

# “Research on the common characteristics of firms in financial distress into bankruptcy or recovery”

## AUTHORS

Ma-Ju Wang  
Heng-Ruei Shiu

## ARTICLE INFO

Ma-Ju Wang and Heng-Ruei Shiu (2014). Research on the common characteristics of firms in financial distress into bankruptcy or recovery. *Investment Management and Financial Innovations*, 11(4-1)

## RELEASED ON

Monday, 15 December 2014

## JOURNAL

"Investment Management and Financial Innovations"

## FOUNDER

LLC “Consulting Publishing Company “Business Perspectives”



NUMBER OF REFERENCES

0



NUMBER OF FIGURES

0



NUMBER OF TABLES

0

© The author(s) 2025. This publication is an open access article.

Ma-Ju Wang (Taiwan), Heng-Ruei Shiu (Taiwan)

## Research on the common characteristics of firms in financial distress into bankruptcy or recovery

### Abstract

This paper uses the Cox regression model in survival analysis to investigate whether factors that affect the financial distress among listed and OTC (over-the-counter) firms in the emerging Taiwan market will continue to influence the probability of bankruptcy/delisting or recovery. The results show that the variables of liquidity, profitability, capital structure and corporate governance have significant differences in their level of influences among the three models. When cash and cash equivalent holdings are lower, the ratio of independent directors is lower, the control rights deviation level is smaller, the company is not a family-owned business, and then the probability of financial distress is higher. A high debt level increases the chance of bankruptcy/delisting. In the case of higher outsider shareholdings or more control rights deviation, the probability of bankruptcy/delisting or recovery is lower. More excess cash does not necessarily help the firm resume operations. The average stock returns of recovered firms significantly outperform the market index in the following two years. Industry classification and being a family-owned business have no influence on the chance of bankruptcy/delisting or on that of recovery. Moreover, the period from the occurrence of financial distress to the bankruptcy/delisting (to recovery) is about 18 (23) months.

**Keywords:** financial distress, bankruptcy and delisting, recovery, survival analysis, Cox regression.

**JEL Classification:** G32, G33, G34.

### Introduction

When a company experiences financial distress, operating conditions may deteriorate, heavy financial burdens become commonplace, and an overall negative atmosphere permeates the company environment. If the company allows the situation to continue and to worsen, bankruptcy may become a reality, market shares decline, and shareholders lose everything. However, if the company takes appropriate steps to remedy the financial conditions and to improve operations, it can recover and experience a resurgence. Typically, a return of stock to normal trading leads to a company's financial recovery in the capital market and thus contributes to balancing the scheduling demands with respect to future operating expenses and investments. A return to the capital market is the basis for the long-term, stable operation of companies. The fact is that when companies are faced with financial distress, some will experience bankruptcy, and some will experience a rebirth. What are the differences between the characteristics of the company that experiences bankruptcy and the company that experiences revitalization?

Past studies about financial distress often define financial distress as being identical to bankruptcy and delisting (bankruptcy/delisting) (e.g., Beaver, 1966; Altman, 1968; Ohlson, 1980; Campbell et al., 2008). With regard to regulations, the Taiwan Stock Exchange (T.W.S.E.) has established a change trading system. Shares of listed companies facing operational difficulties or financial distress will be classified as full delivery shares. This action

reminds investors of the delisting risk of such shares. It also warns the listed company to take active measures to address its current predicament. This study views companies with full-delivery shares to be in financial distress.

The legal provisions regulating listed and OTC companies with full delivery as well as those facing bankruptcy/delisting differ substantially. From the perspectives of the company's insider financial and operational status, bankruptcy or delisting inflicts greater damage on the company compared to full-delivery status. Therefore, firms in financial distress and bankruptcy/delisted firms should be regarded as two different types of firms for discussion.

During this research period, 228 firms encountered financial distress. Although nearly half of the firms in financial distress declared bankruptcy and were delisted, some firms make a successful recovery, demonstrating the possibility of recovery. Studies related to recovery are relatively rare. This gap provides an opportunity to explore the characteristics of recovery of firms caught in financial distress. Survival analysis, which was originally used in the biotechnology field, and the Cox regression model have been applied to credit default or the nonconformance of production segments. We will apply survival analysis and the Cox model in the study.

The empirical study is divided into two stages. According to variables related to liquidity, profitability, capital structure, and corporate governance, we discuss whether the impact of the variables differs significantly between the two stages. During the first stage, all sample firms (including sound firms and firms in financial

distress) are used to explore factors affecting the occurrence of financial distress. During the second stage, focusing on sample firms in financial distress, we distinguish the sample firms in bankruptcy/delisting (in line with the compulsory delisting as provided by the T.S.E.) to explore whether the significant influencing factors of the occurrence of financial distress will similarly affect the bankruptcy/delisting chance of firms in financial distress. In addition, we differentiate sample firms with successful recovery from sample firms in financial distress (classified as shares of full delivery, but resumed in trading) to explore whether the significant influencing factors of financial distress may similarly affect a company's chance of recovery. The study excludes the firms still with full-delivery of the shares in the second stage.

According to the results of empirical studies, when there are more cash and cash equivalent holdings, the ratio of independent directors is higher, the control rights deviation level relative to cash flow rights is higher, and the company is a family-owned business, then the possibility of the occurrence of financial distress in stage I is lower. A high debt ratio is one of the main factors leading to bankruptcy/delisting in stage II. In the event of financial distress, independent directors may not be able to fully function; consequently, in the bankruptcy/delisting stage, when the ratio of independent directors is lower, the probability of bankruptcy is lower.

In the second stage, the results show that a higher outsider shareholdings ratio and higher control rights deviation level lead to a lower chance of bankruptcy/delisting and recovery. Both independent samples from financial distress to bankruptcy and from financial distress to the recovery, we find that the effects of explanatory variables don't necessarily have a mutually inverse relationship.

The empirical results suggest that the factors of industry type and being a family-owned business do not affect the probabilities of bankruptcy/delisting, nor do they affect the recovery in stage II. We analyze their stock returns and find that the stock returns two years after re-listing outperform the market return.

Different from the past research, this study is to clearly define the two stages of three different scenarios of firms-financial distress, bankruptcy/delisting, and recovery an approach that differs from the previous literature's analysis of firms in financial distress as a single group. In addition, this paper introduces the Cox regression model of the survival analysis of risk management to study how the factors affecting a company in financial distress during stage I may similarly affect the next bankruptcy/delisting or recovery in stage II. It

enhances the credibility of the research and analysis relative to other general statistic research models by considering the survival time factor.

## 1. Financial distress and recovery

The occurrence of financial distress may cause different levels of damage to a company in different situations. This phenomenon is related to the survival possibility and future reorganization of firms in financial distress. This paper argues that financial distress and bankruptcy/delisting should differ in both their definition and their level. Fich and Slezak (2008) and Turetsky and McEwen (2001) suggest that firms in distress and firms entering bankruptcy should be differentiated, as the influencing factors at different stages are not identical.

### 1.1. Variables that affect financial distress.

Beaver (1966) and Gombola et al. (1987) use cash flow and liquid assets to measure the impact of a company's liquidity on its financial distress and suggest that a company's liquidity and financial distress are negatively correlated. Altman (1968), Ohlson (1980), Kahya and Theodossiou (1999) argue that networking capital may also represent liquidity. Opler and Titman (1994) suggest that when financial distress occurs, a company's sales will be affected first, producing unexpected reductions and affecting the company's profits. Beaver (1966), Ohlson (1980), Gombola et al. (1987), and Beaver et al. (2005) use ROA (return on asset) to measure a company's profitability. Altman (1968), Ohlson (1980), and Campbell et al. (2008) indicate that debt ratios may be used to measure a company's solvency. Beaver (1966) and Beaver et al. (2005) suggest that the debt ratio is an important factor of the prediction of financial distress.

### 1.2. Corporate governance variables.

Li and Hsu (2010) find that a reduction in the number of independent directors reduces the monitoring of self-interested behavior by the firm's management. Donker et al. (2009) find that the management holding and outsider shareholding may effectively lower occurrence of financial distress. Since the self-interest of both the insider and outsider shareholders associated with firm value, there is a complimentary effect of diligent work and supervision (Cheung et al., 2011).

Anderson and Reeb (2003) find that family businesses are better than non-family businesses in terms of profitability and those family holdings may enhance monitoring mechanisms and increase investment efficiency (Ang et al., 2000). The findings overthrow the earlier generalization that excessive ownership concentration may easily lead to management inefficiency and potential conflicts of interest that cut company value (Shleifer and Vishny,

1997; Gomez-Mejia et al., 2001). As mentioned, there is no consistent conclusion from the analysis of family holdings in previous literature.

Lemmon and Lins (2003) use the ratio of control rights versus cash flow rights to measure extent of deviation. Masulis et al. (2009) note that management duality separates the share control rights and cash flow rights of the controlling shareholder. This phenomenon affects the use of company resources, which may have an adverse impact on shareholders, as managers could easily take advantage behaviors for their own interest.

**1.3. Recovered firms.** Few studies have discussed the recovery of firms in financial distress. Kahl (2002) reports that a firm's having more financial leverage will face more uncertainty with regard to access to creditors facilitating the firm's development. Kim and Kwok (2009) note that creditors and shareholders prefer different solutions when distress occurs. The shareholding ratio of management affects the decision to either file for bankruptcy/reorganization or to privatize.

Although several studies have discussed the choice of reorganization or liquidation in financial distress, no further discussion has been made. This paper attempts to explore the characteristics of firms that have recovered from financial distress.

**1.4. Financial distress and recovered company model.** Yeh et al. (2007) argue that although the logistic model is able to predict the chance of financial distress in the future, it cannot accurately predict the timing of the financial distress. Comparatively, survival analysis is able to predict survival probabilities at different points in time, allowing the company to take proper measures before or upon the occurrence of financial distress (Shumway, 2001). Cox (1972) adds the hazard functions of survival analysis into the sample independent variables in a regression model. The survival analysis model is also known as the Cox model or hazard model.

Kahya and Theodossiou (1999) and Shumway (2001) suggest that because firms' conditions change over time, the use of static models will result in errors. The Cox or hazard model improves on the shortcomings of the static model. Hillegeist et al. (2004) and Beaver et al. (2005) use survival analysis to predict the bankruptcy probability of a company. They find that the model has significant explanatory power (Cheng et al., 2010; Hwang, 2012). We adopt the Cox model for analysis. Because the timing of financial distress differs between companies, the model considers the time-varying covariate, which enhances the explanatory power.

**1.5. Establishment of hypotheses.** According to the literature review (Altman, 1968; Ohlson, 1980; Campbell et al., 2008), the research will focus on the factors that affect the occurrence of financial distress when new types of financial distress occur. For example, in 2001, Enron inflated profits on its financial statements and used fabricated earnings information to deceive its investors. Many studies have begun to add dummy variables to forecast the occurrence of financial distress regarding agency problems (Donker et al., 2009; Cheung et al., 2011).

During the recovery stage, a firm must address complex matters, including liabilities settlements, tax payments, and responses to the monitoring of relevant authorities as well as governmental regulations. Therefore, whether management is willing to continue company operations is of paramount importance. However, companies engaged in earnings management to manipulate earnings increase their moral hazard. Therefore, if companies assume a supervisory function, they will return to normal operations, and investors will not cause secondary damage. Hence, in this stage, it is necessary to incorporate the variables of corporate governance for observation, such as the mechanisms of independent directors and the outsider shareholding.

The variables of financial distress previously discussed in the literature may be divided into financial variables and corporate governance variables. The financial variables are represented by liquidity, profitability, and capital structure. Because most corporate governance variables are related to ownership structure and shareholder control, we discuss corporate governance variables, including the ratio of independent directors, insider shareholding ratio, outsider shareholding ratio, family member shareholding ratio, and ratio of control rights relative to cash flow rights.

A company in distress following bankruptcy/delisting may still recover. We observe that the influencing factors of a company and the extent of their influence on it will differ between stages. H-1 is proposed as follows:

*Hypothesis 1: The financial and corporate governance variables affecting the occurrence of financial distress are different from the variables affecting the occurrence of bankruptcy/delisting (recovery), and they have different levels of influence.*

This paper finds two special phenomena of data from Taiwan during the data compilation process. First, a considerable proportion of Taiwanese listed and OTC companies are family businesses. Second, in the Taiwanese stock market, the electronics industry represents over 50% of the total market. We explore whether the family business type and industry classification may affect the probability of bankruptcy/delisting or opportunities for recovery.

The sample data are classified into 19 categories by industry, according to the TEJ industrial classification, to distinguish the distribution of different samples in various industries. The electronics industry represents the largest proportion at 57%, followed by other major industries, such as the biomedical technology industry at 6.4%, the building materials and construction industry at 5.4%, the electro-mechanical machinery industry at 4.7%, the textile industry at 4.5%, the steel industry at 3%, the foodstuffs industry at 2.7% and the plastics industry at 2%.

In the sample data, the electronics industry and the electro-mechanical machinery industry are major export industries in Taiwan. Export industries are highly important for island countries. Firms in such industries have an average likelihood of encountering financial distress of 10%, a rate that is lower compared with other industries. However, once financial distress occurs in such firms, approximately 40% of these firms will be delisted, nearly 30% of which recovers.

The steel industry, the building materials and construction industry, the textile industry and the foodstuffs industry are traditional industries, which may be severely tested due to bottlenecks from industrial restructuring and labor-intensive features. The average percentage of firms caught in financial distress in traditional industries has risen by nearly 30%, and nearly 50% of such firms experience bankruptcy/delisting. The textile industry and the foodstuffs industry have a higher percentage of bankruptcy/delisting compared with the steel industry, the building materials industry, and the construction industry. The biomedical technology industry is a star industry that is increasing in popularity. Coupled with the considerable reputation of the Taiwanese medical industry and basic R&D in technology, this industry has boomed in recent years. The percentage of firms in this industry caught in financial distress is considerably low at 2.2%, and 100% of the firms caught in financial distress during the period recover. One may thus regard the industry as being promoted or supported by the government and faces considerable future development.

The sample descriptions show that the percentage of firms in financial distress, bankruptcy/delisting, or recovery vary greatly by industry. We argue that there are different characteristics among industries, leading to different probabilities of bankruptcy/delisting or recovery in the event of financial distress. H-2 is proposed as follows:

*Hypothesis 2: Different types of industries will affect the probability of bankruptcy/delisting (recovery) in the event of financial distress.*

As mentioned, there is no consistent conclusion from the analysis of family holdings in previous literature. On the one hand, family businesses cannot attract good talent to serve as professional managers, due to a lack of organizational transparency and the inability to evenly distribute interests (Shleifer and Vishny, 1997; Luis et al., 2001). On the other hand, family businesses are able to focus on their long-term interest without engaging in random speculative behaviors, and the family businesses may effectively use the monitoring effect to reduce agency cost (Ang et al., 2000; Anderson and Reeb, 2003). Until now, there is no definitive conclusion regarding the impact of being a family business on a firm's performance.

We find that a considerable percentage of listed and OTC companies are family businesses in the sample, which are less likely to encounter bankruptcy/delisting in case of financial distress and have a higher probability of recovery. H-3 is proposed as follows:

*Hypothesis 3: Being a family business affects the probability of bankruptcy/delisting (recovery) in the event of financial distress.*

## 2. Research design

The data source is the Taiwan Economic Journal database (TEJ), and the sample period spans from January 2000 to July 2011. This research excludes the finance, securities and insurance industries, because of their different operational features, financial and applicable regulations, and, removing firms that have dissolved due to mergers or other reasons unrelated to financial distress. This paper differentiates data on 228 firms in financial distress during the research period and then distinguishes between data on 101 firms going bankrupt, data of 83 recovered firms and data on 44 firms still with full-delivery stocks among firms in financial distress. These 44 sample firms are not included in later empirical research in this article.

**2.1. Variable selection.** The explanatory variables may be classified into the two categories of financial variables and corporate governance variables, which are variables selected by a company's current financial status and corporate governance, respectively, with reference to the relevant literature. The financial variables are categorized into liquidity, profitability, and solvency variables and include the following: cash and cash equivalents /liquid liabilities, liquid assets/total assets, net working capital/total assets, net profits/total assets, and total liabilities/total assets. Corporate governance variables are primarily concerned with the shareholding structure and the composition of the company's policymakers as well as their impact, including: family business (a dummy variable, where 1 denotes a family business; 0 otherwise); the seats of independent directors/the

total seats on the board of directors; the insider shareholding ratio; the outsider shareholding ratio; and the ratio of control rights to cash flow rights (the deviation level of control rights). In addition, regarding the control variables, firm size is measured by the natural log of the market value of equity. The dividend payout ratio is the cash dividends per share/earnings per share. The price-to-book ratio is the price per common stock/book value per share.

We explore the issues from a post-event point of view, focusing on the possibility of bankruptcy/delisting or recovery of firms caught in financial distress. The individual data are the average of the quarterly data prior to the date of financial distress, the date of bankruptcy/delisting, and the date of recovery. This paper uses the descriptive statistics of the data for 13 variables. The average results are shown in Table 1.

Table 1. Descriptive statistics of variables

Variables	Samples	Financial distress	Two years before bankruptcy/delisting	One year before bankruptcy/delisting	Two years before recovery	One year before recovery
Liquid variables						
Cash & C.E./liquid liabilities	0.7619	0.1676	0.0841	0.1334	0.3411	0.6016
Liquid assets/total assets	0.4318	0.2168	0.2354	0.1928	0.2864	0.4194
Net working capital/total assets	0.2725	-0.1047	-0.1490	-0.3644	0.0405	0.0570
Profitability variables						
Net profit/total assets	2.0313	-0.1373	-0.0586	-0.0980	-0.0504	-0.0419
Capital structure variables						
Total liabilities/total assets	0.3978	0.7258	0.7714	0.1073	0.5996	0.5781
Corporate governance variables						
Family business	0.6376	0.6930	0.6040	0.6040	0.7952	0.7952
Independent director ratio	0.1455	0.0821	0.0425	0.0439	0.1247	0.1214
Insider shareholding ratio	0.5042	0.3694	0.3694	0.3480	0.4994	0.5200
Outsider shareholding ratio	0.1184	0.1230	0.1083	0.1141	0.1312	0.1417
Deviation of control	0.0201	0.0252	0.0167	0.0159	0.0253	0.0244
Control variables						
Firm size	8.1423	5.9033	6.5086	5.7041	6.4158	6.4801
Cash dividends payment rate	3.4187	0.1185	0.2737	0.0748	0.4231	0.2487
Price-to-book ratio	1.7886	1.6040	1.7295	2.5067	1.4548	1.6946
Number of sample	1434	228	101	101	83	83

Notes: The table contains the data of all 1434 sample firms, including 228 firms in financial distress, 101 delisted firms, and 83 recovered firms during the period from January 2000 to July 2011. The column of samples is the total sample mean of the variables. We use data for the year of the distress, one year and two years prior to bankruptcy/delisting, and one year and two years before recovery to calculate the average values of the variables. The family business variable is a dummy variable, for which 1 denotes a family business and 0 otherwise.

In Table 1, in addition to the total samples, we classify the samples into the three categories: financially troubled firms, bankruptcy/delisting firms, and recovered firms, and the average values of the 13 variables in the categories of financial variables, corporate governance variables, and control variables are obtained. The data indicates that variables categorized as liquidity, profitability, capital structure and corporate governance variables have different characteristics at different stages. The data indicates that the debt ratios of firms in financial distress are undoubtedly higher.

The debt ratio of the entire sample in this study is approximately 40%. When a company falls into financial distress, the debt ratio increases to 73%. Furthermore, when a company enters bankruptcy and delists within two years, the debt ratio increases to 77%. In Taiwan, when the debt ratio exceeds 60%, the company is issued a red warning tag on

MOPS, which serves as a signal to investors. If the company strives to revive and works to decrease its debt ratio, then it is able to reduce it to approximately 58%. Accordingly, the debt ratio, which is regarded as an important indicator of the different stages of credit, affects the credit rating of the firm. Moreover, nearly 80% of the recovered firms are family businesses. Difference t-testing of the sample means for every two-stage set is performed to observe whether the variables have significant differences in different scenarios, and the corresponding results are presented in Table 2.

The mean differences, as shown in Column (1) of Table 2, suggest that firms with higher cash, liquid assets, net working capital and profitability and a higher ratio of independent shareholders and insider shareholding ratio as well as those that are not family-owned businesses are less likely to encounter financial distress. As shown in Column (2), the

significance of the difference between firms caught in financial distress and firms facing bankruptcy/delisting is slightly less. The previous literature has

often mixed the two categories of sample firms, but the two sets of firms have several differences and should be discussed separately.

Table 2. Variable average testing

Variables	All samples – financial distress (1)	Financial distress – bankruptcy/delisting (2)	Financial distress – recovery (3)	Bankruptcy/delisting – recovery (4)
Liquidity variables				
Cash & C.E./liquid liabilities	0.594***	0.0.34	-0.434**	-0.468**
Liquid assets /total assets	16.731***	1.249	-1.765**	-0.227**
Net working capital /total assets	0.377***	0.260***	-0.162***	-0.421***
Profitability variables				
Net profit/total assets	2.169***	-0.039**	-0.095***	-0.056***
Capital structure variables				
Total liabilities/ total assets	-0.328***	-0.241***	0.148***	0.388***
Corporate governance variables				
Family business	-0.055*	0.089*	-0.102***	-0.191***
Ratio of independent directors	0.063***	0.038***	-0.039***	-0.078***
Insider shareholding ratio	0.135***	0.021	-0.151***	-0.172***
Outsider shareholding ratio	-0.005	0.009	-0.019	-0.028*
Deviation of control against cash flow right	-0.781	0.009	0.001	-0.009
Control variables				
Firm size	2.239***	0.199	-0.577***	-0.776***
Cash dividends payment ratio	3.300***	0.044	-0.130	-0.174*
Price-to-book ratio	0.185	-0.903	-0.091	0.812

Notes: Mean difference *t*-testing of the variable data between the two samples is performed. The sample sets are the entire sample and those of the year of financial distress (1), the samples of the year of financial distress and one year before the bankruptcy/delisting (2), the samples of the year of financial distress and one year before recovery (3), and the samples of one year before the bankruptcy/delisting and one year before recovery (4). The amounts represent the mean difference at each stage, with \*\*\*, \*\*, and \* representing the 1%, 5% and 10% significance levels, respectively.

We find that a company with higher profitability, but lower net working capital, continues to face the risk of bankruptcy/delisting. The debt ratio of bankrupt firms is significantly higher. Companies that may recover must greatly reduce their debt ratio. In terms of corporate governance, family-owned companies that meet financial distress are less likely to meet bankruptcy/delisting. Independent directors control fewer seats between bankrupt and delisted firms. Once in financial distress or upon encountering bankruptcy/delisting, the companies that are family-owned, more independent directors, and more insider and outsider shareholdings, have a higher chance of recovery. As shown in Table 2, there are the most significant differences in the average of the financial variables and corporate governance variables in the different stages.

**2.2. Survival analysis and Cox model.** Survival analysis is better able than general static models to predict the timing of the occurrence of events, the probabilities of event occurrence at different points in time, and the timing of future survival. When the survival time *T* is beyond a certain time *t*, the survival rate represented by the survivor function is as follows:

$$S(t) = P(T \geq t) = 1 - P(T < t) = 1 - F(t) \tag{1}$$

The hazard function *h(t)* is the probability of the events occurring during the observation period. The relationship between the survivor function and the hazard function may be represented as follows:

$$S(t) = e^{-\int_0^t h(u)du} \Rightarrow h(t) = \frac{-S'(t)}{S(t)} \tag{2}$$

Cox (1972) adds independent variables to the hazard function of survival analysis and changes it to *h(t;x)*, forming the following regression equation:

$$h(t;x) = h_0(t) \exp \sum_{i=1}^n \beta_i \chi_i(t_i), \tag{3}$$

Where  $\chi_i(t_i)$  is an explanatory variable that influences hazard occurrence,  $\beta_i$  is the coefficient of the independent variables, and  $h_0(t)$  represents the baseline hazard function when  $t = 0$ . We run the following three regressions using equation (3) as follows:

Financial distress probability =  $h_1(t;x)$ , bankruptcy/delisting probability =  $h_2(t; x)$ , recovery probability =  $h_3(t; x)$ .

The Cox model uses the MLE (maximum likelihood estimation) method, which estimates parameter  $\beta$  based on the concept of conditional probability. Finally, we conduct a Log-Rank test to assess the fitness of the individual Cox models.

This study uses the Cox regression model of survival analysis to study whether influencing factors on financial distress may similarly affect the probability of bankruptcy/delisting or recovery.

### 3. Empirical analysis

**3.1. Survival time and censored data.** In survival analysis, this analysis focuses on the period from the occurring of financial distress to bankruptcy/delisting as the survival time. The recovery time is the period from the occurring of financial distress to the date of recovery, measured in months. Censored data regard the date of bankruptcy/delisting or the date of recovery as the date of the event. If there is any occurring of an event during the observation period, the company data are regarded as complete and are set as 1. Otherwise, the company data are regarded as censored data and are set as 0.

We find that the average survival period from the date of financial distress occurrence to the date of bankruptcy/delisting is approximately 18 months, whereas the average recovery period from the

occurrence of financial distress to recovery is approximately 23 months. The recovery time is longer than the survival time before the company enters bankruptcy/delisting.

**3.2. Cox regression analysis.** In stage I, we use all of the samples to analyze the influencing factors of the occurrence of financial distress. In stage II, we use the data one year prior to bankruptcy/delisting to predict the probability of bankruptcy/delisting and similarly use the data one year prior to recovery to predict the probability of recovery. The data consist of the average of the quarterly data around the date of the event. The results are summarized in Table 3.

As shown in Table 3, among the liquidity variables for stage I, the ratio cash and cash equivalents/liquid liabilities has a weak but significant negative effect on the occurrence of financial distress, as an increase of each unit of the variable may decrease the risk of distress occurrence by 0.331 times. The family business dummy variable has a negative influence, suggesting that financial distress is less likely to occur if the firm is a family business, as family-owned companies are better able to survive hardship with consistent interest in the event of crisis to reduce the agency problem and increase operational efficiency (Anderson and Reeb, 2003).

Table 3. Cox regression analysis

Independent variables	Stage I F.D.(1)	Stage II B/D(2)	Stage II Rec.(3)
Liquidity variables			
Cash and cash equivalents/liquid liabilities	-0.331*	2.441	-0.261*
Liquid assets/total assets	-0.861	-0.987	-0.996
Net working capital/total assets	-0.994	2.432	1.302
Profitability variables			
Net profit/total assets	1.622	1.309	-0.26
Capital structure variables			
Total liabilities/total assets	1.136	7.764**	-0.308
Corporate governance variables			
Family business	-1.193***	1.265	1.276
Independent director ratio	-0.423*	5.447*	4.996
Insider shareholding ratio	-0.717	1.612	1.772
Outsider shareholding ratio	1.890	-0.066**	-0.061**
Deviation of control	-0.842***	-0.106**	-0.110**
Control variables			
Firm size	-0.936	1.371***	1.244**
Cash dividends payment rate	-0.987	-0.965	2.362**
Price-to-book ratio	1.174	1.208*	1.000
Number of samples	228	101	83
$\chi^2_{LR}$	42.168***	25.515**	22.278*

Notes: The value, as shown in the table, is the result of adding the  $\beta$  coefficients into the index according to the Cox regression hazard ratio equation representing the times of risk increases in the case of an increase of each unit of the variable. Model (1) uses the samples in financial distress during Stage I. Model (2) uses the samples facing bankruptcy/delisting during Stage II. Model (3) uses the sample firms in recovery during Stage II. \*\*\*, \*\*, and \* representing the 1%, 5% and 10% significance levels, respectively.

Among the corporate governance variables, the independent director ratio has a significant negative

effect on the probability of financial distress. The establishment of independent directors may increase



financial transparency, reduce information asymmetry and enhance the supervision mechanism of the board of directors to reduce the occurrence of financial distress (Li and Hsu, 2010) and enhance the probability of recovery. On the other hand, when companies fall into financial distress, they face multiple pressures that may compound the possibility of a significant increase in moral hazard, a situation that clearly indicates the need for supervision at the company level. Therefore, when companies experience financial distress, the event should be regarded as a signal that the firm needs an independent director on its board to oversee activities. Struggling companies that enforce this policy and bring on an independent director increase the likelihood of revitalization.

Generally, when the control rights deviation level is higher, it is believed that the quality of corporate governance is poor. However, for a firm potentially facing financial distress, the results may differ; in this case, greater control rights may reduce the probability of financial distress.

In stage II, from financial distress to bankruptcy, the higher the debt ratio, the more likely to increase the probability of bankruptcy/delisting. A higher independent director ratio can increase the probability of bankruptcy/delisting in stage II. If a company has been in financial distress, independent directors may not be able to function fully. However, at the stage of bankruptcy/delisting, having more independent directors may lead to additional costs and conflicts during decision-making.

In this stage, an increase in the outsider shareholding ratio will result in motives to restrict and supervise management behavior to ensure the normal operations of the company, thus facilitating the reduction of the chance of bankruptcy/delisting (Donker et al., 2009). In the stage of financial distress, when the control rights deviation level is higher, the occurrence of financial distress is less likely, as empirical results suggest. And, in the stage of bankruptcy/delisting, a larger deviation of control may be conducive to the consistency of the controllers and shareholders, in terms of their interests, in turn increasing corporate value and reducing the probability of bankruptcy/delisting, a finding different from the conclusions of Masulis et al. (2009) and Lemmon and Lins (2003).

From financial distress to the recovery stage, excess cash has weak but significant negative effects. At the restructuring and recovery stage, investors are most worried about the company engaging in self-serving behaviors in the name of restructuring, although excess cash may help the company to address liquidity problems. According to these empirical results, in this stage, the incentive of self-serving motivation may have a greater influence than liquidity offer.

Among the sub-sample of recovered firms, an increase in outsider shareholdings may strengthen the supervision of the management, however, when a firm decides to restructure for recovery, outsiders might intervene in the strategies and goals of the restructuring and affect the process of recovery if the outsider shareholding ratio is higher.

In the recovery stage, the higher outsider shareholding ratio and control right deviation, the more firms unfavorable be resurrected, basing on our inferences on the negative effect, caused by involving with incentives governing self-interested behaviors among management authorities. Therefore, the management's willingness to run the company is closely related to the success of recovery. Both samples from financial distress to bankruptcy and from financial distress to the recovery are independent. We find that the effects of explanatory variables don't necessarily have a mutually inverse relationship.

According to the above empirical results, the influencing factors and degree leading to the result of insolvency or recovery are different from those affecting the likelihood of financial distress. Therefore, this study confirms H-1 as true.

**3.3. Survival analysis.** We use the survival analysis life table to discuss the number of samples and the survival ratios at different time periods in different stages, including from normal operation to financial distress and from financial distress to bankruptcy/delisting or recovery. The results are shown in Table 4.

In Table 4, the survival percentages at various intervals of Stage I is higher than those of Stage II. In addition, the survival ratio is higher than that of bankruptcy/delisting in Stage II. It is also found that a longer interval at various stages leads to a lower survival rate among the sample firms.

Table 4. Survival life of various stages

Interval start time	Stage I: Normal operating – financial distress		Stage II: Financial distress – bankruptcy/delisting		Stage II: Financial distress – recovery	
	Number of firms in interval	Cumulative survival ratio	Number of firms in interval	Cumulative survival ratio	Number of firms in interval	Cumulative survival ratio
0	228	0.93	101	0.48	83	0.66
12	213	0.85	48	0.32	55	0.35

Table 4 (cont.). Survival life of various stages

Interval start time	Stage I: Normal operating – financial distress		Stage II: Financial distress – bankruptcy/delisting		Stage II: Financial distress – recovery	
	Number of firms in interval	Cumulative survival ratio	Number of firms in interval	Cumulative survival ratio	Number of firms in interval	Cumulative survival ratio
24	194	0.79	32	0.18	29	0.23
36	179	0.72	18	0.08	19	0.12
48	164	0.63	8	0.02	10	0.06
60	143	0.47	2	0.01	5	0.04
72	107	0.36	1	0.01	3	0.02
84	81	0.27	1	0.01	2	0.01
96	62	0.17	1	0	1	0
108	39	0.09				
120	20	0.02				
132	5	0				

Notes: The interval start time column refers to the survival time of various stages, respectively, at an interval of 12 months. The number of firms in interval column refers to the number of existing firms during the period. The cumulative survival ratio column refers to the percentage of existing firms by the end of the interval.

**3.4. Kaplan-Meier statistics.** To explore whether the probabilities of bankruptcy/delisting and recovery are affected by the industry classification and business type, we use the Kaplan-Meier survival function to estimate the survival time and recovery time of two classification variables (1 and 0) in the case of different probability and then conduct the Log-Rank test to assess whether there is any significant difference in the probability of the two classifications (1 and 0) of the two groups of data. The research findings are summarized in Table 5.

As shown in Table 5, in the case of bankrupt and delisted firms, if the firm is classified as being in an emerging industry, there is a 75% chance of survival of at least 3.4 months. In either industry, a greater probability of bankruptcy/delisting implies a shorter survival time of the sample firms observed. In the case of recovered firms, regardless of what industry, a greater probability of recovery implies a longer recovery time among the sample firms observed. Furthermore, the industry classification is found to have an insignificant effect on the probability of bankruptcy/delisting or recovery.

Table 5. Industry classification and business type

Class/probability	Industry						Family					
	Bankruptcy/delisting			Recovery			Bankruptcy/delisting			Recovery		
	25%	50%	75%	25%	50%	75%	25%	50%	75%	25%	50%	75%
1	24.80	10.07	3.40	8.07	2.28	24.30	31.50	10.07	3.20	6.07	15.97	31.87
0	32.63	12.23	3.20	5.90	4.87	39.93	29.13	10.43	4.13	12.07	15.87	30.10
$\chi^2_{LR}$	0.049			2.150			0.002			0.113		

Notes: The left part of this table illustrates the industry type. A class variable value of 1 is held by 94 firms in emerging industries, and a value of 0 is held by 62 samples in traditional industries. The values in the table are the estimated survival time and recovery time of types 1 and 0 for different probabilities and are measured by month. The right part of this table illustrates the family business type. A class variable value of 1 represents the 158 sample family business firms, and a value of 0 represents the 70 sample firms of the non-family business type. \*\*\*, \*\*, \* represent the 1%, 5% and 10% significance levels, respectively.

Similarly, in the analysis of the effects of being a family business, in the case of the samples of bankrupt and delisted firms, if the firm is classified as a family business, there is a 75% chance of survival of at least 3.2 months. The business type is found to have an insignificant effect on the probability of bankruptcy/delisting or recovery. Therefore, H-2 and H-3 are rejected, indicating that industry classification and business type do not affect the probability of bankruptcy/delisting and recovery. These results are the same with the regression analysis.

**3.5. Share price performance of relisting companies.** As previously mentioned, if companies can recover and reenter the capital market, thereby allowing them normal financing opportunities, they will be in a better position to successfully implement future operations and execute appropriate investment plans. This possibility is evident when examining the stock price performance one to three years after a company's resurrection.

Based on the sample in this study, among the firms that experience financial distress, 44.3% of them declare bankruptcy, and 36.4% of them recover. We

wish to further investigate the stock return performance of recovered firms after a series of reforms and restructuring and to confirm whether the occurrence of financial distress may enhance the distress awareness of the company and thus affect

long-term corporate value. The stock returns are counted according to the concept of buy and hold proposed by Ritter (1991) and Loughran and Ritter (1995). The results of difference tests on average stock returns are as shown in Table 6.

Table 6. Difference tests of average stock returns

t-test	One year after recovery	Two years after recovery	Three years after recovery
Average return difference (%)	22.723	21.909	13.403
t-value	2.612***	2.299**	1.157
S.D. of return difference (%)	76.333	74.436	80.263
Number of samples	77	61	48

Notes: \*\*\*, \*\*, and \* represent the 1%, 5% and 10% significance levels, respectively.

The testing results suggest that the stock returns of recovered firms are better than the concurrent index return. Especially, the long-term effects of the previous two years are significant and positive. This finding also suggests that the management of recovered firms may improve following the sense of crisis, with the managers running the company more cautiously, thus improving the firm's long-term value.

## Conclusions

The survival time from the occurrence of financial distress to bankruptcy/delisting (recovery) is approximately 18(23) months. The results indicate that the factors that affect financial distress are different from those that influence bankruptcy/delisting or recovery.

From the stage of financial distress to recovery, although larger amounts of surplus cash may help solving the company's liquidity problem, insiders may engage in self-serving behavior in the name of restructuring, affecting the chance of successful recovery. During normal operations, a higher independent director ratio implies a more robust supervision mechanism. If the company has been in a financial crisis, independent directors may not be able to fully perform oversight of the company from bankruptcy.

## References

- Altman, E.I. (1968). Financial Ratio, Discriminant Analysis and the Prediction of Corporate Bankruptcy, *Journal of Finance*, 23 (4), pp. 589-609.
- Anderson, R.C. and Reeb, D.M. (2003). Founding-Family Ownership and Firm Performance: Evidence from the S&P 500, *Journal of Finance*, 58 (3), pp. 1301-1328.
- Ang, J.S., Cole, R.A. and Lin, J.W. (2000). Agency Costs and Ownership Structure, *Journal of Finance*, 55 (1), pp. 81-106.
- Beaver, W.H. (1966). Financial Ratios as Predictors of Failure, *Journal of Accounting Research*, 4, pp. 71-111.
- Beaver, W.H., McNichols, M.F. and Rhie, J.W. (2005). Have Financial Statements Become Less Informative? Evidence from the Ability of Financial Ratios to Predict Bankruptcy, *Review of Accounting Studies*, 10 (1), pp. 93-122.
- Campbell, J.Y., Hilscher, J. and Szilagyi, J. (2008). In Search of Distress Risk, *Journal of Finance*, 63 (6), pp. 2899-2939.
- Cheng, K.F., Chu, C.K. and Hwang, R.C. (2010). Predicting Bankruptcy using the Discrete-time Semiparametric Hazard Model, *Quantitative Finance*, 10 (9), pp. 1055-1066.
- Cheung, Y.L., Connelly, J.T., Jiang, P. and Limpaphayom, P. (2011). Does Corporate Governance Predict Future Performance? Evidence from Hong Kong, *Financial Management*, 40 (1), pp. 159-197.

When the control rights deviation level is higher, it is generally considered that the quality of corporate governance is poorer. However, in this event, financial distress in Stage I and insolvency in Stage II are unlikely to arise for firms that have higher control rights. Both independent sample firms from financial distress to bankruptcy and from financial distress to the recovery, we find that the effects of explanatory variables don't necessarily have an inverse relationship of the two.

A family-owned company is less likely to fall into financial distress; however, neither the industry classification nor the business type affects the probability of bankruptcy/delisting or recovery. The stock return of the recovered firms in the two years after recovery is significantly higher than the index return.

Unlike previous literature, this study is the discussions of the factors that affect the probability of scenarios including possible financial distress, bankruptcy/delisting, and recovery of a firm, to help understand the characteristics of different periods. We hope that these discussions add some information on financial strategy to reduce the occurrence of financial distress, in addition to avoiding of insolvency of the firm in financial distress; it may have the chance to return to normal operations.

9. Cox, D.R. (1972). Regression Models and Life-Tables, *Journal of the Royal Statistical Society, Series B*, 34 (2), pp. 187-220.
10. Donker, H., Santen, B. and Zahir, S. (2009). Ownership Structure and the Likelihood of Financial Distress in the Netherlands, *Applied Financial Economics*, 19 (21), pp. 1687-1696.
11. Fich, E.M. and Slezak, S.L. (2008). Can Corporate Governance Save Distressed Firms from Bankruptcy? An Empirical Analysis, *Review of Quantitative Finance and Accounting*, 30 (2), pp. 225-251.
12. Gombola, M.J., Hasklins, M.E., Ketz, J.E. and Williams, D.D. (1987). Cash Flow in Bankruptcy Prediction, *Financial Management*, 16 (4), pp. 55-65.
13. Hwang, R.C. (2012). A varying-coefficient default model, *International Journal of Forecasting*, 28 (3), pp. 675-688.
14. Hillegeist, S.A., Keating, E.K., Cram, D.P. and Lundstedt, K.G. (2004). Assessing the Probability of Bankruptcy, *Review of Accounting Studies*, 9 (1), pp. 5-34.
15. Kim, D.K. and Kwok, C.C.Y. (2009). The Influence of Managerial Incentives on the Resolution of Financial Distress, *Review of Quantitative Finance and Accounting*, 32 (1), pp. 61-83.
16. Kahya, E. and Theodossiou, P. (1999). Predicting Corporate Financial Distress: A Time-Series CUSUM Methodology, *Review of Quantitative Finance and Accounting*, 13 (4), pp. 323-345.
17. Kahl, M. (2002). Economic Distress, Financial Distress and Dynamic Liquidation, *Journal of Finance*, 57 (1), pp. 135-168.
18. Lemmon, M.L. and Lins, K.V. (2003). Ownership Structure, Corporate Governance, and Firm Value: Evidence from the East Asian Financial Crisis, *Journal of Finance*, 58 (4), pp. 1445-1468.
19. Li, C.A. and Hsu, C.Y. (2010). Board independence and financial distress, *Journal of Management & Systems*, 17 (3), pp. 467-499.
20. Loughran, T. and Ritter, J.R. (1995). The new issues puzzle, *Journal of Finance*, 50 (1), pp. 23-51.
21. Gomez-Mejia, L.R., Nunez-Nickel, M. and Gutierrez, I. (2001). The Role of Family Ties in Agency Contracts, *Academy of Management Journal*, 44 (1), pp. 81-95.
22. Masulis, R.W., Wang, C. and Xie, F. (2009). Agency Problems at Dual-Class Companies, *Journal of Finance*, 64 (4), pp. 1697-1727.
23. Opler, T.C. and Titman, S. (1994). Financial Distress and Corporate Performance, *Journal of Finance*, 49 (3), pp. 1015-1040.
24. Ohlson, J.A. (1980). Financial Ratios and the Probabilistic Prediction of Bankruptcy, *Journal of Accounting Research*, 18 (1), pp. 109-131.
25. Ritter, J.R. (1991). The Long-Run Performance of Initial Public Offerings, *Journal of Finance*, 46 (1), pp. 3-27.
26. Shumway, T. (2001). Forecasting Bankruptcy More Accurately: A Simple Hazard Model, *Journal of Business*, 74 (1), pp. 101-124.
27. Shleifer, A. and Vishny, R. (1997). A survey of corporate governance, *Journal of Finance*, 52 (2), pp. 737-783.
28. Turetsky, H.F. and McEwen, R.A. (2001). An Empirical Investigation of Firm Longevity: A Model of the Ex Ante Predictors of Financial Distress, *Review of Quantitative Finance and Accounting*, 16 (4), pp. 323-343.
29. Yeh, C.M., Chang, C.Y., Liao, H.H. and Jou, D.G. (2007). Credit Analysis of CreditCard Holders – The Application of Survival Model, *Review of Financial Risk Management*, 3 (2), pp. 1-30.