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Journal of Banking & Finance 23 (1999) 21–47

Journal of
BANKING &
FINANCE

Sources of gains to shareholders from bankruptcy resolution

Daniel C. Indro ^{a,*}, Robert T. Leach ^b, Wayne Y. Lee ^c

^a College of Business Administration, Kent State University, Kent, OH 44242, USA

^b College of Business Administration, Kent State University - Stark Campus,
Canton, OH 44720, USA

^c Alice Walton Chair of Finance, College of Business Administration,
University of Arkansas, Fayetteville, AR 72701, USA

Received 19 May 1997; accepted 8 April 1998

Abstract

Using a logistic regression model, we identify the characteristics of firms whose shareholders are likely to benefit from bankruptcy resolution. That is, winners (losers) are firms whose shareholders experience positive (negative) excess returns after bankruptcy filing. We find that winners are relatively smaller firms with higher proportions of convertible debt, tend to file for bankruptcy for strategic reasons, have low share-ownership concentration, and suffer comparatively larger pre-filing stock price declines. Among winners, shareholder returns are greater for firms that have higher levels of private debt and research and development (R&D) expenditures, and operate in more concentrated industries. In addition, our analysis indicates that an ex ante trading strategy of purchasing bankrupt stocks with a greater than 50% probability of being a winner on the day after bankruptcy filing and holding the stocks for a year, on an average, can generate average compounded and excess compounded holding-period returns of +71% and +42%, respectively. © 1999 Elsevier Science B.V. All rights reserved.

JEL classification: G33; G34

Keywords: Bankruptcy; Restructuring; Shareholder gains

* Corresponding author. Tel.: 1 330 672 2426; fax: 1 330 672 2448; e-mail: dindro@bsa3.kent.edu

1. Introduction

In recent years, the significant rise in the number of bankruptcy filings by US public companies has sparked considerable interest in trading the securities of bankrupt firms. Altman (1991) notes that the organizations that participate in the “vulture investing” market are diverse, ranging from private partnerships, mutual funds, and specialized groups of large money management firms to arbitrageurs looking to take over distressed companies at bargain prices. In 1993, the *Investment Dealer’s Digest* identified 27 major investment funds specializing in the purchase of distressed claims with managed assets of more than \$20 billion. For the majority of these investors, the preferred investments are distressed debt issues, which usually evolve into equity interests when the firm reorganizes. Investors achieve significant returns on these investments by taking an active role in the firm’s management and by prompting the firm to deploy its assets more efficiently through divestitures, downsizing, or both.

Because equity shares represent residual claims on corporate assets, investing in the stock of a bankrupt firm, though highly risky, can offer great potential for returns to the average investor. The argument for making equity investments in bankrupt firms is that following bankruptcy filing, these stocks are undervalued because few analysts follow them. This is known as the “fallen angel, neglected firm” effect.¹ There are many examples where the acquisition of the common stock of a bankrupt firm resulted in a substantial return on investment. For example, in late 1981, investors could have bought the common stock of ITEL Corporation for \$0.25 and sold the stock at over \$26 per share in the summer of 1987. Similarly, those who purchased Charter Company common stock at \$1 in early 1985 saw its price appreciate to \$5 when the firm emerged from bankruptcy. Texaco and A.H. Robins are two other well-known examples. Indeed, based on a sample of 43 firms filing bankruptcy from 1973 to 1982, Morse and Shaw (1988) find that for firms that filed for bankruptcy prior to the 1978 Bankruptcy Reform Act, such investments produced an annualized 31% buy-and-hold excess return.

Little is known about the attributes of firms whose share prices are likely to rise as a result of restructuring under the 1978 Act. The available empirical evidence is mostly anecdotal (Howe, 1990; Putnam, 1991) and existing studies focus primarily on distressed debt securities (John, 1993). The exception is Datta and Iskandar-Datta (1995a), who examine losses experienced by stockholders and different classes of bondholders around the bankruptcy filing dates. Over the period from 2 to 10 days after filing, they document a statistically significant 9.45% excess return to stockholders.

¹ On investments in fallen angels, see Ellis (1995), Jaffe (1995), Harpel (1992), Phalon (1990), and Welling (1993). On the neglected firm effect, see Arbel and Strebel (1983).

In this paper, we investigate shareholder gains or losses over a longer horizon, from the filing date to the confirmation date of the reorganization plan or the last trading date, whichever comes first. We use a sample of 171 publicly traded firms that filed for Chapter 11 protection under the 1978 Act over the 12-year period from 1980 through 1991. We show that even though investments in bankrupt-firm shares do not usually generate positive excess returns, nevertheless, there are significant potential gains to shareholders from a successful resolution of bankruptcy.² Our analysis attempts to identify the characteristics of *winners*, that is, firms whose shareholders experience post-bankruptcy filing gains. Knowing these characteristics can help investors distinguish those firms that are likely to benefit from bankruptcy restructuring.

Using a logistic regression model to discriminate between winners and losers, we find that winners are relatively smaller firms with higher proportions of convertible debt, tend to file bankruptcy for strategic reasons, have low share-ownership concentration, and suffer comparatively larger pre-filing stock price declines. We also find that shareholder returns are greater for those winner firms that have higher levels of private debt and research and development expenditures, and which operate in more concentrated industries. Furthermore, we find that the impact of leverage on the returns to winners' shareholders depends on the degree of industry concentration. That is, returns are inversely (positively) related to leverage in more (less) concentrated industries. Lastly, our analysis indicates that an *ex ante* trading strategy of purchasing bankrupt stocks with a greater than 50% probability of being a winner on the day after bankruptcy filing and holding the stocks for a year, on an average, can generate average compounded and excess compounded holding-period returns of +71% and +42%, respectively.

Our paper is organized as follows. In Section 2, we describe the sampling procedure and empirical design. In Section 3, we present the testable hypotheses and variables used in the empirical analysis. We discuss our results in Section 4. Section 5 offers implications and conclusions.

2. Empirical design

In this section, we discuss in detail our data sources, sample selection criteria, the performance measure used to classify firms as winners and losers, and our empirical methodology.

² Morse and Shaw (1988) report negligible and statistically insignificant excess returns after the 1978 Bankruptcy Reform Act. However, their sample only contains at most six firms that filed subsequent to the Act.

2.1. Data sources and sample selection

We identify bankrupt firms from a list provided by the Office of the General Counsel of the Securities Exchange Commission (SEC), and from other non-SEC public data sources, such as the *Wall Street Journal*, the Commerce Clearing House's *Capital Changes Reporter*, and the Compustat Research Tapes.

We obtain descriptions of company characteristics, the dates associated with bankruptcy and confirmation plan filing, from in-depth examination of LE-XIS/NEXIS reports and SEC filings. We exclude regulated firms, foreign-based entities, and firms that filed for bankruptcy more than once or filed for and liquidated under Chapter 7. We also eliminate firms that have no news coverage indicating why they filed for bankruptcy, or have inadequate accounting information for the last two years prior to their Chapter 11 filing, or have no defined bankruptcy filing and outcome dates. When two or more sources yield inconsistent dates, we use the earliest date. In addition, we consider only firms that had stock prices available on the day subsequent to filing, and traded at least 260 days before and 20 days after the bankruptcy filing date. This results in a sample of 171 firms.

The Center for Research in Securities Prices (CRSP) is our primary source of daily stock returns data. However, some bankrupt firms that were delisted from the NYSE, ASE, and NASDAQ may have continued trading in the regional exchanges. For these firms, we use a secondary source of return data provided by the regional brokerage firms of Wheat First Butcher Singer to supplement the CRSP stock returns data.

The Compustat Research Tapes are our primary source of financial statement data. However, for companies whose accounting data was not available from Compustat, we collect balance sheet and income statement information manually from the 10-Ks and the *Moody's Industrial Manuals*. We take all the accounting variables used in the analysis and defined in Section 3 from the firm's financial statements in the fiscal year prior to the bankruptcy filing date.

2.2. Performance measurement

To quantify the potential gains or losses from investing in bankrupt-firm shares, we assume a buy-and-hold investment strategy. That is, for each firm j , we assume that shares are purchased at the beginning and sold at the end of each firm's financial-distress period, T_j . We define this period as beginning on the day after the bankruptcy filing date and ending on the day after the bankruptcy is resolved or the last trading day, whichever comes first. We compute the buy-and-hold return as the compounded holding-period return

$$\text{HPR}_j = \left[\prod_{t=1}^{T_j} (1 + R_{jt})^t \right] - 1, \quad (1)$$

where R_{jt} is stock j 's return on each day t during the financial-distress period. We then estimate the (risk-adjusted) excess monthly holding-period return as

$$\text{MHPR}_j = \left[\prod_{t=1}^{T_j} (1 + R_{jt})^t \right]^{20/T_j} - \left[\prod_{t=1}^{T_j} (1 + R_{mt})^t \right]^{20/T_j}, \quad (2)$$

where R_{mt} is the return on an equally weighted market portfolio on each day t in the financial-distress period, and each month is assumed to have 20 trading days.

2.3. Winner and loser classification

In a survey profiling investors in distressed firms, Altman (1991) finds that the majority invest in debt securities and specify a minimum return on investment between 20% and 25%. Since equity claims are inherently riskier than debt, the acceptable minimum return on bankrupt-firm shares should be no less than it is on debt. In addition, to reflect risk, the return must be at least equal to the opportunity cost associated with the same dollar investment in the market.

Specifically, a firm is classified as a winner if its holding-period return, HPR, is at least 20%, and its excess monthly holding-period return, MHPR, is non-negative. This results in 41 winners and 130 losers. The lowest HPR and MHPR among the firms classified as winners are 22.2% and 0.14%, respectively. We note that had we used the criteria separately, there would be 44 winners (criterion 1) or 49 winners (criterion 2). The differences in sample size do not affect our conclusions, and for the sake of brevity are not reported.

2.4. Empirical methodology

Our methodology adopts the twin-linear probability model (Goldberger, 1964) used by Fisher (1962) and Cragg (1971). The two-step procedure is as follows. In the first step, we use the winner–loser classification described in Section 2.3 as the dependent variable in a logistic regression framework. In this framework, the logistic function, $1/(1 + e^{-X\hat{B}})$, defines the probability that the firm will be a winner. X is the vector of explanatory variables used to distinguish winners from losers, and \hat{B} the vector of estimated coefficients. We refer to the estimated probability as the logit- P value.

In the second step, we use the logit- P value generated in the first step as one of the independent variables in Ordinary Least Squares (OLS) regressions. We

use excess monthly and raw holding-period returns, MHPR and HPR, as dependent variables. The purpose of this step is to estimate the expected returns from investing in the shares of bankrupt firms.

The two-step approach reflects an investment strategy under which investors decide on the stock to invest in by identifying the characteristics that make the stock a likely winner (first step), and then compute the expected return from the stock investment, given its characteristics (second step).

3. Determinants of winners and losers

Below, we present a brief description of the attributes we use to distinguish between winners and losers. The attributes are firm size, presence of convertible debt, industry competition, reason for filing, ownership concentration, historical stock returns, presence of private debt, and growth opportunities.

3.1. Firm size

The likelihood that a bankrupt firm's stock will be a winner can be related to its size. Eberhart et al. (1990) and Franks and Torous (1994) observe that on an average, more parties are involved in bankruptcy negotiations for larger firms. This creates both a bargaining complexity and a more severe coordination problem among all parties involved in Chapter 11 bankruptcy (creditors, court, management, and shareholders). Capital structure complexity, which is more likely for large firms than small ones (Betker, 1995), exacerbates the coordination problem. Because the lack of coordination impedes the efficient reallocation of corporate assets toward profitable investment opportunities, the likelihood that a firm will be a winner can be negatively related to its size. We use the natural logarithm of the firm's deflated total assets and its market value of equity as alternative measures of size.

3.2. The presence of convertible debt

Because equity is an option on the firm's assets, agency theory (Jensen and Meckling, 1976) suggests that the presence of debt in a firm's capital structure creates an incentive for shareholders to transfer wealth away from bondholders through asset substitution. This incentive is greater in the case of distressed firms than non-distressed firms. Green (1984) shows that the conflicts of interest between bondholders and shareholders can be mitigated, however, when debt is in the form of convertible debt. Investors who hold convertible debt are less concerned about the possibility of asset substitution because their conversion privilege allows them to participate in the gains. This implies that when convertible debt represents a large proportion of the firm's total liabilities, the

agency costs borne by shareholders will be smaller. The ratio of convertible debt to total liabilities should be positively related to the likelihood that a bankrupt firm's stock will be a winner.

3.3. Industry competition

Some capital structure theories (Brander and Lewis, 1986; Maksimovic, 1988), among others indicate that industry competition might influence the firm's capital structure choice. The intensity of industry competition can affect the ability of bankrupt firms to service debt. On the one hand, competitors, in order to capture the bankrupt firm's customers, have an incentive to engage in strategies that drive the bankrupt firm into liquidation. This could put pressure on the bankrupt firm to operate more efficiently, thereby improving its operating performance and shareholder returns. On the other hand, customers might be reluctant to purchase goods or services from firms in financial distress (Titman, 1984), thus creating a loss of market share and lower operating efficiency. In addition, Allen (1985) argues that bankruptcy causes a firm to delay investment. This in itself may not be costly, but due to imperfect competition, can place the distressed firm at a strategic disadvantage relative to its competitors. Unless the fixed cost of capacity is small, the firm can be forced to contract in size or liquidate. Again, this can result in lowered operating performance and shareholder returns.

We use the Herfindahl–Hirschman Index, computed as the sum of the squared market shares of the firms in a given industry (four-digit SIC code), as a measure of the industry's competitiveness. An index with a value close to one (zero) indicates that the industry is less (more) competitive. Depending on which of the above competing theories is correct, the coefficient of the Herfindahl–Hirschman Index will be positive or negative.

3.4. The reason for filing

Firms file for Chapter 11 for a number of reasons. For the average equity investor in distressed companies, Putnam (1991) recommends looking at firms that file for bankruptcy mainly for strategic reasons. The 1978 Bankruptcy Reform Act was never intended to be used as a vehicle to avoid lawsuits or to break leases and other contracts, yet some companies have used it for such purposes.

Financially healthy companies that file for Chapter 11 strictly for strategic reasons are most likely to continue doing business and earn normal profits. For instance, consider the case of *Texaco Inc. vs. Pennzoil Company*. In 1984, Pennzoil had negotiated a merger with the Getty Oil Company. Before the deal went through, Texaco made a last-minute bid to purchase Getty for \$10.1 billion. Pennzoil sued on the grounds that Texaco illegally interfered with its

merger plans, and won a \$10.5 billion dollar judgment. Texaco then filed for bankruptcy, and in 1988 agreed to settle the dispute for \$3 billion. Thus, if lawsuits and contracts are a zero-sum game between a firm's shareholders and a third party, then filing for bankruptcy to avoid lawsuits or breach a contract represents an attempt to shift the costs of lawsuits or of maintaining unfavorable contracts away from shareholders.

However, because there is uncertainty as to how the legal liability will be resolved, equity shares tend to be undervalued. Our conjecture is that firms which file for Chapter 11 for strategic reasons are likely to be winners.

Other major causes cited for Chapter 11 filing are industry/market-specific and fraud-related. If an industry slump, weak economy, or competition is the main reason that a firm files for bankruptcy, then it can be expected to be a winner when the industry environment becomes more favorable. In contrast, if a firm files for bankruptcy as a result of fraudulent behavior, then we can expect it to be a loser.

3.5. Ownership concentration

Court approval of a reorganization plan under the 1978 Bankruptcy Reform Act requires that a majority of each voting class of creditors must agree to the terms of the plan. Furthermore, unless the firm can show that the appraised value of liabilities exceeds that of assets, shareholders are also entitled to vote. If creditors want to exclude shareholders from voting, then creditors bear the cost of having an appraisal made of the firm's assets and liabilities. However, the cost of conducting an appraisal is often quite expensive. Therefore excluding shareholders from voting is an option firms do not usually use.

The effect of ownership concentration is ambiguous. On the one hand, more concentrated ownership gives shareholders greater bargaining power with creditors. The result is prolonged negotiations, which tends to be costly for shareholders. On the other hand, Putnam (1991) contends that the presence of major shareholders can be a good sign, because their selfish interests also protect those of small shareholders, and getting a majority to agree to a plan of reorganization could become less difficult.

As a proxy for ownership concentration, we use the number of shares outstanding normalized by the number of shareholders. The sign of the coefficient will depend on which of the above hypotheses is correct.

3.6. Historical stock returns

A bankrupt firm normally experiences stock price declines before it files for Chapter 11. The share price drops even more around the Chapter 11 filing as more bad news is revealed. Using a sample of firms that filed for Chapter 11 under the 1978 Bankruptcy Reform Act, Datta and Iskandar-Datta (1995a)

find that stock prices fall by 33.75% in the three-day window around the bankruptcy filing dates. To the extent that all the bad news has been revealed, Putnam (1991) argues that a price rebound should occur after the filing date and during the restructuring period. This is consistent with Brown et al. (1988), who observe that the average price change tends to be greater following bad news than it is following good news.

Putnam (1991) argues that post-filing rebounds occur because of the speculation of investors who do not understand the bankruptcy process or possibly because of short sellers who sold the bankrupt stock short as the firm approached bankruptcy and then covered their positions after the filing. In addition, Putnam notes that price rebounds occur around the news of the company's reorganization. We hypothesize that the greater the shareholder losses over the 120 days before the filing date, the more likely the stock will be a winner over the restructuring period. The use of holding-period returns computed one year prior to bankruptcy is too far in advance of the bankruptcy and does not realistically portray the nature of the pre-filing financial distress of the winners and losers. Similarly, the use of holding-period returns computed three months prior to bankruptcy might be tainted by information leaks about the pending bankruptcy. We compromise by using a six-month holding-period return.

3.7. The presence of private debt

Giammarino (1989) shows that an information asymmetry problem can lead firms to choose the costly method (Chapter 11) of resolving financial distress despite the possibility of costless reorganization. Moreover, a conflict of interest between shareholders and creditors can still develop even after a Chapter 11 filing, since there is so little reliable data to assess whether the firm is solvent on a stock or a cash flow basis (Wruck, 1990). When public debt is involved in the restructuring process, the "lemons" (Akerlof, 1970) and holdout problems can impede debt forgiveness.

However, since banks and other private lenders are generally better informed about the firm's prospects than are public debt holders (James, 1987), their participation in the restructuring process can mitigate adverse selection problems (James, 1996). In addition, since the court-supervised Chapter 11 process allows for recontracting, the information asymmetry between shareholders and creditors could be reduced. For instance, with the court's blessing, the issuance of "debtor-in-possession (DIP) financing" provides new creditors with a super-priority status. Without the court's protection, new creditors cannot be provided with adequate collateral by the firm and can refuse to provide credit to the firm after it files for Chapter 11. The DIP financing arrangement, which is typically a part of bank loan commitments and short-term in nature but can develop into a longer-term relationship, permits new lenders

to get involved in the debtor's operations. Thus, creditors are better able to distinguish good-credit from bad-credit firms during the restructuring period. Indeed, as shown by Gilson et al. (1990), reliance on bank borrowing enhances the likelihood of a successful debt restructuring. This suggests that a firm is more likely to be a winner if it has a higher proportion of bank and private debt relative to total debt. As a proxy for private debt, we use the sum of bank and private (institutional) debt, excluding capital leases.

3.8. *The presence of "growth opportunities"*

The information asymmetry problem becomes more acute when growth opportunities ("real options"), whose value depends on the firm's discretionary future investment, are present. Myers (1977) points out that because real options can be firm-specific and may be traded in thin and imperfect secondary markets, their use as collateral is limited. The use of corporate leverage should be less when growth opportunities are a larger component of firm value. However, when the information asymmetry problem prior to the filing of bankruptcy is severe, creditors and investors cannot distinguish firms with good from those with poor growth opportunities. Only after filing for Chapter 11 can claimholders better assess the value of these growth opportunities. Hence, we expect the coefficient for growth opportunities to be positive (negative) for winners (losers).³ As alternative proxies for growth opportunities, we use the ratio of research and development expenditures (R&D) to sales and the market-to-book ratio.

4. Empirical results

In this section, we identify the causes of bankruptcy filing and the characteristics of firms whose share prices are likely to rise as a result of restructuring under the 1978 Act.

4.1. *Sample characteristics*

Table 1 reports the eventual outcome of bankruptcy and the main causes for Chapter 11 filings for the firms in our sample. Of the 171 firms, 33 (19.30%) were eventually acquired, 94 (54.97%) emerged as independent entities, and 44

³ Opler and Titman (1994) argue that financial distress can cause firms with relatively high R&D expenditures to suffer from customer-driven sales losses. Thus, they expect the shareholders of heavily leveraged firms that engage in R&D to suffer the most in industry downturns.

Table 1
Main causes for filing Chapter 11

	Number of firms	Percentage of total
Bankruptcy outcome		
Acquired	33	19.30
Emerg ed as independent entities	94	54.97
Liquidated	44	25.73
Total	171	100.00
Main cause for filing		
Industry/market-specific reasons	35	20.47
Weak economy	7	4.09
Industry slump	29	16.96
Competition	3	1.75
Strategic reasons	9	5.26
Catastrophic lawsuit	3	1.75
Patent infringement suit	2	1.17
To implement debt-for-equity swap	1	0.58
Break unfavorable contracts	1	0.58
Adverse jury verdicts	2	1.17
Fraud-related reasons	22	12.87
Embezzlement	1	0.58
Mail fraud	2	1.17
Bid rigging	1	0.58
Inflated earnings	13	7.60
False product claims	3	1.75
Securities fraud	4	2.34
Bribery	2	1.17
Extortion	1	0.58
Racketeering	2	1.17
Money laundering	1	0.58
Multiple reasons	105	61.40
Unable to secure financing	15	8.77
Liquidity/cash flow shortage	19	11.11
Excessive debt	18	10.53
Creditor lawsuits/impasse	20	11.70
Over-expansion	8	4.68
Over-leveraged due to past acquisition	6	3.51
Poor management decisions	10	5.85
Rising costs of production	1	0.58
Restructure operations	3	1.75
Substantial legal fees in defending lawsuits	2	1.17
Industry/economy	6	3.51
Competition	7	4.09
Miscellaneous	13	7.60
Unknown	12	7.02

This table reports the outcome of and the causes for Chapter 11 filings. Firms that filed for Chapter 11 were eventually acquired, emerged as independent entities, or liquidated. There are four categories of the causes for Chapter 11 filings. The first three categories (industry/market-specific, strategic, and fraud-related reasons) describe the *main* causes of bankruptcy filing. To qualify for inclusion in the first three categories, at least two different news sources must indicate that a firm files for Chapter 11 primarily for such reasons.

(25.73%) liquidated. The fraction of acquired and emerged firms in our sample is similar to that of Datta and Iskandar-Datta (1995b).

We classify the main causes for filing for Chapter 11 into three mutually exclusive categories: industry/market-specific, strategic, and fraud-related reasons. To qualify for inclusion in any one of these three categories, at least two independent news sources must state that a firm filed for Chapter 11 for one or another of these reasons. If we cannot ascertain the main reason from news sources and multiple reasons for Chapter 11 filing are mentioned, then we assign the firm to the multiple-reason category.

There are 35 firms (20.47%) that filed for Chapter 11 primarily for industry-specific reasons. Nine firms (5.26%) filed for strategic reasons, and 22 (12.87%) filed for fraud-related reasons. Most of those that sought Chapter 11 protection for industry-specific reasons cited an industry slump as the major factor. In addition, note that with one exception, firms that use Chapter 11 for strategic reasons were involved in lawsuits, and that the majority of firms filing for Chapter 11 for fraud-related reasons engaged in earnings manipulation. Finally, among those firms that state multiple reasons for Chapter 11 filing, the majority (72 firms, or 42%) experienced a financial problem. In our empirical tests (Section 4.3), we focus on firms whose main causes for filing for Chapter 11 can be ascertained.

4.2. Potential gains

As evident from Table 2, our sample mirrors the dramatic rise in corporate bankruptcies in recent years. The second column shows that the number of firms filing for Chapter 11 bankruptcy rises from an average annual rate of eight filings at the beginning of the 12-year study period to 19 filings by the end. The length of the financial-distress period declines, however, from an average (median) of 341 (242) days in the early 1980s to 206 (139) days in the early 1990s.

More importantly, Table 2 clearly indicates that investments in bankrupt-firm shares are unprofitable. The overall mean and median excess monthly (raw) holding-period returns are -6.6% (-0.02%) and -5.3% (-27.8%), respectively. Mean (median) raw holding-period returns are not statistically different from zero (except in the 1980–1983 and 1988–1991 subperiods), but mean (median) excess monthly holding-period returns are significantly negative (except for the 1984–1987 subperiod). Moreover, returns appear to be worse in recent years. However, these results mask the potentially large returns from informed investing in the equity shares of financially distressed firms.

Panel A in Table 3 shows that the distributions of returns are increasingly skewed over each subperiod. In the 1980–1983 subperiod, losers outnumber winners by 4 to 1. By the 1988–1991 subperiod, losers outnumber winners by

Table 2
Overall returns

Filing years	Number of firms	Distress period (Days) T_j		Excess monthly holding-period returns $MHPR_j$		Raw holding period-returns HPR_j	
		Mean	Median	Mean	Median	Mean	Median
1980–1983	32	341 (1.38)	242 (2.66)***	-0.035 (-3.20)***	-0.029 (1.66)*	0.208 (0.93)	-0.098 (1.68)*
1984–1987	64	272 (0.41)	171	-0.039 (-2.42)**	-0.023 (1.31)	0.071 (0.54)	-0.153 (0.88)
1988–1991	75	206 (-2.42)***	139 (-0.11)	-0.102 (-4.59)***	-0.077 (2.36)**	-0.149 (-1.41)	-0.438 (-4.56)***
1980–1991	171	256	171 (-0.25)	-0.066 (-5.57)***	-0.053 (0.28)	-0.0002 (-0.003)	-0.278 (-5.99)***

$MHPR_j$ is the excess monthly holding-period return. We compute it as the difference between the monthly holding period return of stock j and that of an equally weighted market portfolio. HPR_j is the raw holding-period return of stock j . We compute this over the period beginning the day after filing to one day subsequent to the court confirmation date of the reorganization plan or the last trading date, whichever comes first. Distress-period significance tests are for differences from the 1980–1991 mean/median. Significance tests for mean excess monthly holding-period and raw holding-period returns are relative to the null hypothesis that the mean is zero. The median tests are based on the differences from the 1980–1991 median excess monthly holding-period and raw holding-period returns. Significance tests for the medians are based on the Wilcoxon Signed Rank Test. T -statistics and Wilcoxon Z -scores are shown in parentheses.

* Significant at 10%, two-tailed test.

** Significant at 5%, two-tailed test.

*** Significant at 1%, two-tailed test.

Table 3
Potential gains and losses

Filing years	Number of winners	Number of losers	Fraction of winners	Winners' mean return		Losers' mean return		Difference in mean return	
				MHPR _{<i>j</i>}	HPR _{<i>j</i>}	MHPR _{<i>j</i>}	HPR _{<i>j</i>}	MHPR _{<i>j</i>}	HPR _{<i>j</i>}
Panel A. Differences in winners' and losers' returns									
1980–1983	6	26	0.19 (-3.54)	0.043 (3.03)***	2.059 (2.46)**	-0.054 (-5.12)***	-0.219 (-3.39)***	0.097 (5.49)***	2.278 (2.72)***
1984–1987	21	43	0.33 (-2.75)**	0.079 (4.11)***	1.028 (3.62)***	-0.097 (-6.08)***	-0.397 (-7.54)***	0.176 (6.64)***	1.425 (4.93)***
1988–1991	14	61	0.19 (-5.43)***	0.124 (2.88)***	1.352 (4.35)***	-0.153 (-7.57)***	-0.494* (-12.35)**	0.277 (5.89)***	1.846 (5.89)***
1980–1991	41	130	0.24 (-6.81)***	0.089 (4.96)***	1.290 (5.93)***	-0.115 (-9.94)***	-0.407* (-13.62)**	0.204 (8.90)***	1.657 (7.73)***
Panel B. Weighted least squares regression									
Dependent variable	Dummy variable		Number of firms	<i>F</i> statistic	Adjusted <i>R</i> ²				
	Winners	Losers				MHPR _{<i>j</i>}	HPR _{<i>j</i>}	MHPR _{<i>j</i>}	HPR _{<i>j</i>}
MHPR _{<i>j</i>}	0.089 (4.96)***	-0.114 (-9.94)***	171	42.22	0.323				
HPR _{<i>j</i>}	1.290 (5.93)***	-0.407 (-13.62)***	171	70.10	0.444				

MHPR_{*j*} is the excess monthly holding-period return. We compute it as the difference between the monthly holding-period return of stock *j* and that of an equally weighted market portfolio. HPR_{*j*} is the raw holding-period return of stock *j*. We compute this over the period beginning the day after filing to one day subsequent to the court confirmation date of the reorganization plan or the last trading date, whichever comes first. The *t*-statistics are shown in parentheses. Significance tests of the fraction of winners are relative to the null hypothesis of one-half.

** Significant at 5%, two-tailed test.

*** Significant at 1%, two-tailed test.

almost 4 to 1. The proportion of winners in the total sample is 24%, which is significantly less than half.

Furthermore, the gains and losses between winners and losers differ in magnitude, and the differences are statistically significant. For winners, the overall mean excess monthly and raw holding-period returns are +8.9% and +129%, respectively. For losers, the overall mean excess monthly and raw holding-period returns are –11.5% and –40.7%, respectively. Interestingly, the difference in mean excess monthly holding-period returns also increases in the subperiods corresponding to the large increase in the number of bankruptcy filings. In the 1980–1983 subperiod, the difference in mean excess monthly holding-period returns is +9.7%, versus +27.7% in the 1988–1991 subperiod. This pattern suggests that while informed investing in bankrupt-firm stocks can be profitable, it is increasingly difficult to identify which firms are likely to be winners.

Finally, note from Panel B in Table 3 that using the excess monthly and raw holding-period returns criteria to classify firms into groups of winners and losers explains 32.3% and 44.4%, respectively, of the cross-sectional variation in returns. This result lends empirical support for the winner–loser classification discussed in Section 2.3.

4.3. Cross-sectional variation in returns: Logistic and OLS regressions

Panel A in Table 4 reports the outcome of two logistic regressions, Models 1 and 2, which use the full set of ten, and a partial set of five, explanatory variables described in Section 3. The results of alternative ten (five) variable models that use the natural logarithm of the firm's market value of equity and market-to-book ratio as proxies of firm size and growth opportunities are weaker than Model 1 (2), both in terms of the statistical significance of coefficient estimates and the Pseudo R^2 (Maddala, 1983). For brevity, these results are not reported here. Firm size is better captured by the natural logarithm of the firm's deflated total asset value than it is by the natural logarithm of its market value of equity. Growth opportunities are better represented by the ratio of R & D expenditures to sales than by the market-to-book ratio.

Model 1 reveals that five explanatory variables – size, presence of convertible debt, strategic reason for filing Chapter 11, concentration ratio, and past losses – are statistically significant and have the predicted signs. Further, from Model 2, the removal of the five statistically insignificant variables has no adverse effect on the Model 1 findings. Both models have similar Pseudo R^2 .

Panel B in Table 4 compares the logit- P value for the winners and losers based on Models 1 and 2. Tests of differences in the mean and median confirm that winners have significantly higher mean and median logit- P values than do

Table 4
Characteristics of winners and losers

Independent variable	Predicted sign	Logistic regressions	
		Model 1	Model 2
Constant		-1.672 (1.94)*	-1.105 (2.09)**
Size	-	-0.280 (2.33)**	-0.246 (2.34)**
Conv_TL	+	3.689 (2.15)**	2.629 (1.86)*
Competition	+/-	-0.591 (0.82)	
Strategic	+	2.808 (3.16)**	2.367 (2.91)**
Concentration	+/-	-0.080 (2.15)**	-0.070 (2.09)**
Past HPR	-	-0.679 (2.55)**	-0.622 (2.45)**
R & D to sales	+	-0.061	(0.43)
Industry reason	+	0.701 (1.37)	
Private debt	+	0.889 (1.16)	
Fraud	-	0.281 (0.44)	
Number of firms		171	171
χ^2 for log-likelihood		25.95***	21.60***
Pseudo R^2		0.14	0.12

Table 4 (Continued)

	Model 1			Model 2		
	Winners	Losers	<i>t</i> -statistics and Wilcoxon- <i>Z</i> scores	Winners	Losers	<i>t</i> -statistics and Wilcoxon- <i>Z</i> scores
Mean	0.35	0.21	5.24***	0.34	0.21	4.68***
Median	0.34	0.17	4.89***	0.31	0.17	4.47***

Dependent variable takes a value of one if the $MHPR_j \geq 0\%$ and $HPR_j \geq 20\%$, and 0 otherwise. The *t*-statistics are in parentheses. Size is the natural logarithm of the firm's deflated total assets value; Conv_TL is convertible debt divided by total liabilities; Competition is the degree of competition measured by the sales-based Herfindahl–Hirschman Index using a 4-digit SIC code; Strategic is 1 if bankruptcy filing is made mainly for strategic reasons, 0 otherwise; Concentration (in thousands) is ownership concentration measured by the ratio of total number of common shares outstanding to the number of common shareholders prior to bankruptcy filing; Past HPR is the historical monthly holding-period return computed over the period 120 days before to one day after the bankruptcy filing; R&D to sales is the ratio of R&D to sales; Industry Reason is 1 if the firm files for bankruptcy mainly due to industry-specific reason, 0 otherwise; Private Debt is the ratio of bank and institutional debt (excluding capital leases) to total interest-bearing debt; Fraud is 1 if there is an incidence of fraud, 0 otherwise. Logit-*P* is the logistic probability, $1/(1 + e^{XB})$, where *X* is the vector of explanatory variables and the vector of estimated coefficients based on these explanatory variables.

* Significant at 10%, two-tailed test.

** Significant at 5%, two-tailed test.

*** Significant at 1%, two-tailed test.

losers. Moreover, the logit- P values for both winners and losers are not sensitive to model specification. We use Model 2 to construct the logit- P value for each of the 171 observations. We then use the logit- P values in the OLS return regressions of excess monthly holding-period (Models 1 and 2) and raw holding-period (Models 3 and 4) returns. The results are shown in Table 5.

From Model 1 in Table 5, we see that the logit- P value explains 6% of the cross-sectional variation in excess monthly holding-period returns. From Model 3 in Table 5, the logit- P value explains 15% of the cross-sectional variation in raw holding-period returns. As expected, the estimated logit- P value carries a positive coefficient and is highly significant in both Models 1 and 3 (with t -statistics of 3.32 and 5.53, respectively).⁴ Shareholder returns over the restructuring period are greater for those firms with higher probabilities of being a winner. To screen bankrupt firms, investors can employ the logistic regression to compute the logit- P value.

In Models 2 and 4, we introduce variables that proxy for the degree of industry competition, growth opportunities, private debt, and leverage, along with two dummy variables that proxy for industry-specific reason for filing for Chapter 11 and the incidence of fraud.⁵ In addition, we examine the asymmetric winner/loser impact on stock returns of the degree of industry competition, presence of growth opportunities, presence of private debt, and interaction between leverage and industry competition.

For assessing the leverage–competition interaction effect on bankrupt-firm returns, we divide the sample firms into four groups, according to whether a firm is a winner or loser and whether its Herfindahl–Hirschman Index is above or below the sample median. Each group is identified by a dummy variable. The difference between the firm's leverage ratio and the industry median leverage ratio, which we estimate by the book value of total interest-bearing debt to total assets, is then multiplied by the group dummy variable to form the leverage–competition interaction variable.

In general, the qualitative results, using excess monthly holding-period returns (Model 2) and raw holding-period returns (Model 4), are similar. The logit- P value is always highly significant (t -statistics of 2.45 and 4.30 in Models 2 and 4, respectively) and has the predicted sign. In addition, the significant coefficient estimates for industry-specific reason for filing for Chapter 11 (t -statistic of 2.07 in Model 2) and fraud (t -statistics of -2.44 and -1.71 in Models 2 and 4, respectively) confirm that the stock market is rational, in the

⁴ Based on the White (1980) test, there is a heteroskedasticity problem in Regressions 1 and 3. However, the introduction of other variables in Regressions 2 and 4 corrects it.

⁵ As a proxy for growth opportunities, we also use the firm's market-to-book ratio in Table 5. The results are again qualitatively similar to those in Table 5, but for brevity, are not reported here.

Table 5
Ordinary least squares regression results

Independent variable	Predicted sign	Dependent variable		Dependent variable	
		MHPR _{<i>j</i>}		HPR _{<i>j</i>}	
		1	2	3	4
Constant		-0.126 (-5.87)***	-0.101 (-2.95)***	-0.642 (-4.68)***	-0.461 (-2.45)**
Logit- <i>P</i> value	+	0.250 (3.32)***	0.162 (2.45)**	2.644 (5.53)***	1.577 (4.30)***
Industry reason	+/-		0.05 (2.07)**		0.008 (0.06)
Fraud	-		-0.07 (-2.44)**		-0.275 (-1.71)*
Private debt, winners	+		0.120 (2.60)**		0.916 (3.39)***
Private debt, losers	-		-0.101 (-3.00)***		-0.209 (-1.14)
Competition, winners	+		0.025 (0.31)		2.196 (4.93)***
Competition, losers	-		0.018 (0.42)		-0.341 (-1.47)
Growth opportunities, winners	+		-0.006 (-0.18)		1.103 (5.69)***
Growth opportunities, losers	-		-0.010 (-1.54)		-0.029 (-0.86)
Leverage, above median, winners	-		0.045 (0.85)		-1.243 (-3.86)***
Leverage, above median, losers	-		-0.000 (-0.00)		0.207 (0.81)
Leverage, below median, winners	+		0.241 (2.61)***		-0.258 (-0.45)
Leverage, below median, losers	+		0.015 (0.26)		0.068 (-0.22)
<i>F</i> -statistics		11.04***	8.92***	30.58***	19.65***
Adjusted <i>R</i> ²		0.06	0.38	0.15	0.59
Number of firms		171	171	171	171

MHPR_{*j*} is the excess monthly holding-period return. HPR_{*j*} is the raw holding-period return computed over the period beginning the day after filing to one day subsequent to a court-approved plan of reorganization or the last trading day, whichever comes first. *T*-statistics are in parentheses. Logit-*P* value is the probability that a stock will be a winner; Industry reason is 1 if the firm files for bankruptcy mainly due to industry-specific reason, 0 otherwise; Fraud is 1 if there is an incidence of fraud, 0 otherwise; Competition is the degree of competition measured by the sales-based Herfindahl–Hirschman Index using a 4-digit SIC code; Private debt is the ratio of bank and institutional debt (excluding capital leases) to total interest-bearing debt; Growth opportunities is the ratio of R & D to sales. Leverage above and below median for winners and losers are the industry-median adjusted leverage ratio (total interest-bearing debt to total assets) of winners and losers whose Herfindahl–Hirschman Index is above and below the sample median Herfindahl–Hirschman Index. * Significant at 10%, two-tailed test. ** Significant at 5%, two-tailed test. *** Significant at 1%, two-tailed test.

sense that once the reasons for filing for Chapter 11 are revealed, it absolves firms that file for legitimate reasons and penalizes those that file due to fraudulent activities.

We also note the asymmetric impact of private debt on the returns of winners and losers in Models 2 and 4. The highly significant coefficient estimates support the belief that banks and other private lenders mitigate the adverse selection problems in the restructuring process (James, 1996). Due to information asymmetry, the uncertainty over the nature and extent of the problems that lead to Chapter 11 filing causes the stock returns of good firms to decline too much, and the returns of the bad firms to decline too little. After filing, there might still be uncertainty regarding the firm's type, but the participation of banks and other private lenders helps resolve this uncertainty. Losers (winners) experience an additional penalty (gain) during the restructuring period when their type is revealed.

Industry competition and growth opportunities also affect the winners' and losers' raw holding-period returns. Winners' returns are higher when the industry is more concentrated (*t*-statistic of 4.93) and when growth opportunities are more prevalent (*t*-statistic of 5.69). When growth opportunities are present, claimholders are likely to disagree about the value of such opportunities prior to Chapter 11 filing. As the information asymmetry problem is alleviated post-filing, it becomes apparent that growth opportunities are more valuable in the hands of good firms, because higher industry concentration enables good firms to extract monopoly rents associated with these opportunities.

Finally, Models 2 and 4 indicate that the impact of leverage on the returns to winners' shareholders depends on the degree of industry concentration. There is no such effect for losers. In particular, because of the strong (weak) strategic interaction in more (less) concentrated industries, leverage and shareholder returns are inversely (positively) related when the degree of industry concentration is high (low). This evidence is consistent with that of Opler and Titman (1994), who document a 13.4% drop in the market value of equity of firms in concentrated industries, and with that of Lang and Stulz (1992), who show that competitors in low-leverage and more-concentrated industries experienced a significant positive abnormal return of 2.2%. Hence, aggressive behavior by less-leveraged competitors in more-concentrated industries reduces the shareholder returns of bankrupt firms.

The intuition for this is as follows. Although bankruptcy restructuring provides firms with a fresh capital structure, firms must carefully manage their new capital structure to avoid being burdened by fixed-interest charges. Such charges can restrict their operating flexibility, especially when the degree of industry concentration is high. Recall the significance of the coefficient estimate of industry-specific reason for filing for Chapter 11. Capital structure mistakes penalize shareholder returns even if the stock market is willing to forgive firms that file for Chapter 11 through no fault of their own.

4.4. An operational trading strategy to select winners

In this section, we show that identifying the characteristics of firms which are likely winners is useful in making informed ex ante investment decisions. We begin by dividing the logit- P value interval $[0, 1]$ into four P -value intervals: $P \leq 0.25$, $0.25 < P \leq 0.50$, $0.50 < P \leq 0.75$, and $P > 0.75$. The logit- P value generated by Model 2 in Table 4 is then used to construct four quartile portfolios. Each quartile portfolio contains bankrupt stocks whose logit- P values fall within the quartile's P -value cutoffs. For each quartile, we compute the portfolio's excess monthly holding-period return and raw holding-period return over the period beginning the day after filing to one day subsequent to a court-approved plan of reorganization or the last trading day, whichever comes first. The results are reported in Panel A of Table 6.

Given the skewness of the returns reported in Table 3, the skewness of the returns shown in Panel A of Table 6 should not be surprising. More importantly, note the pattern of excess MHPR of the quartile portfolios. The $P \leq 0.25$ stock portfolio yields median (average) excess returns of -6.4% (-10%); and the $0.25 < P \leq 0.50$ stock portfolio, median (average) excess returns of -2.6% (-1.8%). In contrast, the $0.50 < P \leq 0.75$ stock portfolio yields median (average) excess returns of $+1.4\%$ (-1.2%); and the $P > 0.75$ stock portfolio, median (average) excess returns of $+5.6\%$ ($+5.6\%$).

The raw HPR of the quartile portfolios exhibit a similar pattern. The $P \leq 0.25$ stock portfolio yields median (average) returns of -40% (-30.1%); and the $0.25 < P \leq 0.50$ stock portfolio, median (average) returns of -3.9% ($+29.7\%$). In contrast, the $0.50 < P \leq 0.75$ stock portfolio yields median (average) returns of 65.8% ($+122\%$); and the $P > 0.75$ stock portfolio, median (average) returns of $+105.8\%$ ($+105.8\%$).

These results suggest that a 0.50 logit- P value cutoff is useful in selecting the likely winners among bankrupt stocks. Excluding observations whose logit- P values are three standard deviations away from the average logit- P value does not change the 0.50 logit- P value choice. A portfolio consisting of bankrupt stocks with logit- P value > 0.50 produces, at worst, an average excess monthly holding-period return of 0% . Moreover, over an average time span of 459 days, this portfolio yields an average raw holding-period return of $+119.4\%$ compared to an average raw holding-period market return of $+66.3\%$.

To examine the impact of investment horizons on returns, we form two portfolios of bankrupt-firm stocks – one portfolio consisting of stocks whose logit- P values > 0.50 and the other portfolio consisting of stocks with logit- P values ≤ 0.50 . We compute the compounded and excess compounded holding-period returns for the two portfolios over alternative investment horizons of 1 month, 3 months, 6 months, and 1 year. Excess compounded holding-period returns are calculated relative to an equally weighted market return. The portfolios' holding-period returns over alternative investment horizons and

Table 6
Operational trading strategy to select winners

		Logit- <i>P</i> value range			
		$0 \leq P\text{-value} \leq 0.25$ ≤ 0.50	$0.25 < P\text{-value}$ ≤ 0.50	$0.50 < P\text{-value}$ ≤ 0.75	$0.75 < P\text{-value} \leq 1$
Median:					
<i>P</i> -value	0.147	0.325	0.583	0.755	
MHPR	-0.064	-0.026	0.014	0.056	
HPR	-0.400	-0.039	0.658	1.058	
Market HPR	0.214	0.053	0.518	0.117	
Time	210	114	366	286	
Mean:					
<i>P</i> -value	0.143	0.348	0.583	0.755	
MHPR	-0.100	-0.018	-0.012	0.056	
HPR	-0.301	0.297	1.221	1.058	
Market HPR	0.295	0.240	0.772	0.117	
Time	277	171	493	286	
Std. deviation:					
<i>P</i> -value	0.056	0.074	0.063	0.004	
MHPR	0.141	0.172	0.106	0.066	
HPR	0.730	1.175	1.485	0.789	
Market HPR	0.414	0.440	1.116	0.206	
Time	272	189	505	286	
No. of returns:					
Positive	18	23	6	2	
Negative	85	33	4	0	

Table 6 (Continued)

Investment horizon	Compounded holding-period returns			Excess compounded holding-period returns		
	Portfolio <i>P</i> -value ≤ 0.5	Portfolio <i>P</i> -value > 0.5	Wilcoxon <i>Z</i> & <i>t</i> -statistics	Portfolio <i>P</i> -value ≤ 0.5	Portfolio <i>P</i> -value > 0.5	Wilcoxon <i>Z</i> & <i>t</i> -statistics
One month:						
Median	-0.036	0.221	1.69*	-0.081	0.171	1.83*
Mean	0.041	0.339	-1.79*	0.003	0.311	-1.92*
No. firms	159	12		159	12	
Three months:						
Median	-0.067	0.239	2.20**	-0.198	0.236	2.27**
Mean	0.033	0.358	-1.56	-0.063	0.274	-1.75*
No. firms	159	12		159	12	
Six months:						
Median	-0.125	0.256	2.00**	-0.227	0.043	1.88*
Mean	0.016	0.212	-1.79*	-0.100	0.101	-1.62
No. firms	159	12		159	12	
One year:						
Median	-0.278	0.195	3.09***	-0.404	0.061	2.29**
Mean	-0.104	0.711	-2.28**	-0.305	0.420	-2.01*
No. firms	159	12		159	12	

This table reports the returns on portfolios of bankrupt-firm stocks. We divide the Logit-*P* value interval [0, 1] into four *P*-value sub-intervals: $P \leq 0.25$, $0.25 < P \leq 0.50$, $0.50 < P \leq 0.75$, and $0.75 < P$. This classification is then used to form four quartile portfolios. Each quartile portfolio contains bankrupt stocks whose Logit-*P* values fall within the quartile's *P*-value cutoffs. For each quartile, we compute the portfolio's MHPR and HPR. MHPR is the portfolio's excess monthly holding-period return. HPR is the portfolio's raw holding-period return computed over the period beginning the day after filing to one day subsequent to a court-approved plan of reorganization or the last trading day, whichever comes first. Time is the period between the day after filing to one day subsequent to a court-approved plan of reorganization or the last trading day, whichever comes first. The number of positive and negative returns is based on MHPR. Panel A shows that 0.50 is an appropriate Logit-*P* value cutoff. Using this cutoff, we construct two portfolios of bankrupt-firm stocks: one portfolio consisting of stocks whose Logit-*P* values > 0.50 and the other portfolio consisting of stocks whose Logit-*P* values ≤ 0.50. In Panel B, we compare the compounded and excess compounded holding-period returns of the two portfolios over alternative holding-periods. The portfolio's excess compounded holding-period returns are adjusted by equally-weighted market returns.

* Significant at 10%, two-tailed test.

** Significant at 5%, two-tailed test.

*** Significant at 1%, two-tailed test.

statistical tests of median and average differences across the two portfolios are reported in Panel B of Table 6.

In terms of median compounded holding-period returns, the logit- P value ≤ 0.50 stock portfolio generates consistently negative returns ranging from -3.6% (one-month horizon) to -27.8% (one-year horizon). In contrast, the logit- P value >0.50 stock portfolio produces consistently positive returns ranging from $+19.5\%$ (one-year horizon) to $+25.6\%$ (six-month horizon). The differences in median returns of the two portfolios are statistically significant.

In terms of average compounded holding-period returns, the logit- P value ≤ 0.50 stock portfolio generates average returns between -10.4% (one-year horizon) and $+4.1\%$ (one-month horizon). In contrast, the logit- P value >0.50 stock portfolio produces consistently positive average returns between $+21.2\%$ (six-month horizon) and $+71.1\%$ (one-year horizon). Except for the three-month investment horizon, the differences in average returns across the two portfolios are statistically significant.

Again, note the similar pattern for excess compounded holding-period returns. In terms of median excess compounded holding-period returns, the logit- P value ≤ 0.50 stock portfolio generates consistently negative returns ranging from -8.1% (one-month horizon) to -40.4% (one-year horizon). In contrast, the logit- P value >0.50 stock portfolio produces consistently positive returns ranging from $+4.3\%$ (six-month horizon) to $+23.6\%$ (three-month horizon). The differences in median returns of the two portfolios are statistically significant.

In terms of mean returns of the two portfolios, the logit- P value ≤ 0.50 stock portfolio generates average returns between -30.5% (one-year horizon) and $+0.3\%$ (one-month horizon). In contrast, the logit- P value >0.50 stock portfolio produces consistently positive average returns between $+10.1\%$ (six-month horizon) and $+42.0\%$ (one-year horizon). With the exception of the six-month investment horizon, the differences in average returns across the two portfolios are statistically significant.

The results in Panel B suggest an ex ante trading strategy of purchasing stocks with logit- P value >0.50 on the day after bankruptcy filing and holding them for a year on average. The logit- P value >0.50 stock portfolio consistently generates higher returns than the logit- P value ≤ 0.50 stock portfolio. In addition, the most statistically significant and impressive results are obtained for the one-year investment horizon.⁶ The logit- P value >0.50

⁶ When the investment horizon is extended beyond one year, the dramatic drop in the number of firms significantly reduces the power of statistical tests. However, extending the investment horizon beyond one year does not change our conclusion that the $P > 0.50$ stock portfolio outperforms the $P \leq 0.50$ stock portfolio. To conserve space, these results are not reported.

stock portfolio generates an average compounded holding-period return of +71.1% and an excess average compounded holding-period return of +42.0%.

5. Implications and conclusion

In this paper, we show the potential substantial gains associated with investing in the equity securities of bankrupt firms. More importantly, we identify the characteristics of winners and are able to discriminate between winners and losers by using a five-variable logistic regression model.

Our findings suggest that winners tend to be smaller firms with a higher proportion of convertible debt relative to total liabilities, file for Chapter 11 for strategic reasons, have a lower ownership concentration ratio, and suffer greater declines in returns prior to bankruptcy filing. In addition, shareholder returns are greater among winners that have higher levels of private debt and research and development expenditures, and operate in more concentrated industries. Furthermore, all else equal, the impact of leverage on the returns to shareholders of winners depends on the degree of industry concentration. That is, the returns to winners' shareholders vary inversely (positively) with leverage for firms operating in more (less) concentrated industries.

These results can assist those who are interested in investing in bankrupt-firm stocks to make more-informed decisions about which firms are more likely to benefit from bankruptcy restructuring, and in estimating the expected returns from such investments. Specifically, our analysis indicates that a portfolio consisting of bankrupt stocks with a greater than 50% probability of being a winner generates one-year compounded and excess compounded returns of 71.1% and 42.0%, respectively.

Acknowledgements

Helpful comments and suggestions from two anonymous referees are gratefully acknowledged. The authors also wish to thank James Lewis and John Harper of the brokerage firm of Wheat First Butcher Singer for providing supplemental price data essential to the study. The expert programming assistance of Douglas Lewis of the Computer Services Center at Kent State University is also gratefully acknowledged. Partial financial support was received from the Division of Research and Graduate Studies at Kent State University. Michael Y. Hu provided helpful comments and suggestions on an earlier draft of the paper.

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