Jiang-Chuan Huang (Taiwan), Chin-Sheng Huang (Taiwan)

Bank relationships and firm private debt restructuring: a duration analysis

Abstract

This paper uses duration models to analyze the factors affecting the duration of private debt restructuring for distressed firms. We find that a distressed firm with a stronger bank relationship has a shorter length of time needed to successfully restructure its debt through private renegotiation. We conclude that in a bank dominated financial system such as Taiwan's in which firms are heavily bank-dependent, the bank-firm relationship is of crucial importance to the duration of successful debt restructuring for financially distressed firms. Moreover, the empirical results also show that younger firms, less severely distressed firms, or those in the new economy industry, exhibit significantly shorter length of time needed for a debt restructuring.

Keywords: bank relationship, duration analysis, debt restructuring, financial distress.
JEL Classification: G21, C41.

Introduction

Banks provide funds to borrowers which enable banks to obtain information that is proprietary and not available to the market. The existing literature on financial intermediation (see, e.g., Diamond, 1984; Ramakrishnan and Thakor, 1984) emphasizes the roles of banks in generating information, in particular, through screening (Diamond, 1991) and monitoring (Rajan and Winton, 1995). Because bank relationships typically involve repeated interactions between a bank and a borrower over time, such interactions may generate "inside information" for the bank and reduce its cost of providing further loans and other services.

To the extent that a bank relationship produces reusable and proprietary information about a borrower, a potential benefit for the relationship to the borrower is that the bank would be better for supporting the private renegotiation with the financially distressed firm. Consequently, a number of recent studies have examined the effect of bank relationships on the private debt restructuring of financially distressed firms. Brunner and Krahnen (2008) employed the number of banks as a proxy for bank relationships and observed an extensive involvement of banks in their borrowers' debt restructuring and private workout activities. They found that the probability of recovery from a distressed situation is negatively related to the number of banks. Couwenberg and Jong (2006) adopted bank debt as a proxy for the effect of bank relationships to study the private restructuring processes of 73 small to medium-sized Dutch firms in financial distress. They found that bank debt has a significant positive effect on the increasing the probability of restructuring success.

While the above mentioned studies show that bank relationships can increase a distressed firm value, little insight is provided into the effects of past lending relationships to the duration of private debt restructuring for a distressed firm. Moreover, the measures of bank relationships are susceptible to a potential weakness. Namely, the degree of bank relationships is measured simply by a single proxy. The concept of "bank relationships" is quite elusive and complex in banking theory. There is no uniformly accepted methodology for measuring the presence and strength of bank relationships (Bharath et al., 2007). To assess the presence of bank relationships, two measures are adopted in the literature depending on data availability. If the record of the starting of a bank relationship is available, researchers often use the time duration of a relationship as a proxy for its presence (see, e.g. Petersen and Rajan, 1994; Berger and Udell, 1995; Elsas and Krahnen, 1998; Ongena and Smith, 2001). Otherwise, the existence of prior bank relationships is used as a proxy (see, for example, Dahiya et al., 2003; Schenone, 2004; Bharath et al., 2007). Due to lack of the precise records of bank relationships in the Taiwan banking industry, this present study adopts the existence of prior bank relationships as proxy for the presence of the bank relationships. In addition, the size of bank relationships and the number of bank relationships are included in this study as well by looking back and searching the past borrowing records of the borrower. In short, three measures of bank relationships are examined: the existence, size, and number, and are simultaneously discussed and used in hazard function estimators to examine the effect of the duration of private debt restructuring for financially distressed firms. In particular, the Taiwan financial market is typically a bank-based financial system in which firms tend to heavily depend upon bank loans[1]. It is inappropriate to employ a single proxy, the size of the bank debt ratio,

[1] Shen and Wang (2005) reported that private corporate borrowing over the past decade in Taiwan has been roughly 60% from external finances based on estimates from Taiwan's Central Bank. Among the external finances, about 40% are corporate loans from financial institutions, particularly from general commercial banks. Hence, it is reasonable to state that bank relationships are crucially important for Taiwan's firms because they are heavily bank-dependent.

for bank relationships, because most firms have high bank debt ratios. Hence, in contrast to the above literature with which only a single proxy for bank relationships is examined, the conclusions drawn from the present research may be robust to the different bank relationship measures.

Moreover, the early empirical studies mainly have been concerned with the argument of formal bankruptcy procedures and have paid relatively less attention to out-of-court debt restructuring. Jensen (1989a, b) are one of a few works that advocated that private contractual arrangements for resolving default represent a viable and less costly alternative to the legal remedies provided by Chapter 11. Gilson et al. (1990) further examined the determinants of 169 financially distressed firms' choice between formal bankruptcy and out-of-court restructuring. Particularly, Gilson et al. (1990) reported that about 80 (47%) firms successfully restructured their debt through out-of-court renegotiations while the remaining 89 firms (53%) failed to privately restructure their debt and subsequently filed for Chapter 11. In addition, the evidence of Gilson et al. (1990) pointed out that firms with out-of-court settlements are characterized by more intangible assets, larger debt owed to banks, and fewer lenders. The main economic costs of private debt restructuring are comprised of the holdout problem (Gilson et al., 1990; Couwenberg and Jong, 2006) and the free-rider problem (Bergman and Callen, 1991; Rajan, 1992) as well. On the contrary, the key economic benefits of private debt restructuring consist in both the lower expenses and the shorter time involved in the restructuring process (Gilson et al., 1990; Franks and Torous, 1994).

The aim of this study is to investigate the determinants of the duration in the success of firm private debt restructuring using data from the Taiwan banking industry. In particular, the primary goal of the present research is to examine the impacts of bank relationships on the length of time needed to complete a restructuring process. Specifically, the hypothesis tested is that the strength of bank-borrower relationships is significantly related to the length of time needed for a successful private debt restructuring. The hypothesis predicts that the stronger the bank-borrower relationship is, the shorter is the duration that a distressed firm takes to succeed in debt restructuring through private renegotiation.

Our empirical results indicate that both the existence of prior bank relationships and the size of bank relationships have significant negative effects on the duration of firm private debt restructuring, whereas the number of bank relationships is significantly positive to the duration of a firm's restructuring. In particular, the evidence shows that the distressed firms with strong bank relationships significantly shorten the duration of successful private debt restructuring. The above phenomenon is consistent with the argument that strong bank relationships mitigated the obstacle of the information asymmetry and "lazy banks" are more positive in participating in debt restructuring efforts of their distressed clients. Moreover, our empirical evidence identifies the significant firm characteristics which can shorten the duration of a firm's debt restructuring: 1) younger, 2) less severity of distress, and 3) appertaining to the new economy.

The remainder of the paper is organized as follows. The next section describes the sources of data and sample selection processes. Section 2 introduces the estimation methods and the description of variables used in our analysis. The major empirical results are presented in Section 3. The concluding remarks are drawn in the final section.

1. Data and sample selection

The sample in this study consists of Taiwan listed companies[1] that encountered financial distress, and were either successful or failed in debt restructuring, over the period of 1995-2003. Specifically, general characteristics of the firms, the firm's income statement and balance sheet data, and an assessment of the corporate credit rating were retrieved from the *Taiwan Economic Journal* (TEJ) database.

In contrast to formal bankruptcy such as Chapter 11 in the U.S., most countries do not provide well-defined duration of the private debt restructurings. Rarely does restructuring begin or end with a formal public announcement and no special documents filed to any government agency (Gilson et al., 1990). Both are because outsiders are not able to understand the details of firm's private debt restructuring. To overcome the data impediments, this study proposes an alternative procedure to identify the duration of private debt restructuring. A distress event is defined in this research as the point of the first time when the TCRI (Taiwan Corporate Credit Risk Index)[2] assigns the firm to a distress rating (notch 9 or 10) during the period, 1995-2003. Likewise, this study regards a private debt restructuring as success whenever the distressed firm's TCRI rating is upgraded from the

[1] In this study, we use Taiwan listed companies that include Taiwan Security Exchange (TSE) listed companies and Over-The-Counter (OTC) listed companies.

[2] The TCRI evaluation system was developed by the TEJ and has been in use since August, 1991. The standard methodology of the rating process relies on a scoring system with up to ten different main financial criteria, related to the risky factors including profitability, safety, activity and size about corporate performance and prospects, and a linear weighting system with fixed weighting factors. TCRI is calibrated using a 1 to 10 rating scale (best to worst), notches 1-4 are categorized as high investment grade, notches 5-6 are categorized as medium investment grade, notches 7-9 represent speculative grade and notch 10 is reserved for a default case (extremely high risk).

distressed rating (notch 9 or 10) to a rating notch of 6 or better[1]. We are confident in the rating quality employed in the above procedure since TEJ database is the most widely used by Taiwanese academic researchers and provides competent ratings as Taiwan Ratings[2]. This proposed empirical method will significantly mitigate the data impediments confined in the research field of debt restructuring among distressed firms.

The sampling procedure results in a total of 302 firms that were subsequently distressed or even had defaulted on their obligations[3]. Among them, 10 firms did not have enough financial data[4] to trace their debt restructurings. We also eliminated 15 firms that were approved to engage in judicial restructurings. And then, a minimum bank debt of 20 million (NTD) is imposed in the sampling selection to ensure a proper level of information with regard to the existence of past bank-borrower relationships. There are 5 firms with small bank debt that were excluded from our sample. In total, we collect 272 firms that were financially distressed during the period of 1995-2003. After that, we searched for private debt-restructuring firms from these 272 firms by using the Important Financial News database (IFN) offered by the TEJ database and cross-checked with the Excellent Business Database System (EBDS). Ultimately, this study analyzes a sample of 208 firms that privately restructured their debts: 49 firms (23.56%) restructured successfully; 159 firms (76.44%) were not successful during our tracking period, 1995-2007[5].

The observation of a firm not successfully completing debt-restructuring is censored by the end of 2007. Therefore, the sample consists of completed and censored durations. The frequency distribution of firms' success in debt-restructuring is presented in Figure 1. The average duration of firms that successfully restructure their debts is 40.38 months. A large proportion of firms completed private debt-restructuring within 60 months, except for only five firms that took more than 60 months.

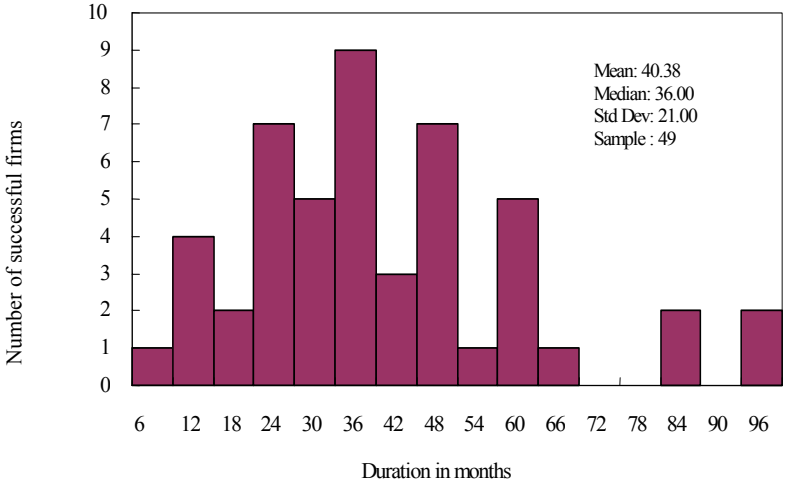

Fig. 1. Frequency distribution of firms that succeed in debt-restructuring

2. The estimation methods and the description of variables

2.1. The estimation methods. Since the data involve right censored observations which render the OLS estimates biased, this study employs the duration models as an appropriate way to deal with right censoring (Baek and Bandopadhyaya, 1996; Ongena and Smith, 2001). In specific, the completion of private debt-restructuring is now measured as length of the distress episode (the time in months) between the distress event and the rating upgrade to 6 or better. In this section, we thus offer a brief description of the main concepts and methods used in the duration analysis. For details refer to Ongena and Smith (2001). Let T represent the duration of time that passes before the

[1] In this study the definition of a firm's success in debt-restructuring is comparable with the previous literature, for example, Brunner and Krahnen (2008) recognized that a distressed firm successfully restructures its debt if rating 4 or better has been achieved subsequent to a distress rating of 5 or 6 in the internal ratings from 1 (highest grade) to 6 (lowest grade); Gilson et al. (1990) defined that a debt restructuring plan is considered successful if the firm does not file for bankruptcy within a year of the last reference to the restructuring.

[2] Taiwan Ratings are provided by the Taiwan Ratings Corporation (TRC) which is a subsidiary of the internationally renowned credit rating agency Standard & Poor's. TRC was established on May 31, 1997 as a result of the Ministry of Finance's efforts to introduce a formal independent credit ratings organization to the domestic financial markets.

[3] In the category of firms with multiple defaults during the 1995 to 2003 period, we have only retained the first default case in order to avoid several defaults linked to the same firm which might have biased the econometric analysis.

[4] Some of the firms merged or were taken over during the period from 1995 to 2003. Thus, those firms did not have available financial data anymore.

[5] We tracked these firms until the end of 2007 to determine if they upgraded their TCRI rating to 6 or better.

occurrence of a certain random event[1]. In this study we are going to relate this "event" with the success of private debt restructuring for a distressed firm. In addition, the passage of time is often referred to as a spell, while the event itself is called a switch in the econometrics literature. The behavior of a spell can be described through the use of two functions. One is the survivor function, $S(t) = P(T \geq t) = 1 - F(t) = \int_t^{\infty} f(x)dx$, which yields the probability that the spell T lasts at least to time t. The other is the hazard function which determines the probability that a switch will occur, conditioned by the spell surviving through time t, and is defined by

$$h(t) = \lim_{\Delta t \to 0} \frac{P(t \leq T \leq t + \Delta t \mid T \geq t)}{\Delta t} = \\ = \frac{f(t)}{1 - F(t)} = \frac{f(t)}{S(t)}, \quad 0 \leq t < \infty \qquad (1)$$

where $f(t)$ is the density function associated with the distribution of spells. Neither the survivor function nor the hazard function provides additional information that could not be derived directly from $f(t)$. In other words, the rate of occurrence of the event at duration t equals the density of events at t, divided by the probability of surviving to that duration without having experienced the event. The hazard function provides a suitable method for summarizing the relationship between spell length and the likelihood of switching. When $h(t)$ is increasing (decreasing) in t, the hazard function is said to exhibit positive (negative) duration, because the probability of ending the spell increases (decreases) as the spell lengthens (i.e., as the time passes). However, the constant duration dependence indicates the lack of a relation between $h(t)$ and t.

While estimating hazard functions, it is econometrically convenient to assume a proportional hazard specification, such that

$$h(t, X(t), \beta) = \lim_{\Delta t \to 0} \frac{P(t \leq T \leq t + \Delta t \mid T \geq t, X(t), \beta)}{\Delta t} = \\ = h_0(t) exp(\beta' X_t), \qquad (2)$$

where Xt is a set of observable, possibly time-varying explanatory variables, β is a vector of unknown parameters associated with the explanatory variables, h0(t) is the baseline hazard function and $\exp(\beta' X_t)$ is chosen because it is non-negative and yields an appealing interpretation for the coefficients, β. The logarithm of h0(t, X(t), β) is linear in Xt. Therefore, β reflects the partial impact of each variable in X on the log of the estimated hazard rate.

The baseline hazard $h_0(t)$ determines the shape of the hazard function with respect to time. Eq. (2) can be estimated without specifying a functional form for the baseline hazard. Cox (1972) proposes a partial likelihood model that bases estimation of β on the ordering of the duration spells. We refer to the Cox partial likelihood model as "semi-parametric", because it specifies no shape for $h_0(t)$. Besides, two commonly used parametric specifications for the baseline hazard are the Weibull and the exponential distributions (Ongena and Smith, 2001). The Weibull specification assumes $h_0(t) = \lambda\alpha\, t^{\alpha-1}$, and the shape parameter, α, captures the behavior of the hazard over time. A positive (negative) duration dependence exists in the data when $\alpha > 1$ ($\alpha < 1$). A positive duration dependence in the entire duration would imply that the instantaneous probability of the successful debt-restructuring for distressed firms increases with the passage of time. The exponential distribution is a particular case of the Weibull when the shape parameter equals one. The case assumes that the influence of time is constant over time as the baseline reduces to $h_0(t) = 1$. Hence, this distribution is suitable for modeling data with constant hazard (i.e., no duration dependence).

Since the proportional hazard models focus on the hazard function, whose connection with the concept of probability is quite clear, they provide a suitable framework for relating the determinants of the duration of private debt-restructuring for distressed firms. Thus, using the maximum likelihood method, we estimate hazard functions using the Weibull specification and the exponential specification. Moreover, we also employ the Cox (1972) partial likelihood model to be helpful for checking the robustness of the results obtained from either the Weibull or the exponential model.

2.2. The description of variables. We specify a duration model to ascertain how variables might carry weights on the length of time needed to recover from successfully the distress shock in private debt restructuring.

The dependent variable is the duration of the distress episode that ends with the distress event of the rating upgrade to 6 or better. This variable enables us to analyze the time length (the time in months) of successfully completing debt-restructuring. The following independent variables represent the postulated bank relationships, firm characteristics, debt structure and other control

[1] More precisely, T is assumed to be a non-negative continuous random variable with probability density function (p.d.f.) and cumulative distribution function (c.d.f.) $F(t) = P(T \leq t)$.

factors that potentially contribute to the future success of a firm debt-restructuring.

1. Bank relationship variables: This study simultaneously constructs three alternative measures of bank relationships by looking back and searching the past borrowing record of the distressed firm. For each loan by a typically distressed firm, we look back over a period of four years for any previous loans taken by this distressed firm.
   - *Existence of bank relationships*: Based on the banks retained for these past loans, the first bank relationship measure is specified as a dummy variable taking one if the main bank[1] of the distressed firm had served as a main bank in lending (making previous loans) to the distressed borrower before its default. This variable captures the existence of a prior bank-borrower relationship.
   - *Size of bank relationships*: The second bank relationship variable is the exposure of the main bank to the distressed borrower which captures the size of past bank relationships by the main bank to a distressed firm. The size of bank relationships is a proxy as a measure for the exposure of the main bank, i.e., total dollar amount of loans to the distressed borrower by the main bank in the last four years divided by total dollar amount of loans from all lending banks[2].
   - *Number of bank relationships*: The last bank relationship variable is the number of bank relationships which represents the number of lending banks of the distressed firms in our sample and captures the strength of bank relationships.
2. Firm characteristic variables: The firm characteristics of this analysis include *firm age* (log of the firm's age in the year of the onset debt-restructuring), *leverage ratio* (i.e., total amount of debt relative to total assets in the year of the onset debt-restructuring) and *return on assets* (in the year prior to the onset debt-restructuring).
3. Debt structure variables: The firm's debt structure is proxied by three variables which include *bank debt ratio* (bank debt over total liabilities), *secured debt ratio* (secured debt over bank debt), and *account-payable debt ratio* (account-payable debt over total liabilities). All of them are computed at the onset of the firm's debt-restructuring year.
4. Other control variables: The control variables employed in this study consist of *firm size* (log of the firm's total assets), *industry dummy*, and *real GDP growth rate*. The industry dummy is unity if a distressed firm belongs to the "new" economy (e.g., the electronics, and high-tech industries) and zero if it belongs to the "conventional" economy (e.g., the construction, paper and pulp, food, and steel industries). The term *real GDP growth rate* is counted at the onset of the firm's debt-restructuring year because it may be helpful for distressed firms to efficiently renegotiate their debt with lending banks[3].

3. Empirical results

3.1. Descriptive statistics of the sample. Table 1 presents the descriptive statistics of the sample. Panel A of Table 1 is the distribution of the sample by year of debt restructuring. In a sample of 208 financially distressed firms, over half debt-restructuring attempts (i.e., 55.29%) are clustered in the years 1998 to 2000. This is in line with the timing of the domestic financial crisis (from July 1998 to January 1999) and the economic recession (from July 2000 to September 2001), as more reported cases of financial distress are to be expected during severe macroeconomic conditions. The phenomenon is also consistent with the previous literature that the frequency of default is negatively correlated with the growth rate of real GDP (Dermine and Carvalho, 2006). Additionally, the average length of all 49 firms (23.56%) for successful restructuring is 40.38 months. Specifically, the first 2 years (1995-1996) show a higher average length of successful restructurings than in other periods.

The descriptive statistics of the financial characteristics for the firms are presented in Panel B of Table 1. The size of the firms, as measured by the annual sales and the total assets, varies to a great extent. Because some very large firms are included in the data set, the amounts of both the mean and the median of the annual sales, total assets, total liabilities, and return on assets are not relatively correspondent. In contrast to the minimum and maximum values, these four financial characteristics

[1] We focus on the main bank of a particular distressed firm, as the information-intensive role that we test in our hypothesis is most appropriate for the main bank, which typically holds the largest share of a firm's bank debt (see Gilson et al., 1990; Franks and Sussman, 2005; Couwenberg and Jong, 2006; Bharath et al., 2007). Thus, the responsibilities of a main bank best fit the description of a relationship lender.

[2] This study retrieves the relevant data of details of bank loans and the nature of relationships via a special source, List Company Loan Transaction (LCLT), produced and updated by the TEJ. Specifically, the LCLT database contains detailed loan transaction information: names of the lending banks, start and expiration dates, long/short-term loan amount, loan currency, secured/unsecured loan, syndicates, and the credit lines.

[3] During the restructuring the condition of the economy may change also, so we cannot measure whether the conditions during the restructuring have remained constant (Couwenberg and Jong, 2006).

of firms display obvious higher volatility. In addition, Panel B indicates the average length of successful debt-restructuring period which is 40.38 months (median is 36 months). In comparison, Gilson et al. (1990) reported for US firms that the restructuring of their debt privately required an average of 15.4 months; Franks and Sussman (2005) found for small UK firms that an average of 9.2 months was required for them to be restructured successfully; Couwenberg and Jong (2006) reported that average length of the restructuring period of firms in the Netherlands is approximately 24 months. These existing empirical results show that the Taiwanese restructuring processes presumably take a much longer time. There is an appropriate explanation worth noting here. Our definition of a private debt restructuring to be successful is stringent in the sense that it requires firms succeeding in credit ratings upgrading to indeed lower their risk category (i.e. TCRI rating notch 6 or better).

Table 1. Descriptive statistics of the sample

Panel A. Distribution of the sample by year of debt restructuring

Year	Total firms (and %)	Successful firms (and %)	Percentage of successful firms to total firms (%)	Successful firms (month)
1995	15(7.21)	7(14.29)	46.67	66.33
1996	11(5.29)	5(10.20)	45.45	53.40
1997	11(5.29)	6(12.24)	54.55	33.00
1998	55(26.44)	6(12.24)	10.91	29.50
1999	27(12.98)	5(10.20)	18.52	37.80
2000	33(15.87)	8(16.33)	24.24	37.00
2001	21(10.10)	4(8.16)	19.05	25.50
2002	21(10.10)	4(8.16)	19.05	44.25
2003	14(6.73)	4(8.16)	28.57	34.50
Total/Mean	208(100.00)	49(100.00)	23.56	40.38

Panel B. Firm characteristics and restructuring information (N=208)

	Mean	Median	Standard deviation	Min.	Max.
Total sales (NTD in million)	2,730	1,342	4,163	0.54	37,867
Total assets (NTD in million)	8,590	4,142	11,158	114	52,631
Total liabilities (NTD in million)	5,208	2,341	7,035	73	37,081
Return on assets (%)	0.88	2.22	8.28	-28.24	30.42
Firm's age (year)	20.66	20.00	11.66	1.00	51.00
Length for successful restructuring (month)	40.38	36.00	21.00	6.00	96.00

Panel C. Lending bank information and firm's debt structure (N=208)

	Mean	Median	Standard deviation	Min.	Max.
Number of lending banks	10.72	9.00	7.02	1.00	39.00
Size of bank relationships	0.38	0.33	0.22	0.04	0.97
Total account-payable (NTD in million)	481	227	783	3	6,424
Total bank debt (NTD in million)	2,965	1,244	4,273	38	22,820
Total secured debt (NTD in million)	2,224	837	3,513	0	21,437

The descriptive statistics of lending bank information and firm's debt structure are presented in Panel C of Table 1. At the onset of distress, the number of lending banks of the firms in our sample averages 10.72, with a median of 9, ranging from single banking to as many as 39 lending banks. Apparently, the average in our paper is higher at 10.72 by comparison with two representative samples of Taiwanese listed firms which are not in financial distress. As reported by Fok et al. (2004), on average, their sample firms borrowed from 9.47 banks, with a median of 8, and the number ranges between 1 and 42 banks. Shen and Wang (2005) reported an average number of 8.335 banks and a max number of 35 banks. One main reason is that as a general rule, the distressed firms usually maintain more banking relationships in order to finance more external funds due to insufficient cash flows. The size of bank relationships is a proxy as a measure for the exposure of the main bank. These empirical results show that the average size of bank relationships is 0.38, with the median 0.33, ranging from 0.04 to as many as 0.97.

3.2. The empirical hazard and survivor functions. As we discussed in the section of the estimation methods, a first thing to analyze the duration dependence of the data is to examine the empirical hazard and survivor functions. The plots of the estimated hazard evaluating at the mean values of the variables for duration models are

presented in Figure 2. Notice that the hazard of the duration model increases initially, reaches a peak at about 40 months, and declines sharply thereafter. In comparison, the peak value (i.e. about 40 months) is close to the average length of the successful debt-restructuring period which is 40.38 months in Panel B of Table 1.

The Kaplan-Meier estimator for the survivor function is shown in Figure 3. As can be seen, the probability decreases sharply for durations less than 60 months; for intermediate durations, among 60 and 100 months, the decreasing tends to be moderate. Finally, for durations longer than 100 months this probability remains almost fixed at the level of 0.75. In comparison, Figure 1 shows a large proportion of firms that completed private debt-restructuring within 60 months, with only five firms taking more than 60 months.

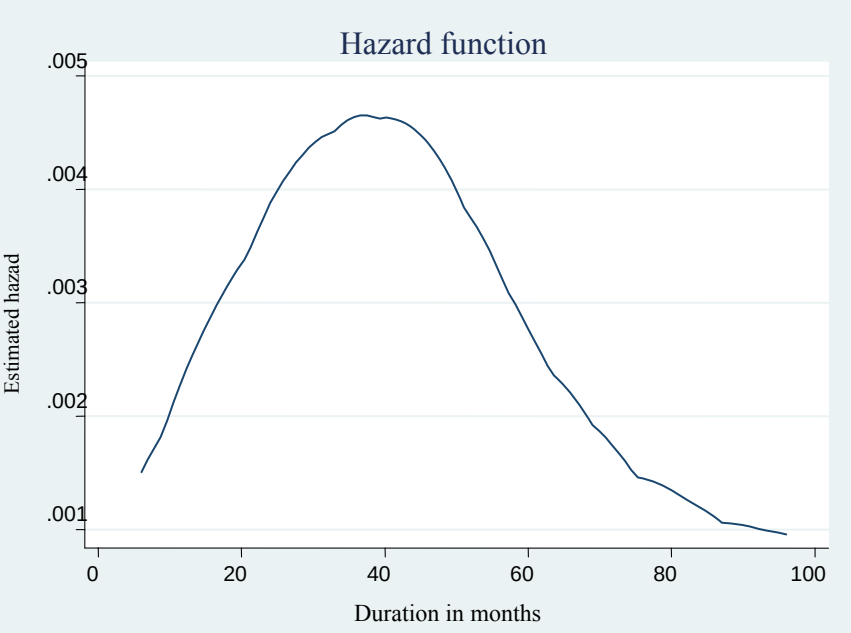

Fig. 2. Smoothed hazard estimate

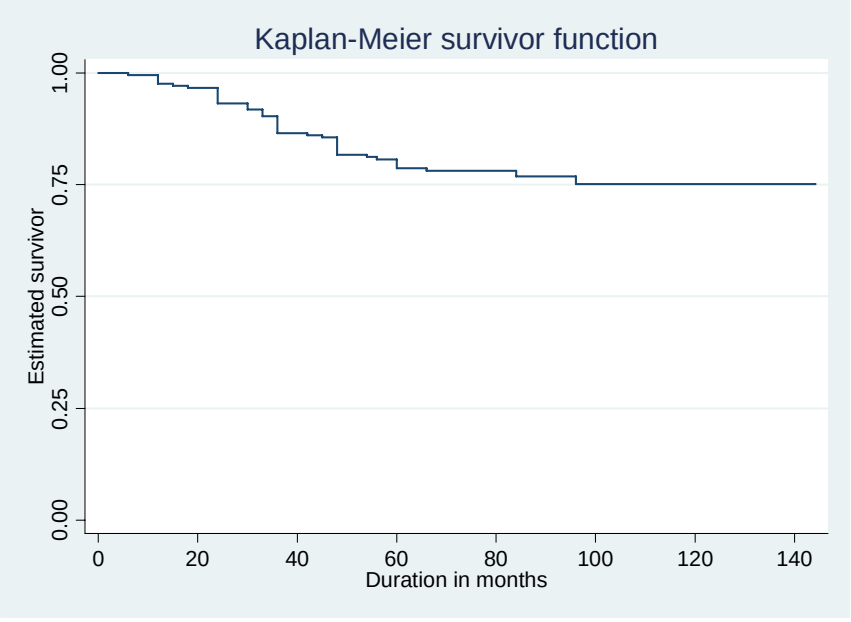

Fig. 3. Kaplan-Meier survival estimate

3.3. The determinants of the duration of successful restructuring. The main purpose of this present paper is to evaluate relevant economic factors on the duration analysis of successful debt-restructuring for distressed firms. We thus specify a duration model to ascertain how variables might carry weights on the length of time needed to recover successfully from the distress shock in private debt restructuring. Our duration models contain two types of explanatory variables: control

variables and theory-based variables. The control variables employed in this study consist of firm size, industry dummy, and real GDP growth rate. The theory-based variables in our duration models are derived from the bank relationships, firm characteristics, and debt structure.

Table 2 reports the results from the Weibull specification, the exponential specification and Cox proportional hazards of the baseline hazard function presented in Eq. (2). For each specification, we report the results of three regressions. In regressions (1) to (6), the coefficients of variables are listed in each column, and the hazard ratios are reported in each column for regressions (7) to (9). As expected, the magnitude and significance of the coefficient estimates from the Weibull and exponential specifications are similar to the hazard ratio estimates from Cox proportional hazards. The Weibull estimates α to be significantly greater than one (i.e., 1.333, 1.270 and 1.352), implying that private debt restructuring exhibits positive duration dependence. In fact, the coefficients are expected to have opposite signs compared to the OLS regression since the dependent variable (i.e., the length of restructuring completion period by months) is an inverse measure of restructuring success: the higher the restructuring performance, the shorter the firm recovery. As we can see in Table 2, the results show that all of the coefficients of the three bank relationship variables are significant at least at the 10% level over all regressions. Especially, since the high correlation (-0.584) between the number of bank relationships and the size of bank relationships, we build up a principal component, named the weighted number of banks, in the regressions (3), (6), and (9)[1]. The positive coefficient of the weighted number of banks implies that the positive effect of the number of bank relationships dominates the effect of the size of bank relationship. Consequently, our empirical results indicate the existence of prior bank relationships and size of bank relationships reduce the time needed to achieve success, whereas an increasing number of bank relationships and an increasing weighted number of banks significantly lengthen the time required to terminate a restructuring completion[2]. Therefore, it is shown that a strong bank relationship alleviates information asymmetry of main lending banks and benefits the debt restructuring of distressed firms.

Table 2. The determinants of the duration for firm restructurings[12]

Variables	Weibull distribution model			Exponential distribution model			Cox proportional hazards model		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Intercept	6.208*** (2.165)	3.590*** (1.056)	4.436*** (0.989)	6.656*** (2.832)	3.477*** (1.322)	4.528*** (1.327)			
Existence of bank relationships	-0.715** (0.302)	-1.024*** (0.306)	-0.813*** (0.289)	-0.890** (0.390)	-1.231*** (0.366)	-1.027*** (0.374)	2.499* (0.975)	3.344*** (1.238)	2.281***
Size of bank relationships	-2.141*** (0.635)			-2.637*** (0.800)			12.553*** (9.951)		
Number of bank relationships		0.044* (0.024)			0.055* (0.030)			0.944* (0.028)	
Weighted number of banks [a]			0.350*** (0.098)			0.424*** (0.124)			0.651*** (0.081)
Firm age	0.437** (0.186)	0.550*** (0.175)	0.393** (0.179)	0.534** (0.239)	0.648*** (0.237)	0.493** (0.233)	0.626** (0.149)	0.557*** (0.128)	0.650* (0.149)
Leverage ratio	1.896** (0.914)	2.080** (0.918)	1.821** (0.888)	2.417** (1.169)	2.555** (1.121)	2.330** (1.155)	0.090** (0.105)	0.088** (0.097)	0.098** (0.114)
Return on assets	-0.008 (0.014)	-0.011 (0.014)	-0.015 (0.014)	-0.011 (0.019)	-0.014 (0.017)	-0.020 (0.019)	1.011 (0.019)	1.015 (0.018)	1.019 (0.019)
Bank debt ratio	-0.230 (0.674)	-0.457 (0.693)	-0.564 (0.654)	-0.284 (0.881)	-0.520 (0.868)	-0.687 (0.868)	1.303 (1.131)	1.631 (1.398)	1.910 (1.638)
Secured debt ratio	0.430 (0.398)	0.497 (0.408)	0.540 (0.379)	0.560 (0.521)	0.602 (0.511)	0.676 (0.507)	0.583 (0.300)	0.594 (0.300)	0.536 (0.269)
Account-payable ratio	-1.811* (1.067)	-1.784* (1.020)	-1.400 (1.029)	-2.003 (1.424)	-1.929 (1.305)	-1.455 (1.406)	7.296 (10.366)	5.944 (7.817)	4.801 (6.723)

[1] We apply principal component analysis to retrieve a new variable of the weighted number of banks which is composed from the number of bank relationships and the size of relationships. In regressions (3), (6), and (9), we employ the weighted number of banks variable to replace the number of bank relationships and the size of relationships in order to avoid the statistical multicollinearity problem.

[2] Brunner and Krahnen (2008) found that the probability of recovery from a distressed situation is negatively related to the number of banks.

Table 2 (cont.). The determinants of the duration for firm restructurings

Firm size	-0.073 (0.122)			-0.087 (0.160)			1.058 (0.171)		
Industry dummy	-0.687** (0.278)	-0.493* (0.284)	-0.549** (0.260)	-0.860** (0.358)	-0.601* (0.352)	-0.695** (0.343)	2.330** (0.831)	1.803* (0.623)	2.008** (0.681)
Real GDP growth rate	-0.036 (0.060)	-0.030 (0.065)	-0.022 (0.058)	-0.056 (0.080)	-0.047 (0.082)	-0.043 (0.078)	1.074 (0.089)	1.068 (0.091)	1.058 (0.086)
α	1.333*** (0.166)	1.270*** (0.160)	1.352*** (0.169)	1 _	1 _	1 _			
Log likelihood	-123.296	-127.802	-123.024	-125.651	-129.430	-125.587	-220.722	-224.049	-220.298
Sample (N)	208	208	208	208	208	208	208	208	208

Notes: [a] We apply principal component analysis to retrieve a new variable of the weighted number of banks which is composed of the number of bank relationships and the size of relationships. In regressions (3), (6) and (9), we employ the weighted number of bank variable to replace the number of bank relationships and the size of bank relationships in order to avoid the statistical multicollinearity problem.

*** Significant at the 1%, ** significant at the 5%, * significant at the 10% level.

1. In regressions (1) to (6), the coefficients of variables are listed in each column, with standard errors reported below in parentheses. The hazard ratios are reported in each column for regressions (7) to (9).

2. The parameter α measures the degree of duration dependence. The exponential model assumes $\alpha = 1$.

In order to test whether the effect on the duration of successful restructuring is driven by firm characteristics, we added these characteristics in our regressional analysis. As the results in Table 2 show, the coefficient of the firm age is significantly positive at least at the 10% level which indicates that the older distressed firms are more likely to lengthen the time of their restructuring. The positive effect of firm age that resulted in this study may be ascribed to the characteristic of the Taiwan industry structure in which a high proportion "new economy" firms reside. Moreover, the severity of the distress shock (leverage ratio) extends the time of the distress episode and delays an eventual completion as indicated in overall regressions.

Among debt structure, bank debt and secured debt have the correct signs, but both measures yield insignificant coefficients. The account-payable debt indicates the shortened duration of firm recovery only at marginal significance in the Weibull specification. It implies that with the concession of trade creditors, the account-payable delivers the positive effects on the completion of private debt-restructuring. Furthermore, within the set of control variables, the industry dummy is statistically significant to shorten the duration of successful debt restructuring, whereas the control variables, the size of the firm[1] and the growth rate of real GDP, have no significant impacts on the duration.

In short, this empirical evidence strongly indicates three bank relationship proxies might capture more information concerning the efficiency of private debt restructuring of distressed firms than those investigated in a single proxy setting as reported by Brunner and Krahnen (2008). In addition, the existence of a prior bank relationship significantly accounts for the time needed for recovery in debt restructuring pursued by distressed firms.

Conclusions

This paper investigates the determinants of the duration for firm private debt restructuring pursued by Taiwan financially distressed firms over the period from 1995 to 2003. Several salient features of this study will shed light on the problem of bank relationships and private debt restructuring in an emerging banking setting. Firstly, this research particularly presents a credit rating index to well identify the success or failure of private debt restructuring. Therefore, this methodology provides a potential vehicle for future research in the field of private debt restructuring which is frequently confronted with the problem of data impediments. In particular, as bank loans are private instruments, the relevant data of debt restructuring in emerging markets are seldom publicly available. Secondly, this paper is one of few attempts to carefully document the effects of bank relationships on the duration of firms' private debt-restructuring. Specifically, three proxies for completely measuring the degree of bank relationships are employed to ascertain the differential impacts upon the length of time needed to successfully obtain private debt restructuring for financially distressed firms.

The evidence strongly indicates that the length of time needed for success of firm private debt-restructuring is significantly affected by bank relationships. In particular, a distressed firm with a stronger bank relationship has a shorter duration to successfully restructure its debt through private renegotiation. Additionally, the empirical results also show that those firms with younger age and less severity of distress conditions, and

appertaining to the new economy industry exhibit significantly shorter length of time needed for a debt restructuring. In brief, bank-firm relationships are crucial to the length of time needed for success of private debt restructuring undertaken by distressed firms, particularly in a bank dominated financial system where firms are heavily bank-dependent as evidenced in Taiwan.

References

1. Baek, I.M., Bandopadhyaya, A. (1996), The determinants of the duration of commercial bank debt renegotiation for sovereigns. Journal of Banking and Finance 20: 673-685.
2. Berger, A.N., Udell, G.F. (1995), Relationships lending and lines of credit in small firm finance. Journal of Business 68: 351-381.
3. Bergman, Y.Z., Callen, J.L. (1991), Opportunistic underinvestment in debt renegotiation and capital structure. Journal of Financial Economics 29: 137-171.
4. Bharath, S., Dahiya, S., Saunders, A., Srinivasan, A. (2007), So what do I get? The bank's view of lending relationships. Journal of Financial Economics 85: 368-419.
5. Brunner, A., Krahnen, J.P. (2008), Multiple lenders and corporate distress: Evidence on debt restructuring. Review of Economic Studies 75: 415-442.
6. Couwenberg, O., Jong, A. (2006), It takes two to tango: An empirical tale of distressed firms and assisting banks. International Review of Law and Economics 26: 429-454.
7. Cox, D.R. (1972), Regression model and life tables. Journal of the Royal Statistical Society 34: 187-220.
8. Dahiya, S., Saunders, A., Srinivasan, A. (2003), Financial distress and bank lending relationships. Journal of Finance 58: 375-399.
9. Dermine,J., Carvalho, C.N. (2006), Bank loan losses-given-default: A case study. Journal of Banking and Finance 30: 1219-1243.
10. Diamond, D. (1984), Financial intermediation and delegated monitoring. Review of Economic Studies 51: 393-414.
11. Diamond, D. (1991), Monitoring and reputation: The choice between bank loans and directly placed debt. Journal of Political Economy 99: 689-721.
12. Elsas, R., Krahnen, J.P. (1998), Is relationship lending special? Evidence from credit-file data in Germany. Journal of Banking and Finance 22: 1283-1316.
13. Fok, C.W., Chang, Y.C., Lee, W.T. (2004), Bank relationships and their effects on firm performance around the Asian financial crisis: Evidence from Taiwan. Financial Management 33: 89-112.
14. Franks, J., Sussman, O. (2005), Financial distress and bank restructuring of small to medium size UK companies. Review of Finance 9: 65-96.
15. Franks, J., Torous, W.N. (1994), A comparison of financial recontracting in distressed exchanges and Chapter 11 reorganizations. Journal of Financial Economics 35: 347-370.
16. Gilson, S.C., John, K., Lang, L.H.P. (1990), Troubled debt restructurings: An empirical study of private reorganization of firms in default. Journal of Financial Economic 27: 315-354.
17. Jensen, M.C. (1989a), Active investors, LOBs, and the privatization of bankruptcy. Journal of Applied Corporate Finance 2: 35-44.
18. Jensen, M.C. (1989b), Eclipse of the public corporation. Harvard Business Review 67: 61-74.
19. Ongena, S., Smith, D.C. (2001), The duration of bank relationships. Journal of Financial Economics 61: 449-475.
20. Petersen, M., Rajan, R. (1994), The benefits of lending relationships: Evidence from small business data. Journal of Finance 49: 3-37.
21. Rajan, R. (1992), Insiders and outsiders: The choice between informed and arm's length debt. Journal of Finance 47: 1367-1400.
22. Rajan, R., Winton, A. (1995), Covenants and collateral as incentives to monitor. Journal of Finance 50: 1113-1146.
23. Ramakrishnan, R., Thakor, A. (1984), Information reliability and a theory of financial intermediation. Review of Economics Studies 51: 415-432.
24. Schenone, C., (2004), The effect of banking relationships on the firm's IPO underpricing. Journal of Finance 59: 2903-2958.
25. Shen, C.H., Wang, C.A. (2005), Does bank relationship matter for a firm's investment and financial constraints? The case of Taiwan. Pacific-Basin Finance Journal 13: 163-184.

[1] The number of bank relationships has a correlation of 0.674 with firm size. In unreported additional regressions we included these two variables and found the following: the number of bank relationships turns insignificant, while the firm size is still not significant and has a positive effect. Therefore, we separated these two variables and report the results in Table 2.