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Can corporate governance save distressed firms from bankruptcy? An empirical analysis

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Abstract We examine financially distressed firms and document how governance characteristics affect (1) a firm's ability to avoid bankruptcy and (2) the power of financial/accounting information to predict bankruptcy. Overall, our findings indicate that a distressed firm's governance characteristics significantly affect its probability of bankruptcy. We find that smaller and more independent boards with a higher ratio of non-inside directors and with larger ownership stakes of inside directors are more effective at avoiding bankruptcy once distress is indicated. These results are consistent with the belief that these types of governance structures induce more effective monitoring. The results are also consistent with the view that the inclusion of governance characteristics enhances the power of financial accounting models in predicting bankruptcy.

Keywords Financial distress · Bankruptcy · Corporate governance

JEL Classifications G30 · G33

1 Introduction

Either academic or practitioner interest in the efficacy of corporate governance has been heightened by recent corporate scandals. In response to these scandals, legislators and regulators have called for reforms and, in some cases, mandatory changes in the characteristics of a firm's governance structure. For example, the SEC has recently approved new

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NYSE and NASDAQ rules that require listing firms have a majority of independent directors.[1] From an academic perspective, one natural question is whether one set of governance characteristics is best for different types of firms. Recent empirical results in Gillan and Martin (2003) provide evidence that governance structures that are effective for certain firms can be ineffective for others. In addition, another natural question is whether one set of governance characteristics is uniformly good in all of the different conditions a firm could face. To contribute to an understanding of this question, we investigate how different corporate governance characteristics affect the probability and the predictability of a distressed firm ending up in bankruptcy court.

Existing studies examine the relation between governance and firm value without conditioning on distress (see, for example, Morck et al. (1988); McConnell and Servaes (1990); Hermalin and Weisbach (1991); Yermack (1996), Gompers et al. (2003); Fich and Shivdasani (2006)). However, studies related to the efficacy of governance structures within distressed firms are, to our knowledge, non-existent. In principle, the findings of those non-distress studies may not carry over to situations in which firms are distressed because the effectiveness of certain governance features may vary with a firm's health. For example, while equity ownership and option compensation may induce management to seek value-increasing opportunities when a firm is healthy, they may create incentives for management to engage in value-decreasing risk-shifting behavior when the firm is distressed (as in Myers (1977)).[2] Other examples are with respect to board composition and size. While independent boards may be better monitors during healthy periods, because inside directors face an increased risk of losing their jobs when the firm is distressed, an inside director's incentive to turn a distressed firm around may be more intense than that of an outside director. Similarly, while smaller boards may be better in healthy firms, due to reduced coordination and free-rider problems (Yermack 1996), larger boards may have more business contacts that increase the likelihood of finding strategic alliances or partners that allow the firm to emerge from distress. Therefore, it is not ex-ante evident whether the governance structures that are effective for healthy firms would also be effective for distressed firms.

Our goal is to identify the various aspects of a firm's governance structure that affect the probability and the predictability of bankruptcy once the firm is distressed. Most existing methods for predicting bankruptcy and bankruptcy risk solely rely on financial and accounting data, ignoring information about the firms' governance characteristics.[3] Previous studies map a firm's disclosed financial and accounting information into a measure of distress that is calibrated, using other samples, as the measure maximally correlated with the occurrence of bankruptcy.[4] Most of the financial and accounting variables used by these studies, however, merely reflect the firm's current condition and are not forward-looking. Yet, both the extent of the distress and management's ability to respond to that distress determines the likelihood of bankruptcy. Although governance characteristics are

[1] See Federal Register, Vol. 68, No. 218, Wednesday, Nov. 12, 2003, Release No. 34-48745, P. 64154.

[2] For example, Richardson and Waegelein (2002) argue that certain compensation structures may trigger aggressive earnings management.

[3] See, for example, the Z score of Altman (originated in 1968 and updated in 1993) and the credit scoring method of Ohlson (1980). In addition, see Turetsky and McEwen (2001) for a study on the predictors of distress.

[4] For example, Altman's Z score is the following mapping: Z = 1.2 (working capital/total assets) + 1.4 (retained earnings/total assets) + 3.3 (earnings before interest and taxes/total assets) + 0.6 (market value of equity/book value of total liabilities) + (sales/total assets).

not directly incorporated into these models, to the extent that distress measures reflect market values, which might reflect forward-looking expectations of the impact of governance, governance may be indirectly reflected. Hence, it is an open empirical question how much (if at all) standard distress measures reflect overall governance information. In addition, because a firm's financial health affects its cost of capital, market value and a host of other characteristics, it is important to identify the types of governance characteristics that reduce the likelihood of bankruptcy, independent of whether or not their impact is reflected in standard distress measures.

Corporate governance can have two potential effects on the probability of bankruptcy given a measured extent of distress. First, the recent Enron and WorldCom scandals provide clear evidence that financial and accounting data can be manipulated to mask poor health.[5] These cases have been held up as examples of failed corporate governance.[6] Thus, corporate governance can potentially influence the accuracy of the financial and accounting disclosures used to measure the true condition of the firm. Second, because a firm's governance structure represents a nexus of incentive contracts, the efficacy of management's response to distress will likely depend upon the characteristics of the firm's governance structure. Thus, although it may be harder to avoid bankruptcy the greater the distress, the likelihood of avoiding bankruptcy will also depend on the adroitness with which management responds to a given level of distress, which conceivably depends upon the firm's governance structure.[7]

We examine whether certain governance characteristics are more or less likely to be associated with bankruptcy by estimating hazard models conditional on financial/accounting information both with and without governance characteristics.[8] Specifically, in this paper we investigate whether board independence, board size, and board ownership—characteristics associated with effective corporate governance in unconditionally healthy firms—are also related to effective governance in distressed firms.

We show that cross-sectional variation in disclosed financial and accounting information explains very little of the cross-sectional variation in the occurrence of bankruptcy among distressed firms. In contrast, the inclusion of governance characteristics significantly (both statistically and economically) increases the ability to predict bankruptcy. That is, for a given level of apparent health, there is a significant amount of cross-sectional

[5] Other examples of instances in which financial/accounting data was misleading can be found in both the academic and business press. In the academic literature, Teoh et al. (1998a) indicate that some seasoned equity issuers may raise reported earnings by altering discretionary accounting accruals; Teoh et al. (1998b) report similar results for initial public offerings. Also, DeAngelo (1988) documents that following successful proxy fights managers adjust discretionary accounts in order to improve apparent performance. The business press reports that Waste Management, Cendant, Xerox, and Enron have all lied in their financial statements in order to mislead investors about their true financial position, while General Electric, the world's largest firm by market capitalization, is suspected of manipulating its accounts in order to disguise risk. (See *The Economist*, May 4th, 2002).

[6] During her February 20, 2004 speech, SEC Commissioner Cynthia A. Glassman indicated that the SEC notes that director independence is a common missing element in those firms embroiled in recent financial scandals. See http://www.sec.gov/news/speech/spch022004cag.htm

[7] Using a medical analogy, the current methods of estimating bankruptcy risk are akin to methods that predict whether or not a sick patient will die on the basis of current measurements of vital statistics, without any regard for the quality (or the incentives) of the doctor treating the patient.

[8] Hazard models are widely employed in the physical and social sciences to estimate the conditional probability that an individual entity (e.g., a person, a firm, a molecule) will transition from one state of being to another as a function of the amount of time in the initial state and other conditioning variables (referred to as covariates). For excellent technical treatments of hazard models and estimation techniques see Cox (1972) and Kalbfleisch and Prentice (1980).

variation in the occurrence of bankruptcy that is systematically related to certain governance characteristics. These results are consistent with the notion that certain governance structures provide better incentives (implicit or explicit) for management to effectively respond to distress.

In particular, the results indicate that firms with larger boards with more inside directors and smaller equity ownership have a higher probability of filing for bankruptcy in the following years after becoming distressed. Our results are consistent with other studies that identify poor governance structures in non-distress settings and indicate that, once in distress, firms with poor governance are less able to make the necessary adjustments to avoid bankruptcy.

The remainder of the paper is organized as follows. Section 2 describes our methodology and data. Section 3 provides empirical tests for hypotheses on the efficacy of certain governance characteristics. Section 4 concludes.

2 Methodology and data

2.1 Methodology

Our goal is to estimate how a firm's probability of filing for bankruptcy once it becomes distressed depends upon the characteristics of its governance structure. In order to isolate the effect of governance, we need to control for the influences of the general and firm-specific economic environment that independently affect the probability of bankruptcy. Many of the environmental influences vary over time (as do, but to a much lesser extent, some of the governance characteristics). Consequently, we employ hazard model estimation techniques (rather than static limited dependent variable techniques) because they allow us to isolate the influence of governance on bankruptcy while taking into account time-series variation in economic conditions using time-varying covariates.[9]

In our hazard analysis, the dependent variable is the time it takes to transition from initially becoming distressed to filing for Chapter 11 bankruptcy protection. Below we describe how we measure distress. For firms that do not file for bankruptcy protection within the sample period, the data is considered censored by the hazard estimation method, which reflects the censoring in the likelihood function. For explanatory variables, we have two types of conditioning variables: (1) governance variables and (2) control variables. Both types of variables are described in detail below. While the governance characteristics of the firm are fairly constant, the economic conditions can vary over time. Unless accounted for, this time-series variation in economic conditions can obscure the impact of governance. For example, holding fixed the governance characteristics, for a firm that becomes distressed in a recession year and survives the first year, the probability of that firm surviving the second year will most likely depend upon whether the recession continues or the economy rebounds. Thus, we use time-varying covariates of economic conditions to capture environmental influences. Indeed, the capability to use time-varying covariates is the primary appeal of hazard techniques for this kind of study. When appropriate we also use time-varying governance covariates.

[9] Static Probit techniques essentially force the researcher to collapse any differences in the time-series paths across firms into a set of static cross-sectional variables. While, in principle, this could be done hazard methods naturally allow for time-varying conditioning information.

2.2 Data and sample selection

The initial sample includes annual data on all publicly traded firms included in the Fortune 1000 during 1991. A firm is included in the sample if annual financial and market data can be obtained from CRSP and COMPUSTAT, and if relevant corporate governance data are available from proxy statements in the Edgar data retrieval system.[10] We use this procedure to screen firms until 2000. This yields a sample of 781 companies.

In this sample of firms, a total of 34 (approximately 4.5%) filed for bankruptcy between 1992 and 2000. Table 1 shows the distribution of these 34 bankrupt firms by 2-digit SIC code and year of filing. These firms are fairly evenly distributed among industries. Although almost half (15 out of 34) of the filing firms are in manufacturing, these firms are scattered among 10 different industries. Panel B of Table 1 shows the temporal distribution of the filing firms. No filings occur until 1994, with most filings occurring in 2000. Figure 1 shows that this inter-temporal pattern is representative of the pattern exhibited by the overall economy, with bankruptcy filings peaking at the end of the last decade.

To determine the date at which a firm first becomes distressed, we consider two measures of distress: Altman's Z-score and the interest coverage ratio (ICR).[11,12] For each measure, we categorize a firm as distressed if its distress measure is below a critical value. Using this definition, we build multiple samples, each corresponding to different critical values for each of the distress measures. Specifically, for each firm, we identify all of the periods for which a specific distress measure is below a specific critical value. For each measure and critical value pair, we then define the year at which a firm enters distress (denoted τ_0) as the first period that the measure is below its critical value following a period in which it is above. The dependent variable T is then defined as the calendar year in which the firm filed for Chapter 11 minus τ_0. We refer to this variable as "time to bankruptcy." In our sample, the latest a firm can file for bankruptcy is the year 2000. Those firms that disappear from the sample without a verifiable bankruptcy filing, or those that never file for bankruptcy in the sample period are coded as censored and are appropriately treated by the statistical procedure we employ. All of the firms in the sample have Z-scores and ICRs above the appropriate critical values at the start of the sample period. As a result, we do not have any left-censored data.[13]

For the Z-score, we follow Altman (1968, 1993) and consider two critical values. Altman defines a firm with a Z-score below 1.81 as having a great risk of bankruptcy and a firm with a Z-score above 2.99 as being solvent. Using the 1.81 critical threshold, we create a sample of 476 distressed firms, 22 of which file for Chapter 11 in the sample period. Using 2.99 as the critical threshold, we obtain a sample of 508 firms diagnosed as distressed. Of these, 25 of the 34 firms that file for bankruptcy protection are included. In what follows, we refer to these two samples as the low- and high-threshold Z-score samples. For

[10] From the corporations' SEC proxy statements, 14-DEF, 14, 14D, 10-K, and 8-K filings we obtain data on compensation, board size, board composition, and firm ownership.

[11] The interest coverage ratio (ICR) is defined as operating income/interest expense. See footnote 3 for the definition of the Z score.

[12] Recent studies using these measures are Dichev (1998) (Z score) and Kahl (2003) (ICR).

[13] Left-censoring refers to the situation in which a starting value is only known to be within a range. In this case, if a firm starts off the sample with a Z score or ICR below the critical values, we would only know that $\tau_0 < 1991$. As such, given a bankruptcy date of say 1995, we would only know that $T \geq 1995–1991 = 4$. Thus T is censored. However, this time it is not because we don't know when it transitioned from distressed to bankrupt (which happens on the right-hand-side of a time line), but because we don't know when it transitioned from fully solvent to distressed (which happens on the left-hand-side of the time line).

Table 1 Distribution of bankrupt firms. The distribution of companies in our sample that filed for Chapter 11 bankruptcy protection by their 2-digit SIC code (panel A) and by the year the actual filing occurred (panel B). Panel A provides a description of the industrial classification and description obtained from the Annual Statement Studies by Robert Morris Associates

2-Digit SIC	Frequency	General industry classification	Description
Panel A			
15	1	Construction	General contractors
20	2	Manufacturing	Food and kindred products
22	1	Manufacturing	Textile mill products
28	2	Manufacturing	Chemicals and allied products
29	1	Manufacturing	Petroleum and coal products
30	1	Manufacturing	Rubber and miscellaneous plastics
32	2	Manufacturing	Glass and glassware
33	2	Manufacturing	Primary metal industries
35	1	Manufacturing	Industrial machinery and equipment
36	1	Manufacturing	Electric and electronic equipment
38	2	Manufacturing	Instruments and related equipment
45	3	Transportation and communications	Air transportation
49	4	Utilities	Electric, gas, and sanitary services
53	4	Retail trade	General merchandise stores
54	1	Retail trade	Food stores
61	1	Finance, insurance and real estate	Non-depository institutions
63	3	Finance, insurance and real estate	Insurance carriers
65	1	Finance, insurance and real estate	Real estate
73	1	Services	Business services

Year	Number of chapter 11 filings
Panel B	
1992	0
1993	0
1994	0
1995	1
1996	2
1997	3
1998	3
1999	5
2000	20

the ICR criterion, we use a critical value of 1. Although an ICR below one does not necessarily imply that a company is insolvent and cannot meet its obligations, a low ICR is clearly indicative of financial distress.[14] This definition of distress produces a sample of 277 firms. Of these firms, 22 eventually file for bankruptcy protection. Herein, we refer to this sample as the ICR-sample. In total, three samples were created.

[14] Kahl (2003) uses a similar selection criterion for the ICR.

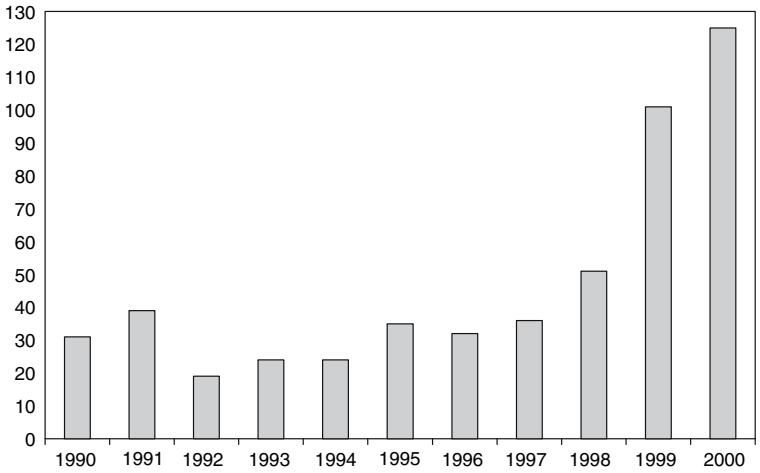

Fig. 1 Chapter 11 filings; 1990–2000. Number of annual bankruptcy filings involving liabilities of at least 100 Million dollars. The vertical axis indicates the number of filings, while calendar years appear on the horizontal axis

As non-governance controls, we augment the in-distress and Chapter 11 filing dates for each sample with relevant financial and operating data for each firm from the year it enters the sample until either the year it files for bankruptcy or it is censored from the sample. These data include Altman's (1968) Z-score and its components, and the ICR and its components. We include the level of the Z-score and the ICR since it not only conveys information about whether a firm is in a state of financial distress but also on the degree of distress.[15] We also include firm size (measured by the natural log of annual sales, Compustat item 13) and growth opportunities (measured as the ratio of expenditures in research and development over total sales).[16] To control for market conditions, we include the S&P 500 index return and the firm's return for every year during the sample period.

Information on each firm's governance characteristics is appended to each dataset. Each director is classified according to his/her principal occupation. Full-time executives of the firm are designated as insiders. Directors who are associated with the company, former employees, those with existing family or business connections with the firm other than their directorship, or those with interlocking directorships with the CEO are designated as "gray" directors. Directors that do not fit the description for inside or gray are classified as independent directors. Distinguishing gray directors and outside directors is particularly important in the context of distressed firms because grays and outsiders often have different objectives. As Fich (2005) indicates, grays might be less concerned with the financial solvency of the firm as long as the business tie s/he has with the firm is not affected by such situation. In contrast, outsiders are often more sensitive about their

[15] As Lundstrum (2003) indicates, it is possible that the firm's Z-score or its ICR are not helpful in diagnosing the firm's finacial condition if the company suffers from information problems.

[16] Smith and Watts (1992), Yermack (1996), and Fich and Shivdasani (2007) utilize a similar variable to proxy for growth opportunities. In addition, in robustness tests we use alternative proxies for growth opportunities such as the market-to-book ratio, and the capital expenditures to sales ratio. The results of these tests generate inferences similar to those tabulated.

fiduciary responsibilities with the firm's claimholders, which is likely to cause them to act in order to remedy or prevent situations of financial distress, or, to avoid lawsuits.

From the proxy statements we establish whether or not a firm has an approved stock option program that it could use to compensate directors. Table 2 provides a detailed description of the governance-related variables used in the study. In general, these

Table 2 Variable names and definitions

Covariate	Definition
Governance variables	
BOARDSIZE	The number of members of the board of directors as listed in the proxy statement
INSIDE	Number of inside directors. Insiders are the firm's full time executives
GRAY	Number of gray directors. Gray directors are those executives closely associated with the firm, are retired employees, have family or business connection with the company other than their directorships, or have interlocking directorships with the CEO
OUTSIDE	Number of outside directors. Outside directors are those who do not fit either the inside or gray category
CEOSTCMP	Black-Scholes value of granted option award divided by the CEO's total pay
INSTOWN	Number of shares owned by institutional investors divided by shares outstanding
BOARDOWN	The percentage of the firm's common stock beneficially owned by the board
FOUNDER	A binary variable for whether a member of the firm's founding family is on the board
YRSASCEO	The number of years the CEO has served as Chief Executive
CEOAGE	The CEO's age in years
MEETINGS	The number of meetings the board held during the fiscal year, including regular and special meetings, but not telephone meetings or actions by written consent
RESET	A variable taking the value of 1 if the exercise price of outstanding stock option awards was reset, and the value of 0 if it was not
TURNOVER	The number of directors (not including the CEO) who leave the board before the election of directors for the next fiscal year
General and firm-specific economic condition variables	
SPRETURN (τ)	Average return for the S&P 500 index from the beginning of year to the end of year. Year t is used to denote the year the firm entered distress, and τ is the year the variable is measured. SPRETURNTV corresponds to the time varying version of this variable where the return is for the period the firm is at risk
GROWTHOP	A proxy for growth opportunities. Defined as R&D expenditures over total sales
STOCKRET (τ)	Log (1 + stock return) – log (1 + CRSP value-weighted index return). STOCKRET (τ) corresponds to the excess return from beginning of year to the end of year. Year t is used to denote the year the firm entered distress, and τ is the year the variable is measured
	STOCKRETTV denotes the time-varying version of this variable where the return is for the period the firm is at risk
Financial/accounting variables	
FIRMSIZE	The natural log of total sales
ICR	Defined as operating income/interest expense
ALTMANSZ	Z = 1.2 (working capital/total assets) + 1.4 (retained earnings/total assets) + 3.3 (earnings before interest and taxes/total assets) + 0.6 (market value of equity/book value of total liabilities) + (sales/total assets)

variables provide information about board size, board composition and turnover, ownership structure (director ownership and institutional ownership), and compensation.

Table 3 contains summary statistics (mean, median, and standard deviation) for all of the above variables for the ICR and the high-threshold Z-score sample.[17] The company's size proxy yields an average value of 8.3.[18] The typical board has approximately 14 directors, 64% of whom are outsiders. On average, board members own very little equity with a mean ownership value of approximately one-third of 1% of their company's stock.[19] In addition, once these firms enter distress, they continue to perform poorly, as indicated by the negative average return. Of course, some of these firms eventually file for bankruptcy. The median return, however, is positive, indicating a skewed distribution. Furthermore, the standard deviation indicates a wide range of outcomes, which we seek to explain given differences in the governance structures. Most of the governance characteristics exhibit large dispersion. The most notable variables in terms of variability are institutional ownership and growth opportunities (albeit around fairly low mean levels), CEO stock compensation (with the value of the option component of compensation having a mean of approximately half the compensation), and board size (with an average of 14 and a standard deviation of 5).

For reference, Table 4 provides a correlation matrix for covariates for the high-threshold Z-score sample.[20] Although there are quite a few significantly non-zero correlations among the variables, very few correlations are high in magnitude. There exists a significant and strong positive correlation between the number of outside directors and board size combined with a significant but weaker positive correlation between the number of gray directors and board size. In addition, there is a significantly negative correlation between the number of outside and gray directors; when combined with the other correlations, this suggests that, on average, outside directors tend to crowd out gray directors but not inside directors in our sample.

2.3 Potential biases and multiple samples

Noise in the measurement of distress can create two potential problems. First, there will be some healthy firms that are diagnosed as distressed and some distressed firms that are diagnosed as healthy. Both the presence of the former set of firms and the absence of the latter set creates an upward bias on the survival time. Thus, the estimated survival time is upward-biased because healthy firms incorrectly diagnosed as distressed are unlikely to die.

Second, the estimated effects of the covariates can be biased if the error in the distress measure is correlated with the governance characteristics. Throughout the paper, we

[17] Since we are concerned about the cases where bankruptcy is more likely to occur, we focus on the high Z-score sample. Nonetheless, summary statistics for the low Z-score sample are available from the authors upon request.

[18] This estimate is obtained by estimating the natural log of the firm's sales (Compustat item 12). Using the natural log of firm assets (Compustat item 6) as a size proxy yields similar hazard estimation results.

[19] Low insider ownership has been reported by other authors in similar samples; see, for example, Shivdasani and Yermack (1999), who analyze a sample of unconditionally healthy *Fortune* 500 firms during 1994–1996.

[20] Very similar correlations exist between the variables for the low-threshold Z-score sample and the ICR sample.

Table 3 Sample statistics. Basic statistics are provided for the high-threshold Z-score sample and the ICR sample. CEO stock compensation is calculated as the ratio of the Black-Scholes value of the option granted during the year by total pay. Firm size is calculated as the natural log of total sales. The Founder (0,1) indicator takes the value of 1 if the company's founder or someone in his immediate family sits on the board of directors. Growth opportunities are calculated by dividing expenditures on research and development (R&D) over total sales. The option reset indicator variable takes the value of 1 if the option exercise price was reset during the calendar year the firm is at risk and takes the value of 0 otherwise. The Board Turnover indicator takes the value of 1 if a director left the board for causes other than death, retirement, or illness, or was not eligible for re-election according to the corporate charter, and takes the value of 0 otherwise

	Variable	Number of outside directors	Board size	CEO stock compensation	Number of gray directors	Institutional ownership	Firm size	Board ownership (% of common)	Founder (0,1) Indicator	Years as CEO	CEO's age	Number of meetings	Growth opportunities	Stock return at t	Option reset (0,1)	Board turnover
High-threshold Z-score sample N = 508	Mean	9.010	14.397	0.483	1.191	0.051	8.312	0.310	0.094	8.673	57.004	8.951	0.008	−0.016	0.364	0.132
	Median	8.000	14.000	0.000	1.000	0.000	8.319	0.273	0.000	6.000	57.500	9.000	0.000	0.075	0.000	0.000
	SD	5.188	5.525	1.597	1.430	0.068	1.148	0.170	0.293	7.840	7.081	4.292	0.043	0.390	0.482	0.339
ICR sample N = 277	Mean	6.830	12.410	0.540	1.257	0.068	8.228	0.363	0.203	9.299	56.805	9.278	0.016	−0.205	0.382	0.166
	Median	7.000	12.000	0.117	1.000	0.050	8.124	0.338	0.000	6.000	57.000	9.000	0.000	−0.148	0.000	0.000
	SD	3.407	3.719	1.253	1.533	0.072	1.240	0.205	0.403	8.861	7.825	3.785	0.060	0.462	0.487	0.373

conduct the analysis on both the high-threshold Z-score and ICR samples to address any concerns about potential biases caused by errors in measurement of distress since it is unlikely that measurement errors are correlated across these samples.[21] In fact, there is very little correlation between the Z score and the ICR in the high-threshold and low-threshold Z-score samples. For example, the correlation matrix in Table 3 indicates that, although the correlation is significantly different from 0 at the 90% level, it is not significantly different at the 95% level and the magnitude of the correlation is low at 11%. If the estimated hazards are very similar across the two samples, this is evidence that errors in the measurement of distress are not consequential.[22]

3 Empirical analyses

The goal of this section is to investigate the effect governance variables have on the bankruptcy hazard. We do this in two steps. First, we estimate the hazard function without conditioning on any governance-related variables. This analysis documents the capability of financial/accounting information to predict bankruptcy beyond the information conveyed by either the Z-score or the ICR having crossed their respective distress thresholds. This analysis also provides a benchmark upon which to judge the incremental explanatory power of the governance covariates. Second, we augment the first analysis with static governance covariates. This analysis allows us to associate the firm's performance with governance characteristics subsequent to becoming distressed with the initial governance structure.

The reason for conditioning on the governance characteristics at the onset of distress is that it is the governance structure at the time of distress that generates the incentive (explicit or implicit) to make any adjustments (including subsequent changes in governance structure) that reduce the likelihood of bankruptcy. If the governance structure fosters resistance to change, lack of action, or ineffective actions leading to bankruptcy then these negative outcomes should be associated with the governance structure in place at the onset of distress.

We also estimate hazards including time-varying covariates that specify changes in the economic environment beyond the control of the firm's governance. If it is the case that most of the firms with a certain set of governance characteristics all enter distress during a period prior to a long recession, while most firms with a different set of characteristics all enter distress during a continuing prosperous economic period, then it is more likely that the former firms will go bankrupt. Without specifying the economic environment, the hazard estimates will indicate a systematic difference between the two governance structures when in reality none may exist. By using time-varying covariates of the general economic conditions these potential erroneous inferences can be avoided.

[21] The low-threshold Z-score sample produces results that are very similar to those obtained with the high-threshold Z-score sample.

[22] In the tables that follow we only report results for the high-threshold Z-score sample and the ICR sample. The two samples differ the most in terms of the firms that are included. As such, they should provide a good check regarding the errors-in-distress-measurement issue. However, we also estimate all the hazard models using the low-threshold Z-score sample and all of the results are very similar to those reported for the high-threshold Z-score sample.

Table 4 Correlation Matrix for the ICR Sample. The first number in each cell is the correlation. Below the correlation is the p value for the hypothesis that the correlation is zero. Entries in bold correspond to variables with significantly non-zero correlation at the 90 percent or above level of confidence. Variable names and definitions are provided in Table 2.

	ICR	OUTSIDE	BOARDSIZE	CEOSTCMP	GRAY	INSTOWN	FSIZE	BOARDOWN	FOUNDER	YRSASCEO	AGE
ALTMANSZ	**0.11563**	0.01824	−0.00471	−0.05537	−0.09053	−0.05824	**0.11886**	0.06957	−0.00373	−0.03758	−0.00430
	0.0546	0.7625	0.9377	0.3585	0.1328	0.3342	**0.0481**	0.2485	0.9507	0.5334	0.9432
ICR	**1.00000**	**0.10674**	−0.00490	−0.05298	**−0.11720**	−0.07286	**0.17602**	0.01857	0.05541	−0.03505	−0.02994
	0.0	**0.0761**	0.9353	0.3797	**0.0514**	0.2268	**0.0033**	0.7583	0.3582	0.5613	0.6198
OUTSIDE	**0.10679**	**1.00000**	**0.47314**	**0.11298**	**−0.33157**	−0.03490	**0.44721**	**−0.53485**	**−0.32653**	**−0.17931**	**0.11031**
	0.0761	**0.0**	**0.0001**	**0.0604**	**0.0001**	0.5630	**0.0001**	**0.0001**	**0.0001**	**0.0027**	**0.0668**
BOARDSIZE	−0.00490	**0.47314**	**1.00000**	−0.02446	**0.20338**	−0.07466	**0.28847**	**−0.23888**	−0.00704	0.00309	**0.13788**
	0.9353	**0.0001**	**0.0**	0.6853	**0.0007**	0.2155	**0.0001**	**0.0001**	0.9072	0.9592	**0.0217**
CEOSTCMP	−0.05298	**0.11298**	−0.02446	**1.00000**	**−0.15700**	0.04011	0.05755	**−0.10933**	**−0.15850**	−0.03507	−0.06635
	0.3797	**0.0604**	0.6853	**0.0**	**0.0089**	0.5061	0.3399	**0.0692**	**0.0082**	0.5611	0.2711
GRAY	**−0.11720**	**−0.33157**	**0.20338**	**−0.15700**	**1.00000**	**0.10557**	**−0.10689**	−0.04139	**0.23614**	**0.15106**	−0.00000
	0.0514	**0.0001**	**0.0007**	**0.0089**	**0.0**	**0.0794**	**0.0757**	0.4927	**0.0001**	**0.0118**	0.9999
INSTOWN	−0.07286	−0.03490	−0.07466	0.04011	**0.10557**	**1.00000**	**−0.11634**	−0.05045	−0.03715	0.02035	**−0.11660**
	0.2268	0.5630	0.2155	0.5061	**0.0794**	**0.0**	**0.0531**	0.4029	0.5381	0.7359	**0.0526**
FSIZE	**0.17602**	**0.44721**	**0.28847**	0.05755	**−0.10689**	**−0.11634**	**1.00000**	**−0.21934**	**−0.31310**	**−0.10902**	**0.14244**
	0.0033	**0.0001**	**0.0001**	0.3399	**0.0757**	**0.0531**	**0.0**	**0.0002**	**0.0001**	**0.0700**	**0.0177**
BOARDOWN	0.01857	**−0.53485**	**−0.23888**	**−0.10933**	−0.04139	−0.05045	**−0.21934**	**1.00000**	**0.36447**	**0.26107**	0.00826
	0.7583	**0.0001**	**0.0001**	**0.0692**	0.4927	0.4029	**0.0002**	**0.0**	**0.0001**	**0.0001**	0.8912
FOUNDER	−0.05541	**−0.32653**	−0.00704	**−0.15850**	**0.23614**	−0.03715	**−0.31310**	**0.36447**	**1.00000**	**0.41990**	0.03730
	0.3582	**0.0001**	0.9072	**0.0082**	**0.0001**	0.5381	**0.0001**	**0.0001**	**0.0**	**0.0001**	0.5365
YRSASCEO	−0.03505	**−0.17931**	0.00309	−0.03507	**0.15106**	0.02035	**−0.10902**	**0.26107**	**0.41946**	**1.00000**	**0.43984**
	0.5613	**0.0027**	0.9592	0.5611	**0.0118**	0.7359	**0.0700**	**0.0001**	**0.0001**	**0.0**	**0.0001**
AGE	−0.02994	**0.11031**	**0.13788**	−0.06635	−0.00000	**−0.11660**	**0.14244**	0.00826	0.03730	**0.43984**	**1.00000**
	0.6194	**0.0668**	**0.0217**	0.2711	0.9999	**0.0526**	**0.0177**	0.8912	0.5365	**0.0001**	**0.0**

Table 4 continued

	ICR	OUTSIDE	BOARDSIZE	CEOSTCMP	GRAY	INSTOWN	FSIZE	BOARDOWN	FOUNDER	YRSASCEO	AGE
MEETINGS	0.00709	**0.21829**	**0.15133**	**0.13816**	−0.04467	0.04560	**0.19669**	**−0.23619**	**−0.15024**	−0.02588	**0.11868**
	0.9072	**0.0003**	**0.0117**	**0.0214**	0.4590	0.4497	**0.0010**	**0.0001**	**0.0123**	0.6680	**0.0485**
GROWTHOP	**−0.10572**	−0.09557	−0.04019	0.02092	**0.12456**	0.08322	**−0.15716**	−0.00611	**0.11205**	0.00587	**−0.11754**
	0.0790	0.1125	0.5054	0.7288	**0.0383**	0.1672	**0.0088**	0.9194	**0.0626**	0.9226	**0.0507**
STOCKRET	**0.16868**	−0.00252	−0.01188	−0.05388	0.04116	−0.01255	0.00685	−0.02063	0.01505	−0.04234	−0.04577
	0.0048	0.9667	0.8439	0.3717	0.4951	0.8353	0.9096	0.7325	0.8031	0.4828	0.4480
S&P500RET	0.00552	0.00552	0.01996	0.07123	0.01742	0.03105	−0.07067	0.03013	0.06913	−0.00672	−0.06460
	0.9272	0.3599	0.7471	0.2373	0.7729	0.6069	0.2410	0.6176	0.2515	0.9114	0.2839
RESET	**−0.15094**	0.06969	0.05299	−0.01070	−0.05814	0.02651	−0.01605	−0.07203	**−0.11671**	−0.07440	−0.07553
	0.0119	0.2477	0.3796	0.8593	0.3350	0.6605	0.7900	0.2321	**0.0523**	0.2170	0.2101

	MEETINGS	GROWTHOP	STOCKRET	S&P500RET	RESET	TURNOVER
ALTMANSZ	**−0.10962**	0.01616	−0.00586	0.00135	−0.01261	−0.05293
	0.0685	0.7889	0.9227	0.9822	0.8345	0.3802
ICR	0.00704	**−0.10572**	**0.16888**	0.00552	**−0.15094**	−0.06090
	0.9072	**0.0790**	**0.0048**	0.9272	**0.0119**	0.3125
OUTSIDE	**0.21829**	−0.09557	−0.00252	0.00552	0.06969	0.02257
	0.0003	0.1125	0.9667	.3599	0.2477	0.7085
BOARDSIZE	**0.15133**	−0.04019	−0.01188	0.01946	0.05299	−0.02007
	0.0117	0.5054	0.8439	0.7471	0.3796	0.7395
CEOSTCMP	**0.13816**	0.02092	−0.05388	0.07123	−0.01070	0.06380
	0.0214	0.7288	0.3717	0.2373	0.8593	0.2900
GRAY	−0.04467	**0.12456**	0.04116	0.01742	−0.05814	−0.04912
	0.4590	**0.0383**	0.4951	0.7729	0.3350	0.4155

Table 4 continued

	ICR	OUTSIDE				
BOARDSIZE		CEOSTCMP	GRAY	INSTOWN	FSIZE	
BOARDOWN	FOUNDER	YRSASCEO	AGE			
				INSTOWN	0.04560	0.08322
−0.01255	0.03105	0.02651	−0.03817			
0.4497	0.1672	0.8353	0.6069	0.6605	0.5270	
FSIZE	**0.19669**	**−0.15716**	0.00685	−0.07067	−0.01605	0.05353
	0.0010	**0.0088**	0.9096	0.2410	0.7903	0.3748
BOARDOWN	**−0.23619**	−0.00611	−0.02063	−0.03013	−0.07203	−0.07758
	0.0001	0.9194	0.7325	0.6176	0.2321	0.1980
FOUNDER	**−0.15024**	**0.11205**	0.01505	0.06913	**−0.11671**	−0.08889
	0.0123	**0.0626**	0.8031	0.2515	**0.0523**	0.1400
YRSASCEO	−0.02588	0.00587	−0.04234	−0.00672	−0.07440	0.07207
	0.6680	0.9226	0.4828	0.9114	0.2170	0.2318
AGE	**0.11868**	**−0.11754**	−0.04577	−0.06460	−0.07553	**0.19314**
	0.0485	**0.0507**	0.4480	0.2839	0.2101	**0.0012**
MEETINGS	**1.00000**	−0.05556	**−0.11222**	−0.06232	0.09278	**0.20223**
	0.0	0.3569	**0.0622**	0.3014	0.1234	**0.0007**
GROWTHOP	−0.05556	**1.00000**	0.00548	0.03708	−0.02815	−0.01374
	0.3569	**0.0**	0.9276	0.5389	0.6409	0.8199
STOCKRET	**−0.11222**	0.00548	**1.00000**	**0.13222**	0.03582	**−0.19591**
	0.0622	0.9276	**0.0**	**0.0278**	0.5528	**0.0010**
S&P500RET	−0.06460	−0.03708	**0.13222**	**1.00000**	−0.08231	−0.03548
	0.2839	0.5389	**0.0278**	**0.0**	0.1719	0.5565
RESET	0.09278	−0.02815	0.03582	−0.08231	**1.00000**	−0.05623
	0.1234	0.6409	0.5528	0.1719	**0.0**	0.3511

3.1 The hazard estimates with only financial/accounting covariates

The hazard estimates for a set of benchmark cases are presented in Table 5.[23] All of the models include combinations of the Z-score and the ICR to test whether the level of these variables has any power to predict bankruptcy beyond that implied by their indication of distress. In addition, since larger firms are likely to have greater opportunities to diversify bankruptcy risk within the firm (i.e., across different divisions or product lines) independent of the efficacy of the firm's governance structure, we also include firm size to account for these differences.[24] We also add the return on the S&P 500 Index for the year prior to entering distress as an indicator of general economic conditions. Finally, the firm's own return for the year prior to entering distress and for the year of distress are used as independent variables in some of the regressions. The rationale for including these returns is discussed further below. In Models 3 and 6, we also include the return on the S&P 500 index as a time-varying covariate to account for changing economic conditions in general.

In general, these models provide little explanatory power. The generalized R^2s for the regressions are very low, implying that very little of the cross-sectional variation in the occurrence of bankruptcy can be explained by these variables. The correlation matrix in Table 4 indicates a marginally significant positive correlation between the Z score and the ICR. As such, using both covariates in the same regression might result in neither appearing to be significant. Thus, we report results with one or the other separately. In the high-threshold Z-score sample, neither variable is significant when both variables are included (see Models 2 and 3). However, the chi-squared test that all coefficients are zero is rejected at the 90% level of significance. We note that in the Z-score sample, it becomes much more likely that the ICR has a non-zero effect when the Z-score is not used as a covariate (with the *p*-value for the ICR coefficient dropping from 0.882 in Model 2, which includes the Z score as a covariate, to 0.1253 in Model 1, which excludes the Z-score as a covariate). When the ICR is removed from the regression in the ICR sample, there is very little change in the magnitude or significance of the Z-score. This fact is noticeable when comparing the Z-score estimates for Models 5 and 6.

All of the models include the firm's own return for the year prior to entering distress to account for the market's expectation. For reference, we also include the return in the S&P 500 index for that period. Models 3 and 6 also include the firm's own stock return for the year they enter distress. The market return for the year prior to distress is included because it could include market information about the likelihood of bankruptcy. In general, none of the included variables provide very much explanatory power, with generalized R^2s ranging from 0.7% to 2%. In the next section, we re-estimate our models using governance characteristics as additional independent variables.

[23] Because the raw coefficient estimates of hazard models have no direct economic interpretation, throughout the paper and in the tables we provide and refer to risk ratios, which have an intuitive interpretation. A covariate's risk ratio minus 1 quantifies the percentage change in the probability of bankruptcy given a one unit increase in the value of the covariate. We also provide and refer to the model's generalized R^2. This measure is analogous to the R-squared in a standard OLS regression; it measures the percentage of the variation in the occurrence of bankruptcy explained by the variation in the covariates used in the model.

[24] Of course, one could argue that the size of a firm is dictated by the governance structure of the firm. As Table 5 shows, however, firm size is not significant when no other governance-related variables are included.

Table 5 Bankruptcy hazards without governance characteristics. This table reports the hazard model estimates for the high-threshold Z-score sample and for the ICR sample. The first entry reported for each covariate is the estimated coefficient. Below each estimated coefficient is the *p*-value associated with the null hypothesis that the coefficient is zero. The third entry is the risk ratio minus 1, which is the percentage change in the probability of bankruptcy given a one-unit change in that explanatory variable. All three entries are highlighted in bold if the coefficient is significantly different from zero at the 90% or above level of confidence. At the end of the coefficient estimates and statistics are the goodness of fit statistics for the model as a whole. The Chi-squared statistic is for the null hypotheses that the coefficients on all the variables are zero. The *p*-value is the probability that this null hypothesis is true. The number of observations is self-explanatory and the Gen. R^2 is a transformation of the ratio of the Log likelihood under the null and with the estimated coefficients that specifies the percentage of the cross-sectional variation in the occurrence of bankruptcy that is explained by cross-sectional variation in the independent covariates. See Table 2 for the definitions of all of the covariates. Index t denotes the year at which the firm entered distress

Sample	Model 1 High Z	Model 2 High Z	Model 3 High Z	Model 4 High Z	Model 5 ICR	Model 6 ICR	Model 7 ICR	Model 8 ICR
Covariate								
ALTMANSZ	–	0.00001	0.00001	0.00004	−0.0001	−0.0001	−0.00012	−0.00012
		0.9429	0.9322	0.8313	0.4777	0.5475	0.5780	0.5703
		−0.00	−0.00	0.00	−0.00	−0.00	−0.00	−0.00
ICR	−0.1247	−.1256	−0.1158	−0.1072	–	−0.0680	−0.0643	−0.0768
	0.1253	0.882	0.1721	0.2081		0.3115	0.3349	0.2566
	−0.117	−.118	−0.109	−0.112		−0.066	−0.062	−0.074
FIRMSIZE	−0.2091	−.2024	−0.1454	−0.0355	−0.2272	−0.1923	−0.1962	−0.1039
	0.2573	0.3279	0.4912	0.8720	0.1976	0.2820	0.2792	0.5931
	−0.199	−.193	−0.135	−0.035	−0.203	−0.825	−0.178	−0.099
STOCKRET(t-1)	−0.5312	−.5285	**−4.326**	**−3.5072**	0.0093	0.0935	−1.804	−1.6523
	0.2911	.2947	**0.0096**	**0.0292**	0.9842	0.8483	0.2600	0.2841
	−0.412	−.411	**−0.987**	**−0.970**	0.009	0.098	−0.835	−0.808
STOCKRET(t)	–	–	−0.3814	−0.3632	–	–	0.1726	0.1816
			0.4922	0.5068			0.7356	0.7231
			−0.317	−0.305			0.188	0.199
S&P500RET(t)	2.993	2.978	−2.678	−2.449	−0.6574	−0.7265	−2.7003	−2.565
	0.1023	0.1062	0.3627	0.3791	0.7033	0.6744	0.2824	0.2871
	18.94	18.64	−0.931	−0.914	−0.482	−0.516	−0.933	−0.923
S&P500RETTV				**−2.795**				−1.512
				0.0481				0.1798
				−0.939				−0.780
Goodness of fit								
χ^2	10.628	10.628	17.267	20.375	2.201	3.033	4.295	5.919
Number of Obs.	508	508	508	508	277	277	277	277
p value	0.0311	0.0592	0.0083	0.0048	0.6988	0.6950	0.6369	0.5493
Gen. R^2	0.0207	0.0207	0.0334	0.0393	0.0079	0.0109	0.0154	0.0211

3.2 The hazard estimates in presence of governance covariates

The estimates of the hazard models using static governance covariates appear in Table 6. In general, the governance covariates significantly increase the ability to explain differences in the occurrence of bankruptcy. The models with governance covariates (in Table 6)

have high chi-squared statistics and much higher generalized R^2 statistics ranging from 26% to 33%, up from at most 2% in the previous section. Each of the regression models in Table 6 and the estimated coefficients for each of the important covariates is discussed in detail below.

Table 6 presents two types of models for each of the two samples. Models 1 and 4 exclude the firm's own stock returns (both for the year prior to entering distress and for the year of distress) as a covariate while Models 2, 3, 5, and 6 include these returns. We present both types of models in order to better interpret the coefficients on the return and the governance variables. The stock return may contain information about future economic

Table 6 Bankruptcy hazards conditional on governance characteristics at the onset of distress. This table reports the hazard model estimates for the high-threshold Z-score sample and for the ICR sample. The first entry reported for each covariate is the estimated coefficient. Below each estimated coefficient is the p-value associated with the null hypothesis that the coefficient is zero. The third entry is the risk ratio minus one, which is the percentage change in the probability of bankruptcy given a one-unit change in that explanatory variable. All three entries are highlighted in gray if the coefficient is significantly different from zero at the 90% or above level of confidence. At the end of the coefficient estimates and statistics are the goodness of fit statistics for the model as a whole. The Chi-squared statistic is for the null hypotheses that the coefficients on all the variables are zero. The P-value is the probability that this null hypothesis is true. The number of observations is self-explanatory and the Gen. R^2 is a transformation of the ratio of the Log likelihood under the null and with the estimated coefficients that specifies the percentage of the cross-sectional variation in the occurrence of bankruptcy that is explained by cross-sectional variation in the independent covariates. See Table 2 for the definitions of all of the covariates. Index t denotes the year at which the firm entered distress

Sample	Model 1 High Z	Model 2 High Z	Model 3 High Z	Model 4 ICR	Model 5 ICR	Model 6 ICR
Covariate						
ALTMANSZ	**−0.00029**	**−0.00032**	−0.00017	−0.00037	−0.00040	−0.00034
	0.0477	**0.0320**	0.2749	0.3185	0.3024	0.2873
	−0.00	**−0.00**	−0.00	−0.00	−0.00	−0.00
ICR	**−0.1724**	−0.1767	**−0.2168**	−0.1210	−0.1066	−0.0739
	0.0756	0.1013	**0.0113**	0.1634	0.2204	0.2902
	−0.158	−0.154	**−0.195**	−0.114	−0.111	−0.071
BOARDSIZE	**0.3190**	**0.3233**	**0.3384**	**0.2226**	**0.2226**	**0.2377**
	0.0001	**0.0001**	**0.0001**	**0.0001**	**0.0001**	**0.0001**
	0.376	**0.382**	**0.403**	**0.249**	**0.249**	**0.268**
OUTSIDE	**−0.8652**	**−0.8736**	**−0.3596**	**−0.6053**	**−0.6285**	**−0.2634**
	0.0001	**0.0001**	**0.0001**	**0.0001**	**0.0001**	**0.0048**
	−0.579	**−0.583**	**−0.302**	**−0.454**	**−0.467**	**−0.232**
GRAY	**−0.7506**	**−0.8127**	**−0.3994**	**−0.3969**	**−0.4366**	−0.2334
	0.0032	**0.0011**	**0.0177**	**0.0182**	**0.0154**	0.1423
	−0.528	**−0.556**	**−0.329**	**−0.338**	**−0.354**	−0.208
BOARDOWN	**−19.39**	**−18.96**	–	**−12.44**	**−12.31**	–
	0.0001	**0.0001**		**0.0001**	**0.0001**	
	−1.000	**−1.000**		**−1.000**	**−1.000**	
INSTOWN	3.643	5.108	**7.482**	−1.144	−0.0106	5.122
	0.3398	0.2189	**0.0563**	0.7943	0.9982	0.2342
	37.21	165.48	**1775.39**	−0.681	−0.021	166.65

Table 6 continued

Sample	Model 1 High Z	Model 2 High Z	Model 3 High Z	Model 4 ICR	Model 5 ICR	Model 6 ICR
FOUNDER	**1.658**	**1.566**	1.447	**1.445**	1.209	0.3142
	0.0593	**0.0970**	0.1493	**0.0453**	0.1158	0.6271
	4.249	**3.786**	3.249	**3.241**	2.351	0.369
YRSASCEO	−0.0201	−0.0072	**−0.1878**	−0.0716	−0.0702	**−0.1296**
	0.7387	0.9075	**0.0018**	0.1414	0.1562	**0.0016**
	−0.020	−0.007	**−0.171**	−0.069	−0.068	**−0.122**
CEOAGE	−0.0599	−0.0608	0.0129	0.0477	0.0537	0.0190
	0.2091	0.1996	0.7599	0.2566	0.2119	0.5722
	−0.058	−0.059	0.013	0.049	0.055	0.019
CEOSTCMP	−0.0673	−0.0386	0.0264	−0.0633	−0.2701	−0.2954
	0.4483	0.6767	0.7647	0.8913	0.6338	0.5395
	−0.065	−0.038	0.027	−0.071	−0.237	−0.256
FIRMSIZE	−0.5250	−0.5330	**−0.7125**	**−0.6602**	**−0.6396**	**−0.7854**
	0.2465	0.2243	**0.0114**	**0.0741**	**0.0811**	**0.0087**
	−0.408	−0.413	**−0.510**	**−0.483**	**−0.472**	**−0.544**
S&P500RET(t-1)	−3.207	−3.420	−1.649	1.217	−1.737	**−5.716**
	0.3134	0.5073	0.7228	0.6254	0.6523	**0.0815**
	−0.960	−0.967	−0.808	2.377	−0.824	**−0.997**
STOCKRET(t-1)	–	−0.5231	1.208	–	−2.621	**−4.456**
		0.8674	0.6849		0.2822	**0.0257**
		−0.407	2.345		−0.927	**−0.988**
STOCKRET(t)	–	−0.8695	−0.6346	–	0.1838	0.3542
		0.2392	0.2627		0.8328	0.6150
		−0.581	−0.470		0.202	0.425
Goodness of fit						
χ^2	156.99	158.352	124.76	111.76	113.056	85.170
Number of Obs.	508	508	508	277	277	277
p value	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Gen. R^2	0.2658	0.2678	0.2177	0.3320	0.3351	0.2647

conditions. To the extent that these expectations have implications for future recovery independent of the efficacy of the governance structure's response, then the firm's own stock return predictive power should be independent of the governance variables. If, however, the market can gauge how a firm's observable governance structure is related to its probability of bankruptcy, then this return might subsume all of the governance-related information on bankruptcy risk. In that case, the estimated effects of the governance characteristics can become commingled with the coefficient on the firm's return, causing the estimated coefficients on the governance characteristics to be misleading. Thus, for comparison we also provide hazard estimates when the firm's own stock return is excluded from the regression.

The results of both samples indicate that the firm's stock returns are insignificant, suggesting that the market either had no information about the likelihood of bankruptcy the

year before the firm entered distress or the market incorporated that information earlier. This is also consistent with the general lack of explanatory power in the regressions without governance reported in Table 5. A more important result is that the exclusion of the firm's own-stock return has no effect on the magnitude or the significance of the other variables. This implies that in the year prior to the onset of distress, the market does not seem to predict any differences in the hazard of bankruptcy due to observable governance differences. As such, the estimated effects of the governance variables are not diluted by the inclusion of the firm's own return.

In the Z-score sample, both the Z-score and the ICR are mostly significant at the 90% level. The estimates for both variables indicate that higher values of either the Z score or the ICR imply lower hazard rates. Thus, once governance variables and initial market conditions are accounted for, cross-sectional dispersion in the level of the initial distress indicators does explain differences in the occurrence of bankruptcy. Of course, this result is probably an artifact of the discrete measurement interval of a year. If a firm enters distress early in the year and continues to deteriorate, then its Z-score and ICR will be much lower than those for a firm that enters distress right before the end of the year. Because of the coarse sampling intervals, both firms will be identified as becoming distressed at the same time. If both firms deteriorate at the same rate, then the first set of firms will probably enter bankruptcy sooner than the second set of firms since it had actually been distressed longer. This cross-sectional variation in the occurrence of bankruptcy can be explained by differences in the level of the ICR or Z-score, which essentially proxies for when in the yearlong measurement interval the firm becomes distressed. It is important to include these proxies since the estimated effects of the governance variables may be biased without these proxies if there is correlation between the time in the measurement interval a firm enters distress and its governance characteristics.

In the ICR sample, both the Z-score and the ICR are insignificant. This is potentially due to the much smaller sample size and less cross-sectional variation in the levels of these variables. To examine whether multicollinearity between these variables explains the lack of significance, regressions including only one or the other variable were estimated. The results (not reported due to the limitation of space) again indicate that neither variable is significant in the ICR sample.

Board size is significantly positively related to the probability of bankruptcy. In both the Z-score and ICR samples, the risk ratios imply, respectively, approximately a 38% or 25% increase in the hazard of bankruptcy for every additional director. Under the interpretation of bankruptcy as a bad outcome, this result is consistent with results reported in Yermack (1996), which documents an inverse relation between a firm's market value, as measured by Tobin's Q, and the size of its board of directors. Gilson (1990) reports that board size is often reduced once firms enter Chapter 11 bankruptcy protection. These reductions in board size may be motivated by the belief, which our results support, that smaller boards are more effective at improving value (or at least not destroying value) during periods of distress.

In addition to size, the composition of the board has a significant effect on the hazard rate. Table 6 shows a statistically significant inverse association between the number of outside directors and the bankruptcy hazard. The risk ratios are approximately 0.58–0.46 in both samples, implying that each additional outside director can cut the bankruptcy hazard in half. In addition, the number of gray directors has a significantly negative coefficient, with each gray director mitigating the bankruptcy hazard by about a half to a third in the Z-sample and the ICR samples, respectively. Since the regressions control for board size, an additional outside or gray director comes at the cost of an additional insider. Thus, the

above results imply that boards with greater representation by insiders are less effective at avoiding bankruptcy. That is, more independent boards (as indicated by more outside representation) appear to be more effective at making the necessary business adjustments under distress that avoid bankruptcy.

The efficacy of outside directors relative to inside directors is consistent with existing studies of board independence that do not condition on distress.[25] Unconditionally, inside directors are more likely to have conflicts of interest with shareholders over perquisite consumption while unaffiliated outside monitors do not have access to such perquisites and can actually garner valuable reputation capital by preventing insiders from entrenching and consuming perquisites.[26] Conditional on distress, however, the incentives of insiders relative to those of outsiders is less obvious. In distress, inside directors are likely to have a more intense interest in the future recovery of the firm since they risk losing both current and future employment, in addition to their source of perquisites.[27] Outside directors, however, only risk losing their seat on the board and face a reduced likelihood of being asked to sit on others. Although the total compensation associated with sitting on multiple boards can make a Fortune 500 director rich over the years of board service (Yermack 2004), the total amount at risk is small relative to the primary compensation often earned by a top manager in a Fortune 1000 company. That is, the effective pay-for-performance sensitivity of an insider is likely to be much greater than that for an outsider. Thus, on the surface, it is surprising that the greater the insider representation on a distressed firm's board, the more likely a distressed firm ends up in bankruptcy court.

One probable explanation for why inside directors, despite their potentially more intense incentives, may be less effective at preventing bankruptcy is that an insider may not have a clear understanding of the problems their firm faces. Alternatively, it is also possible that insiders, as Yen (1987) suggests, are engaging in opportunistic behavior to protect their firm-specific pecuniary/non-pecuniary wealth. In many cases, these manager/inside board members will anticipate and respond to impending adverse conditions before they become a problem. However, in those situations in which adverse conditions actually hurt the firm (i.e., forced the firm into distress), it is likely that management was not able to recognize, or, was purposefully ignoring the problem at the outset. In these cases, an insider is unlikely to provide an effective remedy. Outside directors, however, may have different types of skills that allow them perspective to solve such problems. The more outside directors there are, the greater the likelihood is that there is a perspective among them that will be useful.

Another potential explanation for why the greater the insider representation on a distressed firm's board, the more likely bankruptcy becomes, is rooted in the idea that insiders may take value-destroying actions in order to sustain and/or justify inflated equity valuations. This interpretation of our result is consistent with the arguments by Jensen (2005) who suggests that when a firm's equity becomes substantially overvalued firm insiders set in motion a set of organizational forces that are extremely difficult to sustain, forces which often destroy part of the core value of the company.

[25] For example, Cotter et al. (1997) report that outside directors of targeted firms enhance their stockholders' gains during tender offers.

[26] Vancil (1987) and Fich (2005) provide discussions on the market for directorships and the cost to an outside director from a loss in reputation as an independent monitor.

[27] Gilson (1990) supports this view by documenting that directors of failed firms are less likely to obtain similar positions at other firms.

The inverse relation between the number of gray directors and the hazard of bankruptcy is counter to the usual interpretation of gray directors as being affiliated with insiders and, thus, having greater conflicts of interest than outside directors with shareholders over perquisites. However, many of the directors classified as gray are accountants, lawyers, bankers, suppliers, interlocked directors, or even clients. These types of directors may provide specialized skills (accounting and legal advice) or unique relationships (capital, clients, or interlocks with potentially strategic partners) that will help a firm turn around, or delay bankruptcy. Furthermore, in many cases, the gray directors' very own firms may be harmed by the subject's bankruptcy, and, thus, these gray directors have a greater incentive to mitigate the hazard of bankruptcy.

Table 6 also indicates that the greater the amount of inside ownership, the lower is the bankruptcy hazard. This result is in agreement with numerous studies and underscores the importance of equity ownership in properly aligning the interests of the firm's directors and stockholders. (See, for example, Morck et al. (1988); McConnell and Servaes (1990); Hermalin and Weisbach (1991); Yermack (1996).) Yet, it should be pointed out, even though options can also align the incentives of top managers with those of shareholders, the CEO option compensation covariate is not statistically significant. In addition, it is also possible that the value of the option is understated (Yermack 1998). Table 4, however, shows that there is a significant negative correlation between the value of the CEO option compensation and board ownership, indicating that the options and ownership may be substitutes in terms of providing incentives. Thus, the significance of option compensation may be undermined by its collinearity with insider ownership. Models 3 and 6 exclude the board ownership covariate to investigate whether it has any impact on the significance of the CEO option compensation covariate. There is no significant change in the magnitude or the significance of the option compensation variable.

Alternative explanations for the insignificance of option compensation include the following. First, Ofek and Yermack (2000) provide evidence that insiders that are given options typically respond by selling shares in their firm, which moderates the incentive effect of the option grants. Second, it is possible that top managers in firms operating in industries prone to bankruptcy prefer to structure their compensation contracts with less emphasis on performance-contingent pay. Third, the incentives created by option compensation can be ambiguous when a firm is in distress. When a firm is distressed and the options are out of the money, increases in both the mean and the variance of cash flows can increase the option's value. Whether the firm adopts policies that increase the mean (which would reduce the probability of bankruptcy) or increase variance (which, depending upon the pre-policy-adoption path of the firm, may increase or decrease the probability of bankruptcy) depends upon how hard it is to identify and implement each of these types of policies. Without information on the ease of identification and implementation, the effect of option compensation is ambiguous. Fourth, it is possible that CEOs of distressed firms are more concerned with preserving their pension compensation and less worried about their option-based pay. This situation might occur because, in most situations, even in the event of bankruptcy, creditors cannot tap onto pension funds. In contrast, equity-based compensation in a bankrupt firm is worthless. Given these four possibilities, the relation (both causality and correlation) between option compensation and bankruptcy risk is complex and unlikely to be the same across firms, which is consistent with our results.[28]

[28] The idea that CEOs and other top managers would make self-serving decisions that might be detrimental to the firm's shareholders is not new. In the context of merger proposals, Yen (1987) provides a clear rationale to explain why incumbent top managers, concerned about their own job security, might engage in opportunistic behavior.

The results are mixed with respect to the effect of firm size on the bankruptcy hazard with size being insignificant in the Z-score sample but significant at the 90% level in the ICR sample.[29] While larger firms may have greater opportunities to shift assets between divisions or to dispose of assets to generate cash flow in order to make payments to creditors, perhaps firm size is only weakly significant since these types of actions require good governance and, as a result, are captured by the governance variables. Furthermore, given that the sample includes Fortune 1000 firms, perhaps the cross-sectional variation in size is insignificant in viewing the generally large size of these firms. Nonetheless, to address the potential heterogeneity of firm size we repeat all of our tests replacing the variable by firm size quartiles. These tests yield results and inferences qualitatively identical to those reported herein.

In the models that include board ownership (models 1, 2, 4, and 5), the percentage of institutional ownership is not significant in either sample. Furthermore, the signs of the coefficients differ across the two samples. This is surprising in that institutions are typically thought to be proactive in the governance of firms. (See, for example, Hartzell and Starks 2003.) One explanation is that institutional investors are either not as active as expected or that they are active but that their influence has no substantive effect on outcomes. The first explanation may be true because many institutions are index funds. As such they are more concerned with tracking error rather than making the firms perform well. See Edelen (2001) for a study that supports this view. Furthermore, indexing is likely to be a prevalent motivation for many institutions since our sample comes from the Fortune 1000. Interestingly, when board ownership is excluded from the Z-score sample (see Model 3), institutional ownership becomes significant. However, the exclusion of board ownership results in approximately a 20% drop in the generalized R^2.

3.3 The hazard estimates adding time-varying covariates

In this section we add time-varying covariates that specify changes in both general economic conditions and firm-specific economic conditions. If there are changes in economic conditions that affect the bankruptcy hazard, and the occurrence of these changes is correlated with some governance characteristics, then the hazard model will erroneously attribute the effect to the governance characteristics rather than to the changing conditions. In order to rule out this potential bias, we include time-varying covariates that characterize the economic environment throughout the period in which the firm is at risk.

A covariate for growth opportunities is generated as expenditures on research and development (R&D) divided by sales.[30] One view of growth options is that it captures changes in economic conditions that could be exploited by a distressed firm. That is, if there is a change in the market demand for a given product that improves that firm's growth options, then that firm will be less likely to become bankrupt. An alternative view of the R&D expenditure divided by sales is that R&D is a luxury good that firms can afford only after they emerge from being distressed. Higher R&D expenditures, rather than being symptomatic of improved economic conditions, are symptomatic of good decisions made

[29] Other commonly used proxies for firm size, such as the natural log of total capital or the natural log of assets, yield similar results.

[30] Other proxies for growth opportunities such as the market-to-book ratio generate qualitatively similar results.

by good governance that lead the firm out of distress. In one case it is something that must be held fixed in the regression while in the other case it is a variable that is correlated with good governance and, therefore, might mask the importance of the governance characteristics.

A similar argument can be made for stock-option resets. Once the economic conditions deteriorate, thus making it more difficult for even an effective governance structure to avoid bankruptcy, the incentives must be changed to reflect this change in conditions. Thus, option resets will proxy for changing conditions. Alternatively, if only poor governance structures allow executives to reset their options after their poor decisions adversely affect the value of the firm, then option resets will be correlated with poor governance. If so, collinearity might mask the negative effect of the poor governance.

We also include the firm's own stock return to capture the market's expectation of firm-specific conditions. Of course, this variable may reflect changes in viability generated by the governance structure of the firm. Thus, if the firm's governance structure effectively responds to distress and this is reflected in the stock price, the coefficient on the stock return may absorb the positive impact of the governance, yielding coefficients on the governance characteristics that wrongly indicate no effect.[31]

To better interpret the coefficients on the initial governance characteristics, we estimate the hazard models with and without the time-varying growth option variable, the stock-option reset variable, and own-firm stock return. Models 1 and 3 in Table 7 include these variables while Models 2 and 4 exclude them. A comparison of these models shows that the inclusion of these time-varying covariates has no significant impact on either the magnitude or the significance of the initial governance covariates. Thus, it appears that these time-varying covariates are not correlated with the governance structure and, as a result, their inclusion does not dilute the effect of the initial governance characteristics. Only the time-varying covariate for the resetting of executive stock options is significant. The estimated coefficient indicates that greater option resets reduce the bankruptcy hazard. This is consistent with the notion that options are less effective at creating clear managerial incentives to increase the mean value of the firm when they are out of the money. Thus, firms that reset their executive stock options to better reflect current deteriorating financial conditions will have more reasonable incentives and a lower hazard of bankruptcy.

A comparison of the models in Tables 7 and 6 also shows that the estimated effects of the governance variables are robust to the inclusion of any time-varying covariate, including the time-varying S&P 500 index return. Board size continues to be positively related to the hazard of bankruptcy, and both the number of outside directors and the number of gray directors maintain an inverse association with the bankruptcy hazard. The estimated coefficients on the ownership covariate are also consistent with those in Table 6. Firm size, however is no longer significant. The coefficients on the Z score and the ICR are negative and significant in the Z-score sample, while only the ICR is significant in the ICR sample. The time-varying covariate of the S&P 500 index return is significant in three out of the four regressions, effectively controlling for the influence of general economic

[31] Shumway (2001) indicates that the firm's return as a time-varying covariate significantly improves the fit of the hazard model. The focus in Shumway (2001) is on predictability and, as a result, there is a greater concern about the amount of cross-sectional variation in the occurrence of bankruptcy that can be explained by the model. Our approach differs in that we are primarily interested in isolating the impact of governance characteristics and obtaining precise estimates of their effect on the hazard. Thus, if the time-varying return is correlated with the decisions generated by the governance structure, resulting in the governance effects being masked, these returns should not be included as time-varying covariates.

Table 7 Bankruptcy hazards conditional on governance characteristics and time-varying conditions at the onset of distress. This table reports the hazard model estimates for the high-threshold Z-score sample and for the ICR sample. The first entry reported for each covariate is the estimated coefficient. In parentheses next to each estimated coefficient is the *p*-value associated with the null hypothesis that that coefficient is zero. The third entry is the risk ratio minus one, which is the percentage change in the probability of bankruptcy given a one-unit change in that explanatory variable. All three entries highlighted in bold indicate a coefficient that is significantly different from zero at the 90% or above level of confidence. At the end of the coefficient estimates and statistics are the goodness of fit statistics for the model as a whole. The Chi-squared statistic is for the null hypotheses that the coefficients on all the variables are zero. The *p*-value is the probability that this null hypothesis is true. The number of observations is self-explanatory and the Gen. R^2 is a transformation of the ratio of the Log likelihood under the null and with the estimated coefficients that specifies the percentage of the cross-sectional variation in the occurrence of bankruptcy that is explained by cross-sectional variation in the independent covariates. See Table 2 for the definitions of all of the covariates. Index t denotes the year at which the firm entered distress

Sample	Model 1 High Z	Model 2 High Z	Model 3 ICR	Model 4 ICR
Covariate				
ALTMANZ	**−0.0010 (0.0287)**	**−0.0003 (0.0304)**	−0.0005 (0.3215)	−0.0005 (0.1973)
	−0.001	**−0.000**	−0.001	−0.001
ICR	**−0.3444 (0.0342)**	**−0.2206 (0.0578)**	**−0.2480 (0.0473)**	**−0.1625 (0.0920)**
	−0.291	**−0.198**	**−0.220**	**−0.150**
BOARDSIZE	**0.4262 (0.0001)**	**0.3663 (0.0001)**	**0.3227 (0.0001)**	**0.2359 (0.0001)**
	0.531	**0.442**	**0.381**	**0.266**
OUTSIDE	**−0.9937 (0.0001)**	**−0.8667 (0.0001)**	**−1.007 (0.0001)**	**−0.6749 (0.0001)**
	−0.630	**−0.580**	**−0.635**	**−0.491**
GRAY	**−1.056 (0.0040)**	**−0.8626 (0.0042)**	**−0.8269 (0.0105)**	**−0.4134 (0.0381)**
	−0.652	**−0.578**	**−0.563**	**−0.339**
BOARDOWN	**−23.967 (0.0002)**	**−18.774 (0.0001)**	**−21.830 (0.0001)**	**−14.810 (0.0001)**
	−1.000	**−1.000**	**−1.000**	**−1.000**
INSTOWN	1.596 (0.7845)	−0.2649 (0.9589)	0.5972 (0.9307)	−1.496 (0.7701)
	3.931	−0.233	0.817	−0.776
FOUNDER	0.5080 (0.7152)	1.098 (0.3216)	1.590 (0.1631)	1.3216 (0.1356)
	0.662	1.998	3.905	2.750
YRSASCEO	−0.0254 (0.7210)	−0.0064 (0.9209)	**−0.1401 (0.0332)**	−0.0743 (0.1324)
	−0.025	−0.006	**−0.131**	−0.072
CEOAGE	0.0307 (0.6510)	−0.0380 (0.4678)	**0.1254 (0.0403)**	0.0565 (0.2071)
	0.031	−0.037	**0.134**	0.058
CEOSTCMP	−0.0315 (0.8677)	0.1353 (0.2388)	−0.5259 (0.4234)	−0.1717 (0.7663)
	−0.031	0.145	−0.409	−0.158
MEETINGS	−0.0750 (0.5316)	−0.0645 (0.4616)	0.0726 (0.5315)	0.0909 (0.4017)
	−0.072	−0.062	0.075	0.095
FIRMSIZE	−0.7510 (0.2017)	−0.5435 (0.2463)	−0.6050 (0.2583)	−0.6604 (0.1415)
	−0.528	−0.419	−0.454	−0.483
GROWTHOPTV	7.327 (0.3111)	–	−10.158 (0.1854)	–
	1519.6		−1.000	
RESETTV	−0.1510 (0.8766)	–	**−1.769 (0.0204)**	–
	−0.140		**−0.829**	
STOCKRET(t-1)	2.464 (0.6185)	4.513 (0.2425)	−1.735 (0.6109)	0.2482 (0.9305)
	10.75	0.90213	−0.824	0.282

Table 7 continued

Sample	Model 1 High Z	Model 2 High Z	Model 3 ICR	Model 4 ICR
STOCKRET(t)	−2.250 (0.1026)	−0.9402 (0.2500)	0.4740 (0.7204)	−0.4360 (0.6403)
	−0.895	−0.609	0.606	−0.353
STOCKRETTV	−70.042 (0.1244)	–	−39.562 (0.2277)	–
	−1.000		−1.000	
S&P500RET(t-1)	−1.514 (0.8618)	1.981 (0.7375)	2.834 (0.6220)	1.599 (0.7247)
	−0.780	6.25	16.013	3.949
S&P500RETTV	**−8.179 (0.0084)**	**−5.744 (0.0037)**	**−4.654 (0.0283)**	−2.488 (0.1790)
	−1.000	**−0.997**	**−0.990**	−0.917
Goodness of fit				
χ^2	151.107	165.825	125.036	119.307
Number of Obs.	508	508	277	277
p value	0.0001	0.0001	0.0001	0.0001
Gen. R^2	0.2573	0.2785	0.3633	0.3500

conditions on the hazard of bankruptcy. As expected, its sign is negative, indicating that distressed firms are more likely to file for bankruptcy when the economic environment is unfavorable.

3.4 A summary of empirical findings

We investigate whether a distressed firm's governance characteristics affect its likelihood of emerging from distress or deteriorating further into bankruptcy. For this purpose, we estimate hazard models that control for several firm characteristics as well as for general economic conditions. Overall, the empirical analyses show that standard financial and accounting measures of distress possess very little capability to predict bankruptcy. The results also indicate that an empirical analysis conditioning on corporate governance characteristics significantly enhances the predictive power of bankruptcy hazard models and identifies governance characteristics that have a material effect on the likelihood of bankruptcy. The variables with the most significant impact include board size, board composition, and board ownership.

4 Conclusions

In this paper we investigate whether bankruptcy forecast models that incorporate accounting, stock market, and corporate governance characteristics are better able to predict bankruptcy than those that rely solely on financial and accounting information. Though the recent wave of financial scandals has highlighted the importance of corporate governance in safeguarding claimholder's wealth, to our knowledge, the question of whether corporate governance affects the likelihood of bankruptcy has been largely overlooked.[32] Our study attempts to fill this important gap in the literature.

[32] A possible exception exists in the law literature. See LoPucki and Whitford (1993).

The methodology we use throughout consists of hazard models. From a risk management perspective, the hazard analysis presented in the paper provides three types of useful information. First, it identifies a set of observable governance characteristics that provide incremental power to predict bankruptcy beyond that provided by existing credit-scoring techniques that solely use financial/accounting data. Second, it specifies the likelihood that bankruptcy will occur at different horizons once the firm is distressed (i.e., the "hazard function"). This allows lenders to better predict the expected repayment of loans from distressed borrowers as a function of the borrowers' observable governance characteristics. Third, the analysis also provides new information on the efficacy of different governance structures at responding to financial and economic distress. This information is important for designing effective corporate governance structures.

The results indicate that cross-sectional differences in governance characteristics explain approximately 25–30% of the variation in the occurrence of bankruptcy: smaller and independent boards with a higher ratio of non-inside directors and with larger ownership stakes of inside directors are more effective at avoiding bankruptcy once the firm becomes distressed. Overall, our findings unambiguously indicate that governance characteristics are associated with the likelihood that financially distressed firms eventually file for Chapter 11. Our analyses indicate that these characteristics significantly enhance the predictive power of bankruptcy forecast models, a result that should be of particular interest to academics, corporate governance policy groups, regulators, credit rating agencies, and financial institutions.

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