volume represents investors' willingness to be involved in the stock market. In the context of a technical analysis, "quantity" is the leading indicator for "price". Hence, a relatively high volume should be a signal that deserves more attention. Here, the stock turnover change rate is not only compared with that of the previous three quarters but also takes industry differences into consideration. If a specific company's turnover is higher than the average level of companies in the same industry, it implies that that company is likely in distress.

13. Leverage balance for the long position by individual investors

Only individual investors can leverage for the long position in the stock market. Thus, this indicator can easily assess the behavior of individual investors. When leverage volume (balance) increases, it indicates that individual investors expect a good future for a specific stock; otherwise, the leverage volume would decline. Here, leverage balance is defined as amount of leverage the previous day plus today's increase minus cash repayment.

14. & 15. Usage ratio of leverage for the long (short) position by individual investors

A relatively high usage ratio of leverage for the long (short) position means that individual investors are expecting a bull (bear) market. Since December 6, 2004, the Taiwan Stock Exchange has enacted a new regulation: companies are set into warning stocks if the following conditions are satisfied --the ratio of short and long position is higher than 20%; the usage ratio of leverage for the long position is over 25%; and the usage ratio of leverage for the short position is over 15%. Here, the usage ratio of leverage for the long (short) position is defined as leverage balances for long (short) against a limitation quota, which refers to 25% (15%) of outstanding stock.

Variables 16, 17 and 18 are the rate of change in foreign investor shareholding, dealers' shareholding, securities investment and trust companies' shareholding, respectively.

Empirical Analysis

Analysis of Descriptive Statistics

Table 1 presents the descriptive statistical analysis by source of the announcement of distress, i.e., by the authority or by a newspaper. It is found that the ratios for distressed companies are significantly worse than those for healthy ones. More specifically, among the financial ratios, the mean of return on assets is -9.75% for distressed companies (announced by the authority) but 0.54% for healthy companies (columns 1 and 3, respectively). Net worth growth rates are -62.30% and 1.73%; the cash flow ratios are 1.26% and 7.53%; and the debt ratios are 73.23% and 44.59%.

As concerns the corporate governance indicators, the differences between distressed and healthy companies when announced by the authority are more obvious for two ratios, in particular. One is the shareholding ratio of the board and directors, and the other is the stock pledge ratio. The former are 13.48% and 21.96%, whereas the latter are 38.20% and 18.94%, respectively.

With regard to the market indicators, distressed companies, of course, perform worse than healthy ones. For instance, when announced by the authority, the stock price volatility change rate is higher (1.21% vs. 1.02%); the usage ratio of leverage for the short position by individual investors is considerably larger (4.43% vs. 0.39%). And, securities investment trust companies prefer to trade the stocks of healthy companies more frequently (change rate is 13.96% for distressed companies but a somewhat surprising 62.17% for healthy ones).

Since the authority's announcement date is behind the newspaper release date by more than one week up to even three years, even more striking and significant differences emerge when we consider the statistics based on the financial distress announcements released by newspapers. For example, the cash flow ratio for distressed companies goes from 1.26% to -2.24%; the sales growth rate shifts from 10.13% to -2.00%. As for the stock pledge ratio, distressed companies change from 38.20% to 45.06%. Concerning the market indicators, the leverage balances for distressed companies are even more than twice as high as those for healthy ones (38,676 vs. 15,763). Similarly, the usage ratio of leverage for the long position by individual investors is markedly larger (42.93% vs. 18.91%). Therefore, individual investors are in the long position right before a newspaper announces a company's financial distress, which implies that individual investors suffer the most financially.

Empirical Results of the Logistical Models

Before the logistical regression is conducted, the Variance Inflation Factor (VIF) is tested. The VIF for all variables is less than 10,[9] except for the variables related to institutional investors, such as dealers, securities investment trust companies and foreign investors, due to the problem of missing data. For this reason, the variables related to institutional investors are omitted from the following logistical models.

Financial Distress Announced by the Authority

Table 2 to Table 4 present the empirical results of the logistical models for one

quarter and one to three years (presented by quarter) before the financial distress was announced by the authority. According to Table 2, in models where market information is added, the accuracy of model prediction is improved, as reflected inan increase in the R-square value and a decrease in Type I error. The accuracy ratio even reaches 90.6%, which is much higher than that reported in previous literature, such as Lee and Yeh (2004). On the question of financial ratios, both return on assets and debt ratio are at a consistent significant level. The coefficient of return on assets is negative, while the debt ratio is highly positive, which match our expectations. As for the corporate governance variables, only the stock pledge ratio shows a significantly positive coefficient with financial distress, which confirms the finding of Lee and Yeh (2004).

On the level of market indicators, the stock price volatility rate shows a significantly positive correlation with company distress, which coincides with our expectation. However, change in the stock turnover rate indicates an undesirable negative coefficient two quarters before a company's bankruptcy. One reasonable explanation for this is that the financial distress news announced by the authority is actually far behind the date of release in the newspaper. This means market investors are all well aware of the information; that is that a specific stock is in danger. As a result, either investors seldom trade the specific stock or they trade in the short position. This expectation is further supported by the positive coefficient of the usage ratio of leverage for the short position, showing a higher probability of a company going bankrupt.

The return on assets, the debt ratio, the stock pledge ratio and the usage ratio of leverage for the short position still remain significant. Beyond Table 3, some phenomena are explored; for example, the change in the stock turnover rate enters a significantly positive level.[10] Similarly, the shareholding ratios of large shareholders and managers show a significantly negative coefficient, which would imply *ceteris paribus* that before financial distress, the company's insiders decreased their shareholdings. Thus, observing the shareholding ratios of large shareholders and managers might also be advised since they could also serve as good indicators of a company's long-term prospects.

Financial Distress Released by Newspapers

Unlike Tables 2 & 3, Tables 4 & 5 show the empirical results for financial distress released by newspapers. It should be noted that the accuracy rate reaches an overwhelming 85.9% one quarter before the release, the highest level in all models. Even the models with three quarters, 8 quarters (two years) and 12 quarters (three years) outperform the results which use the authority's announcements of financial distress.

As for the performance of the financial ratios and corporate governance variables, it is interesting that all the results remain the same as those using the authority announcement dates as the definition of distress. Nevertheless, with respect to the market indicators, three different, yet important, results are found. First, change in the stock turnover rate favorably changes from a significantly negative level to a positive one. Secondly, and equally salient, the usage ratio of leverage for the long position becomes significantly positive, which indicates that individual investors are still expecting a good future for companies that are headed toward bankruptcy. Thirdly, though the usage ratio of leverage for the short position remains positive, it is not significant.

Conclusions and Policy Implications

One major contribution that this study makes to this line of research is that it empirically tests whether the timely market information can improve the predictive power of corporate distress using Taiwan as the example. Two announcement dates of financial distress are explored. One is the officially announced date by the Taiwan Stock Exchange, while the other is the date the news is announced by the press. 52 companies that fell into financial distress between 1990 and 2005 are examined.

We find through our empirical research that the models where market information is added do improve the accuracy of its predictions. As for the financial ratios, the most robust indicator is the debt ratio; the higher the debt ratio is, the more likely it is that there is financial distress. Of particular interest here is that the sales growth rate appears

significantly negative as early as one quarter before distress. This may imply that the sales growth rate is easily manipulated.

Regarding the corporate governance variables, only the stock pledge ratio shows a significantly positive coefficient with financial distress. This result again confirms the research finding of Lee and Yeh (2004). Furthermore, there is strong evidence that the shareholding ratios of large shareholders and managers are good long-term indicators of a company's future.

On the market indicators, since the financial distress news from the authority is actually announced far later than that from newspapers, market investors are in the short position, which is indicated by the positive coefficient of the usage ratio of leverage for the short position.

The individual performance of the financial ratios and corporate governance variables all remain the same whether we use the announcement dates of the authority or of the press. For the market indicators, on the other hand, three different results are found. First, the stock turnover change rate shifts from a significantly negative level to a positive one. Secondly, the usage ratio of leverage for the long position becomes significantly positive, implying individual investors are still expecting a good future for companies which are about to be bankrupt. Thirdly, though the usage ratio of leverage for the short position is a positive coefficient, it is not significant. This study also finds that the empirical results for financial distress released by newspapers outperform the model using the authority's date of announcing financial distress.

The implication for investors in Taiwan is that they should continue to take serious note of information released by companies and newspapers. That is, there is evidently no need to wait for announcements from the TSE. Investors should also carefully compare the relevant variables which are provided in this study before making decisions vis-à-vis investments. And, just as important, the implication for the authority is that this study should enable them to perform a better, more efficient role by screening fewer indicators. That is, they should monitor the specific indicators conducted in this study.

date released by a newspaper ▪▪▪▪▪ date announced by the authority
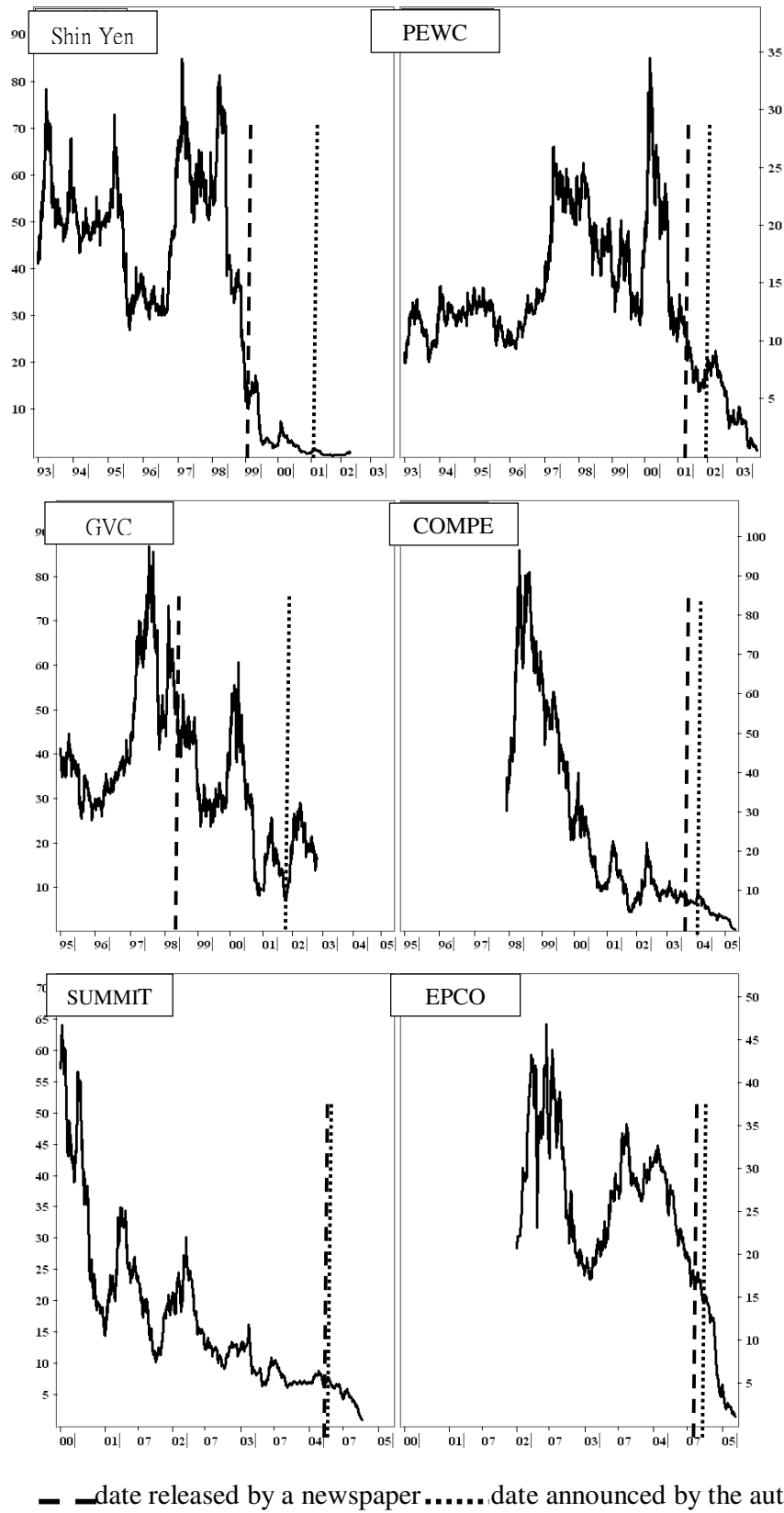
Fig1 Stock Price Trends for Financially Distressed Companies (Unit：NTD)

— date released by a newspaper   ⋯⋯ date announced by the authority
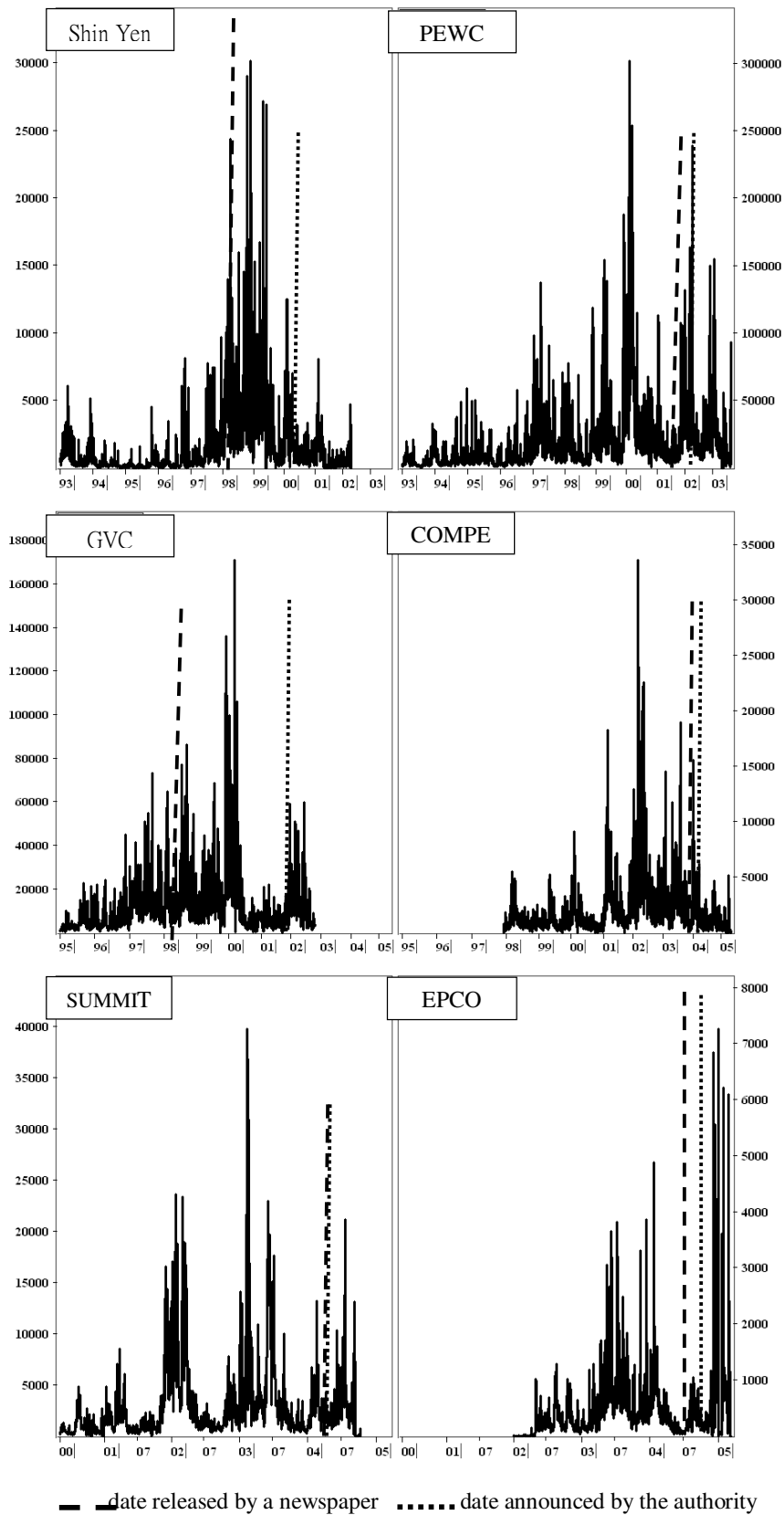
Fig 2   Stock Trading Volume Trends for Financially Distressed Companies   (Unit：Thousand Shares)

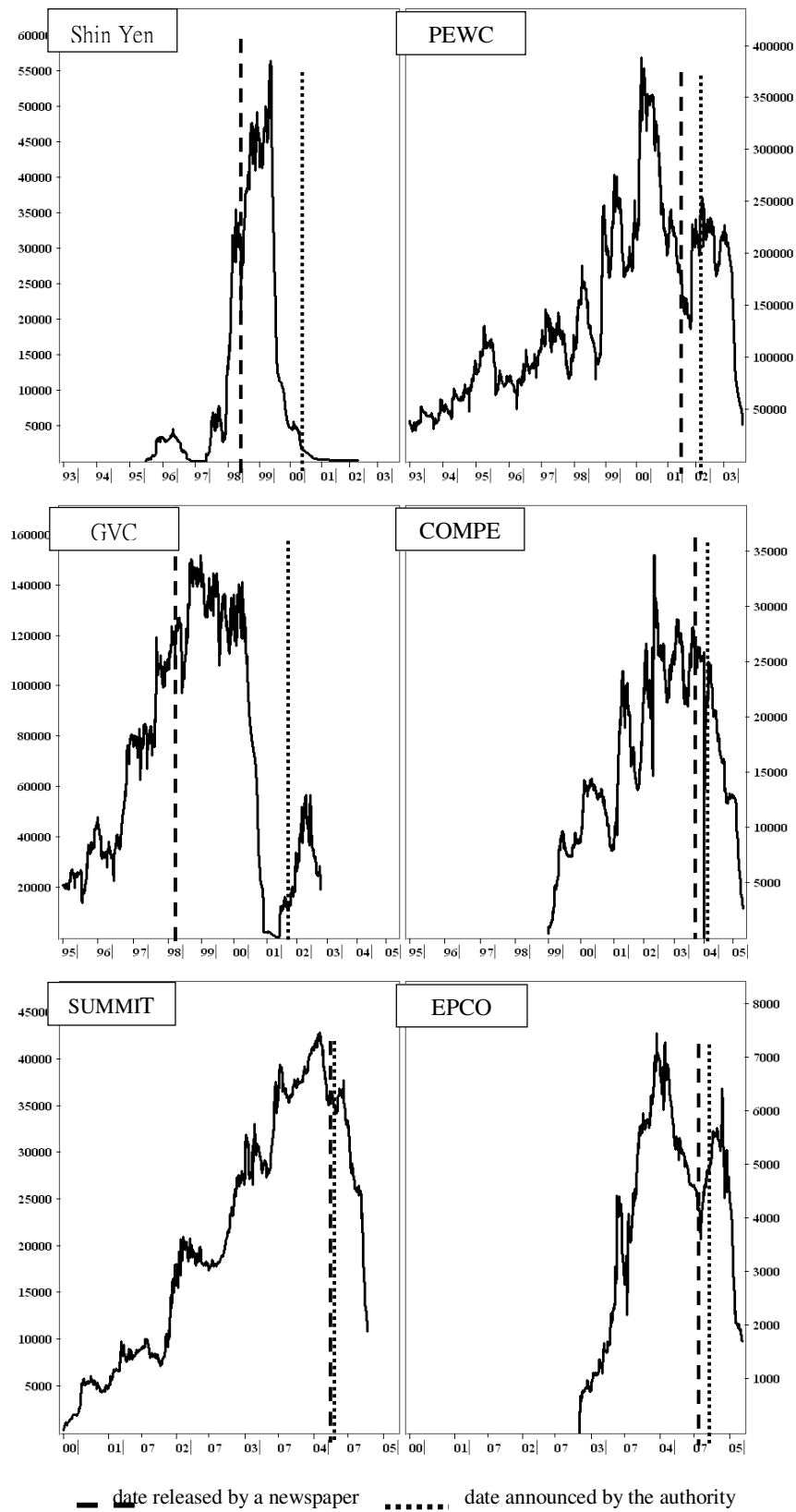— date released by a newspaper   ▪▪▪▪▪▪ date announced by the authority

Fig 3 Leverage Volume for Long Position by Individual Investors for Distressed Companies (Unit：Thousand Shares)

Table 1: Mean difference test of the financial ratios, corporate governance variables and market information between distressed and healthy firms one-? quarter before the financial distress **announced by the authority** *&* **released by a newspaper**

	Distressed firms		Healthy firms		t-statistics	
	announced by the authority	released by a newspaper	announced by the authority	released by a newspaper	announced by the authority	released by a newspaper
A Financial ratios						
Return on assets	-9.75	-10.52	0.54	5.11	4.55***	4.67***
Net worth growth rate	-62.30	-28.71	1.73	-0.24	3.74***	4.28***
Cash flow ratio	1.26	-2.24	7.53	8.51	1.87*	3.18***
Debt ratio	73.23	65.27	44.59	46.48	-7.94***	-6.10***
Turnover frequency of total assets	0.11	0.11	0.17	0.20	2.31**	2.87***
Sale?s growth rate	10.14	-1.99	5.67	19.32	-0.18	1.52
B. Corporate governance variables						
Shareholding ratio of large shareholders	1.28	2.23	1.76	23.25	0.52	-0.76
Shareholding ratio of managers	0.545	0.58	0.86	0.72	1.5	0.83
Shareholding ratio of of the board?s and directors	13.48	15.94	21.96	21.81	3.96***	2.91***
Stock pledge ratio	38.20	45.06	18.94	12.16	-3.06***	-4.54***
C. Market indicators						
Stock price volatility change rate	1.21	1.20	1.02	1.05	-2.82***	-3.24***
Stock turnover change rate	118.43	106.99	81.57	99.33	-1.20	-1.32
Leverage balances for the long position by individual investors	25734.69	38676.56	18437.26	19763.74	-0.03	-2.69***
Usage ratio of leverage for the long position by individual investors	33.96	42.93	24.00	18.91	-1.84*	-3.88***
Usage ratio of leverage for the short position by individual investors	4.429	3.78	0.39	9.05	-3.63***	-3.45***
Change rate of foreign investor shareholding	95.23	102.15	138.25	143.61	0.81	0.70
Change rate of dealers shareholding	89.82	137.30	88.72	100.93	-0.01	-0.70
Change rate of securities investment trust companies shareholding	13.96	15.13	62.17	106.18	2.34**	2.35**

Note: ***, ** and * indicate significance at the 1%, 5% and 10% level, respectively.

Table 2: Regression coefficients of the logistical models- one quarter before the financial distress is announced by the authority

Constant	-6.081*** (10.012)	-10.696*** (9.839)	-6.151*** (9.820)	-8.283*** (9.050)	-8.661*** (9.837)	-13.631*** (11.744)	-9.268*** (18.3376)
A Financial ratios							
Return on assets	-0.2354 (3.732)	-0.3091* (5.287)	-0.2384 (3.704)	-0.1872 (2.097)	-0.1690 (1.796)	-0.2882* (3.033)	-0.2124 (2.272)
Net worth growth rate	-0.0021 (0.016)	0.0070 (0.964)	-0.0016 (0.0132)	0.0016 (0.0125)	-0.0011 (0.0057)		
Cash flow ratio	-0.0678 (1.8530)	-0.0090 (0.0236)	-0.0703 (1.9448)	-0.0706 (1.5980)	-0.0632 (1.3059)	0.0703* (2.7748)	0.0211 (0.105)
Debt ratio	-0.0678 (1.8530)	-0.0090 (0.0236)	-0.0703 (1.9448)	-0.0706 (1.5980)	-0.0632 (1.3059)	0.1400*** (12.285)	0.1228*** (15.178
Turnover frequency of total assets	-4.7796 (1.9044)	-5.6884 (2.6739)	-4.4290 (1.5880)	-5.0551 (1.3572)	-5.3310 (1.3164)		
Sales growth rate	0.0009 (0.1006)	0.0012 (0.1396)	0.0012 (0.1514)	-0.0030 (0.2681)	-0.0022 (0.1298)		
B. Corporate governance variables							
Shareholding ratio of large shareholders	-0.0577 (0.3753)	-0.1088 (1.6431)	-0.0527 (0.3082)	-0.0905 (0.4818)	-0.0749 (0.3430)		
Shareholding ratio of managers	-0.1137 (0.2394)	-0.0509 (0.0435)	-0.1385 (0.3507)	-0.1457 (0.2855)	-0.1627 (0.3808)		
Shareholding ratio of the boards and directors	-0.0331 (1.1848)	-0.0274 (0.6722)	-0.0334 (1.2065)	-0.0311 (0.5093)	-0.0215 (0.2553)		
Stock pledge ratio	0.0332** (6.0359)	0.0386*** (6.8046)	0.0344** (6.2024)	0.0322** (3.9082)	0.0332** (4.6407)	0.0443*** (7.5913)	0.0354*** (7.5434)
C. Market indicators							
Stock price volatility rate		3.1476* (3.1835)				3.0121* (3.6230)	
Stock turnover change rate			-0.0113 (0.2360)			-0.00335 (1.7510)	
Leverage for the long position				0.0000 (0.1577)			
Usage ratio of leverage for the long position					0.0154 (0.5712)	-0.0127 (0.2311)	
Usage ratio of leverage for the short position						0.4672** (4.8395)	0.3407* (2.8885)
Concordant ratio (%)	82.5	81.4	82.3	80.2	81.2	**88.1**	**90.6**
Type I Error (%)	22.22	22.22	20.00	23.08	23.68	10.53	10.53
Type II Error (%)	13.46	15.38	15.69	17.02	14.89	13.04	8.51
R^2	0.5633	0.5784	0.5631	0.5887	0.5901	0.6143	0.5926

Note: Values in parentheses are chi-square values; ***, ** and * indicate significance at the 1%, 5% and 10% level, respectively.

Table 3: Summary of the coefficients between variables and financial distress <u>announced by the authority</u>

Quarter (s)	Expect	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12
A Financial ratios													
Return on assets	-	-	-*	-**	-**	-*	-	-	-	-	-	-	-
Cash flow ratio	-	+	-	-	-	-	-	-	-	-	-	-	-
Debt ratio	+	+***	+***	+***	+***	+***	+***	+***	+***	+***	+***	+***	+***
B. Corporate governance variables													
Stock pledge ratio	+	+***	+***	+**	+***	+***	+***	+*	+***	+***	+***	+***	+***
C. Market indicators													
Usage ratio of leverage for the short position	+	+*	+**	+	+*	+	+	+*	+	+	+	+	+**
Concordant ratio (%)		**90.6**	82.4	87.0	**87.4**	79.4	78.8	79.8	69.8	71.1	69.1	69.2	65.8
Type I Error (%)		10.53	23.26	13.64	13.33	21.28	22.45	19.15	35	32.5	35.90	33.33	36.11
Type II Error (%)		8.51	12.5	12.5	12	20	20	21.28	26.09	25.58	26.19	28.21	32.43
R^2		0.5926	0.5339	0.5422	0.5290	0.4707	0.4582	0.4676	0.2904	0.3089	0.3675	0.3457	0.3424

Note:

1. ***, ** and * indicate significance at the 1%, 5% and 10% level, respectively.

2. Numbers in bold indicate that the values are higher than the results of Lee and Yeh (2004).

Table 4: Regression coefficients of the logistical models-one quarter before the financial distress is released by a newspaper

Constant	-6.8690*** (9.4688)	-9.1117*** (8.1875)	-6.1509*** (9.8197)	-8.2830*** (9.0502)	-8.6612*** (9.8372)	-13.462*** (13.0925)	-8.7383*** (16.3989)
A Financial ratios							
Return on assets	-0.2517** (4.1339)	-0.2393* (3.5985)	-0.2381* (3.7035)	-0.1872 (2.0972)	-0.1685 (1.7959)	-0.1685* (2.7519)	-0.2169** (3.9841)
Net worth growth rate	0.0142 (1.0853)	0.0174 (1.4394)	-0.0016 (0.0132)	0.0016 (0.0125)	-0.0011 (0.0057)		
Cash flow ratio	-0.0314 (0.9519)	-0.0279 (0.7290)	-0.0703 (1.9448)	-0.0706 (1.5980)	-0.0632 (1.3059)	-0.0204 (0.4209)	-0.0106 (0.1211)
Debt ratio	0.1329*** (12.9317)	0.1353*** (12.3129)	0.0998*** (9.9526)	0.1388*** (10.6675)	0.1372*** (10.8209)	0.1249*** (11.7875)	0.1046*** (11.7050)
Turnover frequency of total assets	-7.6935* (3.3789)	-6.0930 (2.3132)	-4.4290 (1.5880)	-5.0551 (1.3572)	-5.3310 (1.3164)		
Sales growth rate	-0.0027 (0.4473)	-0.0413 (0.9243)	0.0012 (0.1514)	-0.0030 (0.2681)	-0.0022 (0.1298)		
B. Corporate governance variables							
Shareholding ratio of large shareholders	-0.0514 (0.4287)	-0.0407 (0.2296)	-0.0527 (0.3082)	-0.0905 (0.4818)	-0.0749 (0.3436)		
Shareholding ratio of managers	-0.0257 (0.0107)	-0.1396 (0.2630)	-0.1385 (0.3507)	-0.1457 (0.2855)	-0.1627 (0.3808)		
Shareholding ratio of the boards and directors	-0.0698** (4.9240)	-0.0644** (4.0297)	-0.0334 (1.2065)	-0.0311 (0.5093)	-0.0215 (0.2553)		
Stock pledge ratio	0.0442*** (7.9874)	0.0458*** (8.0731)	0.0334** (6.2024)	0.0322** (3.9082)	0.0332** (4.6407)	0.0576*** (12.8792)	0.0525*** (15.5219)
C. Market indicators							
Stock price volatility rate		1.6866 (1.2986)				2.6238* (2.7618)	
Stock turnover change rate			-0.0011 (0.2360)			0.00977 (1.4087)	
Leverage for the long position				0.0000 (0.1577)			
Usage ratio of leverage for the long position					0.0154 (0.5712)	-0.0130 (0.2985)	
Usage ratio of leverage for the short position						0.5860 (1.8931)	0.5560* (2.8719)
Concordant ratio (%)	80.8	80.8	82.3	80.2	81.2	85.9	84.8
Type I Error (%)	23.40	21.28	20.00	23.08	23.68	13.95	13.95
Type II Error (%)	15.38	17.31	15.69	17.02	14.89	14.29	16.33
R^2	0.5772	0.5826	0.5631	0.5887	0.5901	0.5953	0.5752

Note: Same as Table 2.

Table 5: Summary of the coefficients between variables and financial distress released by a newspaper

Quarter (s)	Expect	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12
A Financial ratios													
Return on assets	-	-*	-*	+***	-**	-	+	-	-**	-	-	-	-**
Cash flow ratio	-	-	-	-	+	+	-	-*	-*	-	+	+	-
Debt ratio	+	+***	+***	+***	+***	+***	+**	+***	+***	+***	+***	+***	+**
B. Corporate governance variables													
Stock pledge ratio	+	+***	+***	+***	+***	+***	+**	+**	+**	+**	+***	+*	-
C. Market indicators													
Stock price volatility rate	+	+*	-	-***	+*	-	-	+	+	-	+	-	-
Stock turnover change rate	+	+	+	-*	-*	-	+**	+*	+	+	-	-	-
Usage ratio of leverage for the long position	-	-	+**	+***	+***	+***	+**	+*	+**	+**	+	+*	+
Usage ratio of leverage for the short position	+	+	+	+	+	+	+	+	+	+	+	+	+
Concordant ratio (%)		85.9	77.1	**89.0**	76.6	77.5	75.0	79.8	**74.7**	68.9	67.2	**72.1**	**68.9**
Type Ⅰ Error (%)		13.95	25	13.04	21.28	20	23.91	22.73	24.39	29.73	34.48	25.81	32
Type Ⅱ Error (%)		14.29	20.83	8.89	25.53	25	26.09	17.78	26.19	32.43	31.25	30	30
R^2		0.5953	0.5015	0.6133	0.5032	0.5020	0.4860	0.5512	0.4672	0.3970	0.4083	0.3952	0.4942

Note:

1.　　Same as Table 3.

2.　　Numbers in bold indicate that the values are higher than those in Table 3.

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Notes

1. Altman (1968) proposed the Z- score model of bankruptcy prediction, which has since proven to have predictive abilities and has aided management in the early prevention of financial distress.

2. http://www.sfb.gov.tw/statistics/point/9504/t16.xls.

3. Six firms are chosen as the sample, namely Shin Yen Textile Co. Ltd., a textile company; Pacific Electric Wire & Cable Co. Ltd., a cable company;   Summit Computer Technology Co. Ltd., Pco Technology Co. Ltd. and GVC Corporation Co. Ltd. all electronic firms and Compex International Co. Ltd. which belongs to the other classification.

4. Lo (1986), p. 151.

5. Stickney (1996), p. 510.

6. Altman, Marco, and Varetto (1994), p. 505

7. For instance, Klapper and Love (2004) adopt the questionnaire data completed by Credit Lyonnais analysts which covers firm-level corporate governance rankings across 14 emerging markets. They find that better corporate governance is highly correlated with better operating performance and market valuation.

8. See Lee and Yeh (2004) for more details.

9. If the Variance Inflation Factor (VIF) is greater than 10, it indicates that there is a serious collinear problem.

10. The results are not reported here but are available upon request.

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