



Can the Street Information Improve the Corporate Distress Diagnosis? Evidence from Taiwan

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Abstract: Most studies adopt the definition of financial distress announced by the authority. However, it is observed in Taiwan, that bankruptcy information is generally released by the media well ahead of its release by the authority. The delay period lasts averagely for three quarters and even last for six quarters over the half sample. Thus, if a prediction model traces the official default date one year back, the information may tell very little. To the best of our knowledge, no one has previously discussed whether the default date chosen by the literature is suitable or not. This paper fills this gap.

The evidences show that the accurate ratio for predicting the first signal of financial distress (released by the press) reaches to a level of 89%, higher than the ability to predict the second signal (announced by the authority) under the same time basis. Furthermore, companies go through the first signal of financial distress, their average stock pledge ratio is 45.06%; however, it decreases to 38.20% right before the formal distress. It implies that banks will withdraw their loans once the financial distress signs and further worsen the financial conditions of companies. Therefore, this study can provide more policy implications.

JEL classification: G14, G33, O16.

Keywords: Financial distress, market information, corporate governance, early warning system

1. Introduction

The development of empirical models that successfully discriminated between failing firms and the surviving firms started in the mid 1960s. The pioneer research can be traced back to Beaver (1966) and Altman's (1968) who work in business failure classification. Previous studies have focused on discussion regarding econometric methods used (such as Lo 1986; Shumway 2001; Altman et al. 1994; and see Brockett et al. 2006 for more details), financial variables selections (Ohlson 1980; Zavgren 1985; Beaver et al. 2005 etc.), corporate governance effect (Johnson et al. 2000; Claessens et al. 2002 ; La Porta et al. 2002; Lemmon and Lins 2003; Lee and Yeh 2004), and including market data to improve forecasting accuracy (such as Berger et al. 2000; Evanoff and Wall 2000; Flannery 1998 and 2001; Gunther et al. 2001; Curry et al. 2002 and 2003; Gropp et al. 2006; and Distinguin et al., 2006), and more.

This paper extends the previous studies by considering the effect of default date. Earlier studies choosing the default date typically based on the availability of data sources, which is usually the official announcement date by the corporate or by the government authority, including suspending the trading of such securities, delisting from the exchange, confirmation of bankruptcy by any court, confirmation of reorganization, and record of refusal of financial institutions to transact with the company. However, the distressed information of corporate, such as the distressed exchange of an obligation and failure to make timely payments of interest or principal etc., 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. Once this first announcement date is released by the media, the corporate is struggled to survive. However, in our sample, none of them succeed. Thus, once the first distressed news is released, firms tend to default formally later.

Previous studies overwhelmingly use financial ratios to predict the official announcement date, which is referred to the second default date here. Under this circumstance, the success of predicting the firm's default adds little value to practical world because investors and creditors relying on the media have already known the information. It is the first default date that is crucial for investors and creditors. Furthermore, after the first default date, the stock price drops. If the distressed firms will financially default in the near future, there is no need to predict the default probability of the second default date.

The aim of this study is to investigate whether the financial ratios can successfully predict the default of firms using the first default date. Our paper contributes to the literature in three aspects. The first contribution is that it considers two dates as the announcement date for corporate distress: one is the date which is reported in the press, and the other is the officially announced date by the Taiwan Stock Exchange. The latter is a straightforward definition and has commonly been adopted in previous studies. However, it is worth noting that rather than do nothing until that information is officially announced, investors in Taiwan tend to react to the relevant information as soon as any bankruptcy news is reported in the media. For example, the stock pledge ratio under the first signaling is 45.06%; however, it decreases to 38.20% one-quarter before officially announced date. It implies that banks will withdraw their loans once the financial distress signs and will further worsen the financial conditions of companies.

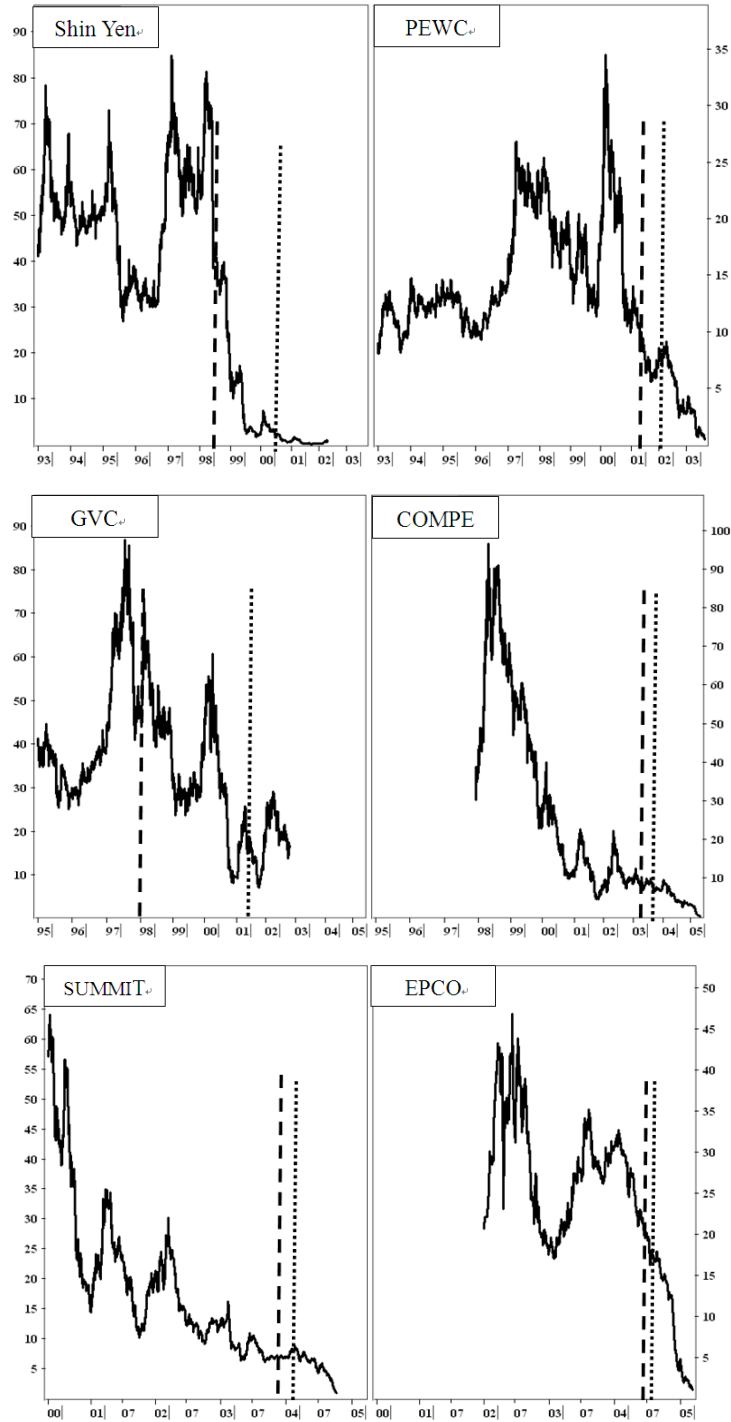
The second contribution that this study makes to the extant literature is that it explores whether timely market information as reported in the media improves the predictive power of corporate distress using Taiwan as an example.

The third contribution of this research is that it uses quarterly rather than annual data as this fully captures market information. Furthermore, in another departure from previous studies that mostly investigate a period of one year before the distress occurred, this study extends the study period to three years ahead to determine even earlier warning signs. One example that can be illustrated here is to demonstrate the advantage of using quarterly data. Chung-Hsing Textile company, for example, fell into distress owing to the “distressed exchange of an obligation (grace of debt)”. This information was reported by a newspaper on April, 2, 2001. If someone had used the company’s annual report one year previously, according to Article 36 of Taiwan’s Securities and Exchange Act, the 2000 annual report would not have been released until April 30. Nevertheless, using quarterly data can remedy the disadvantage of relying on the annual report. Furthermore, it was not officially announced that the Chung-Hsing Textile company was in distress until May 6, 2004; three years after the news became known.

The remainder of this paper is structured as follows. The next section presents a more extensive review of the literature, which 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 reached and discuss some important policy implications.

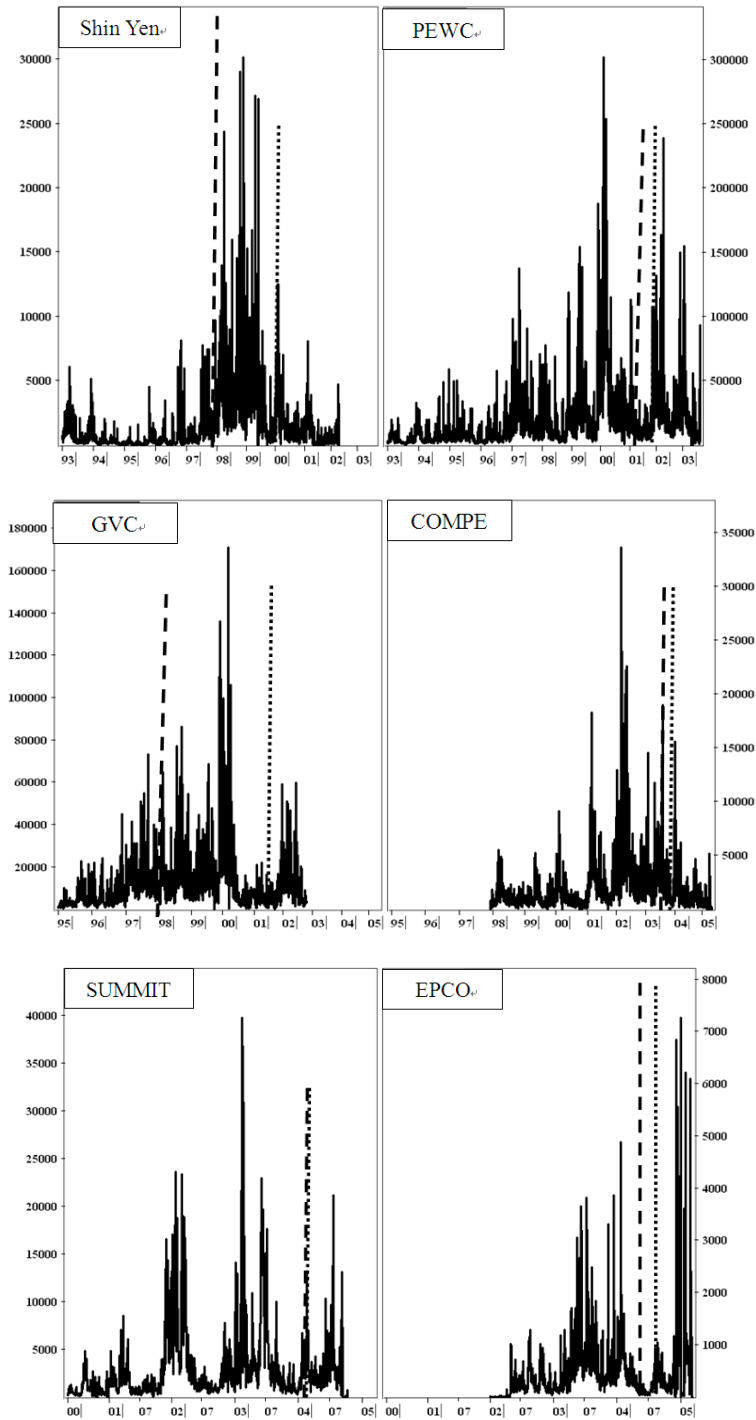
Fig. 1

Stock Price Trends for Financially Distressed Companies (Unit: NTD)



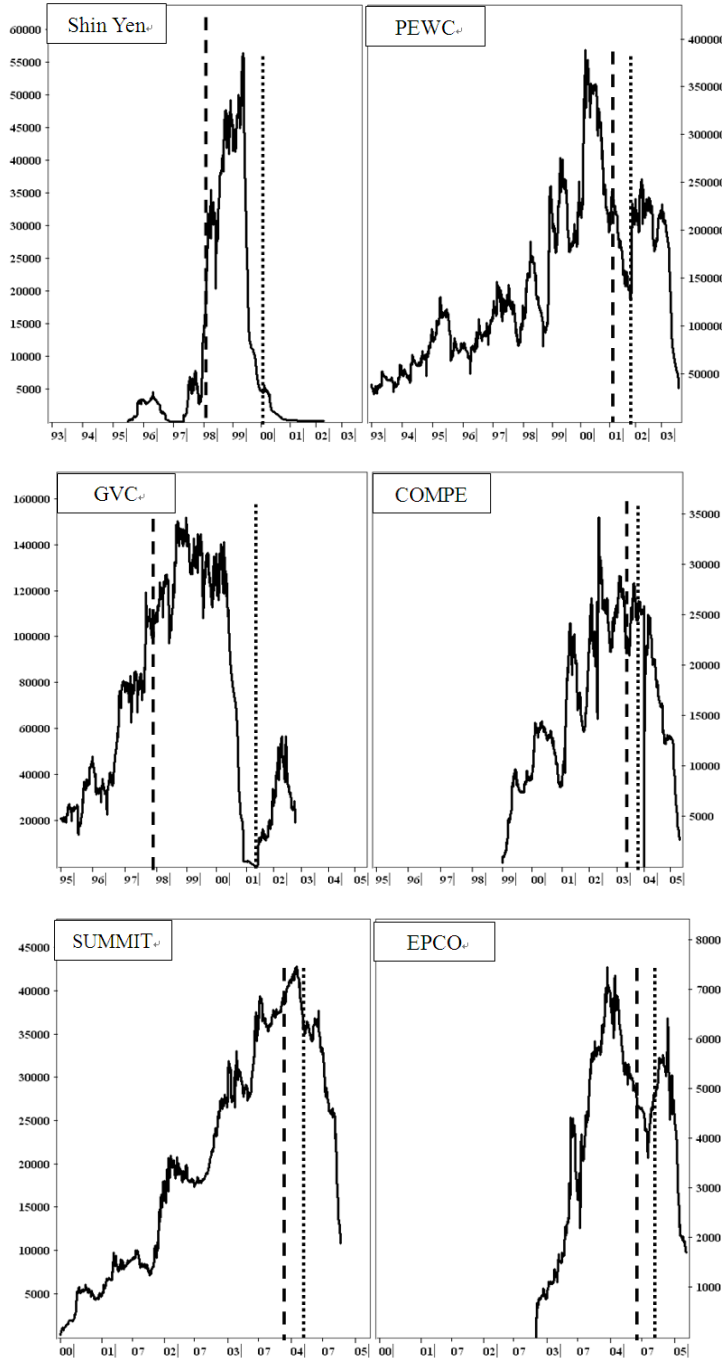
— date revealed by a newspaperdate announced by the authority

Fig. 2
Stock Trading Volume Trends for Financially Distressed Companies (Unit: Thousand Shares)



— — date revealed by a newspaper ······ date announced by the authority

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



— date revealed by a newspaper date announced by the authority

2. Hypothesis Development

2.1 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 the 6 financial ratios he selected from among 29, he concluded that the best predictive variable was cash flow against total debt, followed by the debt ratio and return on assets.

Altman (1968) proposed the well-known and 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 the turnover 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.

Ohlson (1980) and Zavgren (1985) later introduced a logit model that corrected for this problem, and their models are considered "more robust". Further, logit analysis actually yields the probability (in terms of a percentage) of bankruptcy, and the probability calculated might be considered to be 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. More recently, logit analysis has been compared to a more advanced analytical tool, namely, neural networks. Research has found that the two approaches perform similarly.¹ However, by any measure, neural networks do not require and neither produces any rules nor construct a black box model with which to generate the learned information. For this reason, neural networks have not proved to be very convincing.

2.2 Corporate Governance Variables

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

¹ Altman, Marco, and Varetto (1994), p. 505.

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

Lee and Yeh (2004) found that firms with weak corporate governance are vulnerable to economic downturns and that the probability of their falling into financial distress increases. They adopted three variables to proxy for corporate governance risk, namely, the percentage of directors controlled by the controlling shareholder, the percentage of the controlling shareholders' shareholding pledged for bank loans (the pledge ratio) and the deviation of control away from cash flow rights. Their results suggest that the greater the deviation in control rights from cash flow rights, the more that directors and supervisors are controlled by the largest shareholder and the higher the stock pledge ratio, the greater the likelihood that the firm will experience financial distress in the following year.

Recently, Chia-Hsin Food and Synthetic Fiber Co., Ltd., one of Taiwan listed companies, applied for reconstruction due to the financial crisis it experienced on Jan. 4, 2007. Weak corporate governance was blamed as the main reason for the distress. Therefore, including the variables for corporate governance is essential in this study.

2.3 Market Indicators

All corporations operate under governance systems designed to reduce agency problems among shareholders, debt-holders and managers. Most importantly, the ability of various principals to obtain timely and accurate information regarding 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 supervisory ratings. In studying U.S. banks, Berger et al. (2000) suggested that, in terms of predicting future changes in performance, supervisory assessments are generally less accurate than either stock or bond market indicators. Gunther et al. (2001) showed that the inclusion of a market indicator, such as expected default frequency, improves the predictive power of a model that is based on accounting ratios and CAMEL ratings. Along similar lines, Curry et al. (2003) demonstrated 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. However, they find that this predictive power is only significant for banks in the greatest financial distress.

In examining European banks, Gropp et al. (2006) compared the properties of stock markets and subordinated debt data as early indicators. They also showed that beyond the information conveyed by a composite score variable based on accounting data, the equity market-based distance to default significantly improves predictions up to an 18-month time horizon. Distinguin et al. (2006) specified a logit early-warning model which they used to test if market-based indicators add predictive value to models that rely on accounting data. Furthermore, they confirmed 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 employed market variables to explore the role of supervision in the banking industry (Beaver et al. 2005), such a practice is still not so common in the field of corporate governance, except for Claessens et al. (1999), as mentioned earlier. Therefore, this study intends to answer the questions as to whether timely market information can improve the diagnosis of corporate distress.

3. Data and Methodology

3.1 Sample

This study collects data for Taiwanese listed companies that encountered financial distress between January 1990 and September 2005, together with a matching sample consisting of companies considered to be in good shape during the same period. Financial distress is defined as either in two ways. The first relates to 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 percent margin. Article 211 of the Company Law also specifies that a loss of more than half of a company's capital stock is one of the conditions of bankruptcy. Thus, we also include companies that are traded at the 100 percent 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 over a longer period, in this study, the data are collected for the three-year period before the occurrence of 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 entails high risk. Moreover, the data set is further constrained by adopting quarterly data, which is discussed in more detail shortly. 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. All the above conditions limit the matching principle to a one-to-one basis. 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 date reported in the press, while the second is the officially announced date given by the Taiwan Stock Exchange. The latter is a straightforward definition and has commonly been adopted in previous studies. However, rather than do nothing until the information is officially announced, investors tend to quickly react to relevant information whenever any bankruptcy news appears in the media. According to our sample, the main reasons behind financial distress that are reported in newspapers are (1) the distressed exchange of an obligation (grace of debt), 42.30% of the sample; (2) failure to make timely payments of interest and/or principal under the contractual terms of any financial obligation, 28.84%; (3) the CPA's going concern issue, 15.38%; and (4) reorganization filings, 9.61%. The delay period lasts averagely for three quarters and even for six quarters over the half sample. Furthermore, in order to fully capture such market information, this study adopts quarterly and not just annual, data.

3.2 Methodology and Operating Variables

Our econometric model is a logistic model with the dependent variable being equal to one if a company fallen into distress and zero otherwise.

$$Y_{jt} = F(\beta_0 + \alpha_1 \text{Financial}_{jt-1} + \alpha_2 \text{CG}_{jt-1} + \alpha_3 \text{Market}_{jt-1} + \varepsilon_{jt-1})$$

where j is the j th company in Taiwan; t ranges from 1990 Q1 to 2005 Q4; and F denotes the logistic function used here. A company is classified as failed when $Y_{jt} = 1$, and as non-failed (normal) when $Y_{jt} = 0$.

Financial refers to financial ratios, such as return on assets, net worth growth ratio, cash flow ratio (Beaver 1966), debt ratio, turnover frequency of total assets, sales growth rate (Beaver 1966; Altman 1968; Ohlson 1980; Zavgren 1985; Beaver et al. 2005 etc.).

CG denotes corporate governance variables, namely, shareholding ratio of large shareholders, shareholding ratio of managers, shareholding ratio of the board and directors, and stock pledge ratio (Johnson et al. 2000; Claessens et al. 2002; La Porta et al. 2002; Lemmon and Lins 2003; Lee and Yeh 2004).

Market represents market indicators, namely, stock price volatility change, stock turnover change rate, leverage balance for the long position by individual investors, and usage ratio of leverage for the long (short) position by individual investors (Berger et al. 2000; Evanoff and Wall 2000; Flannery 1998 and 2001; Gunther et al. 2001; Curry et al. 2002 and 2003; Gropp et al. 2006; and Distinguin et al., 2006).

4. Empirical Results

4.1 Descriptive Statistics

Table 1 presents the descriptive statistical analysis based on the source of the announcement of the 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 the 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 for the corporate governance indicators, the differences between distressed and healthy companies when announced by the authority are more obvious for two of the ratios, in particular. One is the shareholding ratio of the board and the 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. Worth noting is

that the stock pledge ratio under the first signaling is 45.06%; however, it decreases to 38.20% under the officially announced distress. It implies that banks will withdraw their loans once the financial distress signs.

Table 1

Mean difference test between distressed and healthy firms one quarter before the financial distress is announced by the authority and revealed by a newspaper

| | Distressed firms | | Healthy firms | | t-statistics | |
|--|----------------------------|-------------------------|----------------------------|-------------------------|----------------------------|-------------------------|
| | Announced by the authority | Revealed by a newspaper | Announced by the authority | Revealed by a newspaper | Announced by the authority | Revealed 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*** |
| Sales 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 the board 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 investors' 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% levels, 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%); and the usage ratio of leverage for the short position by individual investors is considerably larger (4.43% vs. 0.39%). Furthermore, securities investment trust companies prefer to trade the stocks of healthy companies more frequently (the 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 and even up to 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 changes from 1.26% to -2.24%, while the sales growth rate shifts from 10.13% to -2.00%. As for the stock pledge ratio, for distressed companies this changes from 38.20% to 45.06%. As regards 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.

4.2 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 10,² 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 subsequent logistical models.

4.3 Financial Distress Announced by the Authority

We first report the estimated results using the distressed dated announced by the authority. Tables 2 to 5 present the empirical results of the logistical models for one quarter and one to three years (presented by quarter) before the financial distress, whereas Table 6 and Table 7 provide the results for one year before the

² If the Variance Inflation Factor (VIF) is greater than 10, it indicates that there is a serious collinearity problem.

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

As for the level of market indicators, the stock price volatility rate exhibits a significantly positive correlation with company distress, which coincides with our expectation. However, a 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 the news released by the press. This means that market investors are all well aware of the information; i.e., that a specific stock is in danger. As a result, investors will either seldom trade the specific stock or they will trade in the short position. This expectation is further supported by the positive coefficient of the usage ratio of leverage for the short position, which reveals a higher probability of a company going bankrupt.

Table 3 summarizes the signs of the coefficients of the model using one quarter to 12 quarters (three years) lag of the financial distress. It appears that the return on assets, the debt ratio, the stock pledge ratio and the usage ratio of leverage for the short position still remain significant. Nevertheless, the change in the stock turnover rate enters a significantly positive level.³ Similarly, the shareholding ratios of large shareholders and managers exhibit a significantly negative coefficient, which would imply *ceteris paribus* that prior to 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.

³ The results are not reported here but are available upon request.

Table 2**Regression coefficients of the logistical models- one quarter before the financial distress 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 board 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 |
| Pseudo 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% levels, respectively.

Table 3

Summary of the coefficients between variables and financial distress announced by the authority

| Lag Quarter (s) | Expect | Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Q7 | Q8 | Q9 | Q10 | Q11 | Q12 |
|--|--------|-------------|--------|--------|-------------|--------|--------|--------|--------|--------|--------|--------|--------|
| A Financial ratios | | | | | | | | | | | | | |
| Return on | - | - | _* | _** | _** | _* | - | - | - | - | - | - | - |
| Cash flow ratio | - | + | - | - | - | - | - | - | - | - | - | - | - |
| Debt ratio | + | +*** | +*** | +*** | +*** | +*** | +*** | +*** | +*** | +*** | +*** | +*** | +*** |
| B. Corporate governance variables | | | | | | | | | | | | | |
| Stock pledge | + | +*** | +*** | +** | +*** | +*** | +*** | +* | +*** | +*** | +*** | +*** | +*** |
| C. Market indicators | | | | | | | | | | | | | |
| Usage ratio of leverage for the short position | + | +* | +** | + | +* | + | + | +* | + | + | + | + | +** |
| Concordant | | 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 |
| Pseudo 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. Same as Table 2.

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

4.4 Financial Distress Revealed by Newspapers

We next report results using financial distress dates released by newspapers. Tables 4 and 5 show the empirical results. Three interesting differences are found. First, using financial distress dates released by newspapers the accuracy rate, which is measured as $[100\% - (\text{Tier I} + \text{Tier 2})/2]$, encouragingly outperforms the results based on the authority's announcements of financial distress. For example, as mentioned earlier, the lagging period between two dates which are released by the press and announced by the authority, lasts averagely for three quarters and even last for six quarters over the half sample. Thus, under the same time basis, the accurate ratio for predicting the first signal of financial distress (released by the press) before three quarters ahead reaches to a level of 89% (Table 5). However, under the same time basis, the same ratio adopting the distress dates announced by the authority should trace ahead three quarters or even six quarters, which drops significantly to 78% or 71% (Table 3). Therefore, it is evidenced that successfully predicting the first signal of financial distress is necessary and feasible through this study.

Table 4**Regression coefficients of the logistical models-one quarter before the financial distress revealed 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 board 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 |
| Pseudo R ² | 0.5772 | 0.5826 | 0.5631 | 0.5887 | 0.5901 | 0.5953 | 0.5752 |

Note: Same as Table 2.

Next, with respect to the market indicators, the change in the stock turnover rate favorably changes from a significantly negative level to a positive one. The results become more consistent with our institution. Third, a finding that is 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, although the usage ratio of leverage for the short position remains positive, it is not significant.

Table 5

Summary of the coefficients between variables and financial distress revealed by a newspaper

| Lag Quarter (s) (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 |
| Pseudo 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.

5. Conclusions and Policy Implications

One major contribution that this study makes to this line of research is that it considers two dates as the announcement date for corporate distress: one is the date which is reported in the press, and the other is the officially announced date by the Taiwan Stock Exchange. The second 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 an example.

Table 6**Regression coefficients of the logistical models- one year before the financial distress announced by the authority**

| | | | | | | | |
|--|-------------------------|------------------------|------------------------|-------------------------|-------------------------|------------------------|-------------------------|
| Constant | -5.3788*** (10.9697) | -5.0973*** (8.4673) | -4.8192*** (8.3179) | -6.6888*** (11.5255) | -8.6099*** (13.8551) | -6.3153*** (8.1814) | -7.5028*** (19.1131) |
| A Financial ratios | | | | | | | |
| Return on assets | -0.4245** (6.6249) | -0.4338** (6.6294) | -0.4304*** (6.8693) | -0.4424** (6.2357) | -0.4589** (6.1455) | -0.3660** (5.1504) | -0.3335** (4.9961) |
| Net worth growth rate | 0.0303** (5.7155) | 0.0311** (5.7318) | 0.0307** (5.5339) | 0.0329** (5.2823) | 0.0195 (1.5172) | | |
| Cash flow ratio | -0.0263 (1.3574) | -0.0275 (1.4518) | -0.0182 (0.6050) | -0.0280 (1.4204) | -0.0206 (0.7052) | -0.0308 (1.3108) | -0.0365 (2.6125) |
| Debt ratio | 0.0924*** (13.1467) | 0.0952*** (12.6475) | 0.0924*** (12.5938) | -0.1064*** (13.0052) | -0.1168*** (12.9696) | 0.1050*** (13.9918) | 0.0986*** (15.2770) |
| Turnover frequency of total assets | 1.8502 (0.4367) | 1.9485 (0.4690) | 1.3019 (0.2182) | 3.0964 (1.0237) | 0.7490 (0.0554) | | |
| Sales growth rate | -0.0373 (0.5571) | -0.0041 (0.5341) | -0.0035 (0.4430) | -0.0311 (0.4807) | -0.0032 (0.2917) | | |
| B. Corporate governance variables | | | | | | | |
| Shareholding ratio of large shareholders | -0.0373 (0.4404) | -0.0403 (0.5008) | -0.0366 (0.4158) | -0.0358 (0.3502) | -0.0292 (0.1915) | | |
| Shareholding ratio of managers | -0.2572 (2.1311) | -0.2530 (2.1111) | -0.2335 (1.8231) | -0.2742 (2.0275) | -0.1522 (0.7356) | | |
| Shareholding ratio of the boards and directors | -0.0281 (1.4264) | -0.0269 (1.2887) | -0.0234 (0.8829) | -0.0231 (0.8647) | -0.0041 (0.0235) | | |
| Stock pledge ratio | 0.0328** (10.0571) | 0.0336*** (10.0704) | 0.0326*** (9.5229) | 0.0336*** (8.4047) | 0.0382** (9.8552) | 0.0413*** (9.9880) | 0.0391*** (11.1995) |
| C. Market indicators | | | | | | | |
| Stock price volatility rate | | -0.4987 (0.1830) | | | | -1.0700 (0.4734) | |
| Stock turnover change rate | | | -0.0064 (1.4801) | | | -0.0087 (1.3815) | |
| Leverage for the long position | | | | 0.0000 (0.8063) | | | |
| Usage ratio of leverage for the long position | | | | | 0.0439*** (7.0327) | 0.0151 (0.6610) | |
| Usage ratio of leverage for the short position | | | | | | 3.2266** (4.3379) | 3.6633*** (10.7386) |
| Concordant ratio (%) | 74.8 | 69.6 | 73.3 | 72.6 | 77.9 | 83.0 | 87.4 |
| Type I Error (%) | 25.49 | 32.00 | 28.00 | 28.89 | 20.00 | 22.22 | 13.33 |
| Type II Error (%) | 25.00 | 28.85 | 25.49 | 26.00 | 24.00 | 12.24 | 12.00 |
| Pseudo R ² | 0.4515 | 0.4481 | 0.4524 | 0.4634 | 0.5053 | 0.5431 | 0.5290 |

Note: same as Table 2.

Table 7**Regression coefficients of the logistical models-one year before the financial distress released by a newspaper**

| | | | | | | | |
|--|------------------------|------------------------|------------------------|-------------------------|-------------------------|-------------------------|-------------------------|
| Constant | -4.0465*** (9.7537) | -4.8118*** (9.4012) | -4.8192*** (8.3179) | -6.6888*** (11.5255) | -8.6099*** (13.8551) | -8.3296*** (11.9902) | -3.7012*** (11.4358) |
| A. Financial ratios | | | | | | | |
| Return on assets | -0.3537** (5.1453) | -0.3616** (5.3108) | -0.4304*** (6.8693) | -0.4424** (6.2357) | -0.4589 (6.1455) | -0.4234** (6.1904) | -0.3240** (5.8694) |
| Net worth growth rate | 0.0195* (3.1269) | 0.0209* (3.4801) | 0.0307** (5.5339) | 0.0329** (5.2823) | 0.0195 (1.5172) | | |
| Cash flow ratio | -0.0100 (0.3860) | -0.0107 (0.4392) | -0.0182 (0.6050) | -0.0280 (1.4204) | -0.0206 (0.7052) | 0.0088 (0.2552) | -0.0157 (1.1846) |
| Debt ratio | 0.0761*** (12.4138) | 0.0771*** (12.4069) | 0.0924*** (12.5938) | 0.1064*** (13.0052) | 0.1168*** (12.9696) | 0.0873*** (11.3286) | 0.0580*** (8.5352) |
| Turnover frequency of total assets | 1.4421 (0.2799) | 1.3258 (0.2347) | 1.3109 (0.2182) | 3.0964 (1.0237) | 0.7490 (0.0554) | | |
| Sales growth rate | -0.0018 (0.7375) | -0.0019 (0.9669) | -0.0035 (0.4430) | -0.0031 (0.4807) | -0.0321 (0.2917) | | |
| B. Corporate governance variables | | | | | | | |
| Shareholding ratio of large shareholders | -0.0253 (0.2615) | -0.0243 (0.2433) | -0.0366 (0.4158) | -0.0358 (0.3502) | -0.0292 (0.1915) | | |
| Shareholding ratio of managers | -0.0855 (0.2853) | -0.0814 (0.2538) | -0.2335 (1.8231) | -0.2742 (2.0275) | -0.1522 (0.7356) | | |
| Shareholding ratio of the boards and directors | -0.0342 (2.4779) | -0.0365* (2.7694) | -0.0234 (0.8829) | -0.0231 (0.8647) | -0.0041 (0.0235) | | |
| Stock pledge ratio | 0.0286*** (10.0777) | 0.0278*** (9.3461) | 0.0326*** (9.5229) | 0.0336*** (8.4047) | 0.0382*** (9.8552) | 0.0347*** (10.2680) | 0.0259*** (9.8420) |
| C. Market indicators | | | | | | | |
| Stock price volatility rate | | 0.7765 (0.8402) | | | | 2.1028* (2.8859) | |
| Stock turnover change rate | | | -0.0064 (1.4801) | | | -0.0118* (2.7777) | |
| Leverage for the long position | | | | 0.0000 (0.8063) | | | |
| Usage ratio of leverage for the long position | | | | | 0.0439*** (7.0327) | 0.0558*** (11.8590) | |
| Usage ratio of leverage for the short position | | | | | | 0.1177 (0.5700) | 0.2720 (2.4304) |
| Concordant ratio (%) | 68 | 67 | 73.3 | 72.6 | 77.9 | 76.6 | 74.5 |
| Type I Error (%) | 32.00 | 34.00 | 28.00 | 28.89 | 20.00 | 21.28 | 27.66 |
| Type II Error (%) | 32.00 | 32.00 | 25.49 | 26.00 | 24.00 | 25.53 | 23.40 |
| Pseudo R ² | 0.3722 | 0.3781 | 0.4524 | 0.4634 | 0.5053 | 0.5032 | 0.3507 |

Note: same as Table 3.

The evidence shows that the accurate ratio for predicting the first signal of financial distress (released by the press) reaches to a level of 89%, higher than the ability to predict the second signal (announced by the authority) under the same time basis. Thus, this study evidences that successfully predicting the first signal of financial distress is necessary and feasible. Moreover, the stock pledge ratio under

the first signaling is 45.06%; however, it decreases to 38.20% under the officially announced distress. It implies that banks will withdraw their loans once the financial distress signs and further worsen the financial conditions of companies. Thus, the extant literature adopting official default date as their event date is too late for investors to react. And using the financial distress date released by the press, the accuracy ratios encouragingly outperform the results based on the authority's announcements of financial distress with models lagging a longer period.

Furthermore, this study exhibits 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 the occurrence of the distress. This may imply that the sales growth rate is easily manipulated. Regarding the corporate governance variables, only the stock pledge ratio exhibits a significantly positive coefficient with financial distress.

The implication emerged from this study, is that investors 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 that are provided in this study before making decisions vis-à-vis investments. Furthermore, and just as important, the implication for the authority is that this study should enable them to perform a better and more efficient role by screening fewer indicators presented in this study.

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