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PREDICTING SUCCESSFUL REORGANIZATION OF  
COMPANIES IN CHAPTER 11 BANKRUPTCY

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Abstract

This research presents a model to predict which firms entering Chapter 11 bankruptcy will be reorganized and which firms will be liquidated. Past research has indicated large absolute returns can be gained from buying shares of firms entering Chapter 11 bankruptcy. The high returns are mostly from firms that are reorganized; when the firm in bankruptcy is liquidated, shareholders usually lose. A logit model was designed to identify factors that will predict which firms will be reorganized and which will be liquidated. Tests of the model indicate asset size, debt load, and the expected growth of a bankrupt firm's industry are the most significant factors identifying which firms will successfully reorganize.

INTRODUCTION

Since the 1978 Bankruptcy Reform Act became law, many financially distressed firms have voluntarily filed for court protection of their assets. This trend is partly due to provisions in the new law that have made it easier and less traumatic for management to file for Chapter 11. Managements no longer need to prove that their firms are insolvent. Instead, a poor actual or expected cash flow position provides enough justification for the courts to order that distressed firms be protected from their creditors. The new law also allows managers to retain control and maintain their positions in a Chapter 11 firm. The courts now view reorganizing firms as 'going-concerns' and are interested that all investors in these firms receive something from reorganization. The old "absolute-priority" rule, which established the priority of claimants with debtholders above shareholders, is gone. Today, the court encourages claimants to work together with a reorganizing firm's management. More negotiation takes place between creditors and equity holders, often

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resulting in equity holders receiving shares in a reorganized firm when it emerges from Chapter 11.

In response to this change in the operational features of a Chapter 11 filing, investors have increased their trading activity in the securities of reorganizing firms.<sup>1</sup> Some investors buy the stocks and bonds of these firms immediately after a filing takes place in hopes of earning large capital gains. These investors might believe that panic selling on the news of the bankruptcy filing would push the prices of these securities lower than they would trade at after the market has had a chance to evaluate the new information more calmly; or they might be seeking extremely risky securities, without having a notion that the particular securities will follow any preconceived price trajectory.

If panic selling does depress the prices of these securities below the levels they attain a few days or weeks after filing, a lack of publicly available information about the bankrupt company could be one explanation. During the reorganization process firms often do not publish annual reports or any other financial information. Most firms cease trading on organized exchanges, or if they continue to trade, volume declines. Many institutional investors and fiduciaries are restricted from buying the securities after the filing date; and many securities analysts cease following companies that are in reorganization. The decline in availability of information and the shifting of attention away from these securities create the possibility that high returns may occur for investors purchasing Chapter 11 stocks shortly after filing.<sup>2</sup>

Another reason that Chapter 11 stocks may become mispriced concerns perceptions of risk. Investors might think that the bankrupt company's shares become riskier after the filing date. The fact of the filing is a new and discouraging datum. In reality, firm-specific risk might decrease after the filing because the court protects the firm from creditors while it attempts to reorganize. This strengthens the firm's financial position by extending the de facto maturities of its debt. Also, a decline in specific risk can be expected if management changes its policies and acts to improve liquidity.

The authors of this research have developed a model that will help investors choose which firms entering Chapter 11 have the highest probability of reorganizing. Firms which successfully reorganize have a high probability of yielding large capital gains for investors who purchased their common stocks after their managements filed for Chapter 11. The model is designed to identify factors which will predict successful reorganization and help an investor avoid losses that occur when firms are forced to liquidate after filing. The financial characteristics that are associated with successful reorganization are identified and tested with logit analysis.

### PAST BANKRUPTCY STUDIES

Most past research involving bankrupt firms studied the behavior of common stock returns as firms entered financial distress. Aharony, Jones, and Swary [1] report that although the betas of firms approaching bankruptcy do not rise, the variance of their returns increases. Morse and Shaw [25] studied the returns of bankrupt firms which had filed during the years 1973 through 1982 and found that trading in bankrupt firms is becoming more common. In 1973 they found that none of the firms in their sample had quotes available on the national exchanges. By 1982, they found that 65% of the firms in their sample were traded on national exchanges. They also found that the systematic risk of bankrupt firms did not change after filing occurred but that the standard deviation of the monthly raw returns did increase significantly. Large after-filing returns also existed, especially for firms which made positive announcements concerning their reorganization plans.

The limitations of the above studies are pointed out by Johnson [18]. She studied the risk behavior of the equity of firms approaching bankruptcy. The presence of nonsynchronous trading greatly affects any conclusions that one can draw concerning the behavior of these firms' betas. Empirical results from her study showed that the betas were nonstationary and their behavior was unique to individual firms.

Only recently have studies begun to focus on the outcome of a bankruptcy filing by a firm. Hong [17] hypothesized that the difference between the value of the firm as a "going-concern" and its value in liquidation would be the major explanatory factor affecting the eventual outcome. Based on a model that White [27, 28, 29] proposed, Casey, McGee, and Stickney [13] demonstrate that the significant variables that discriminate between firms that reorganize and those that liquidate are a firm's amount of "free assets" (unpledged, unencumbered assets) and a change in profitability in the years preceding bankruptcy.

The authors of this research have approached the study of bankrupt firms from a different viewpoint than the above studies. In this paper a logit model is developed that can be used to predict whether a bankrupt firm will eventually reorganize or be liquidated.

### THE MODEL

#### *Model Assumptions*

It is hypothesized that the market value of bankrupt firm at each point in time,  $t$ , determines whether it will be reorganized or liquidated. At time  $t$ , if the liquidation value of assets is greater than the present value of the firm if reorganized, then a

bankrupt firm will be liquidated. The market value of a bankrupt firm ( $V$ ) to an investor (creditor) is a function of the expected outcome of bankruptcy proceedings. Let  $V_L$  be the expected value of the assets of a firm if it is liquidated. The value of the firm's assets relative to their book value, *cet. par.*, is likely to be related to the growth rate of the bankrupt firm's industry sector relative to the rest of the economy. A firm in a low-growth or declining industry might have assets with a book value much greater than market value at the time of filing or liquidation. The market value of the bankrupt firm's assets is also influenced by the age of the assets.

Let  $V_R$  be the expected value of free, uncommitted assets (i.e., assets - debts) of the firm, if it is reorganized. This value is likely to be influenced by the growth rate of the bankrupt firm's industry sector, and by the age of the firm's assets. In this model the growth rate of the industry sector and the age of the firm as of the filing date are used as determinants of the value of the firm.

The value of the firm as a reorganized "going-concern" is weighed against the opportunity cost to the creditor of leaving money invested in the firm. Since this opportunity cost will rise or fall with the rate of return on alternate investments, the monthly return on long term corporate bonds is used as a proxy for this variable. Thus, it is expected that the sign of the coefficient of this variable in the model will be negative.

The literature that supports the use of the above variables includes work by Banz [9], one of the early researchers who established the existence of a small firm effect. He found that investors in small firms could earn abnormal returns because the market underestimated the risk and analysts had little financial information on the firms. In subsequent research, Arbel, Carvell, and Strebel [8] studied firms neglected by analysts. They discovered that superior return performance was obtained by the neglected firms in their sample compared to the smaller firms. Since reorganizing firms are often neglected by analysts, it is possible their performance will be similar to those in the Arbel *et. al.*, study. Size is also incorporated into our analysis in order to test White's hypothesis that larger firms are more likely to reorganize than smaller firms.

Many researchers have argued that expected growth in earnings is a major factor in determining a firm's value [15, 19]. As a surrogate for an individual firm's earnings growth rate, we used the firm's industry growth rate; there is a body of literature which provides evidence that the industry in which a firm is a member affects its value [21]. Since growth during the reorganization process is not hampered by payments to bondholders or stockholders, all income is reinvested in a Chapter 11 firm during the time it is in reorganization. It is possible that court protection might lower the firm's risk and raise its expected

growth rate high enough to make creditors prefer reorganization to liquidation. The Gordon model [15] accords a pre-eminent role to growth in determining the value of common stock in going concerns. For companies in bankruptcy, expected growth might be a major factor in determining whether the firm will be reorganized or liquidated.

Finally, the amount of debt a firm holds at filing in relation to its assets was incorporated into the logit model. Beaver [11] showed that the ratio of total debt to assets helps creditors predict bankruptcy. It is reasonable to assume that the amount of debt a firm holds will influence its ability to successfully reorganize.

#### Model Definition

At time  $t$ ,

if  $V_L < V_R$  then the firm will be reorganized, and  
if  $V_L > V_R$  then the firm will be liquidated.

As discussed above, let:

Equation 2

$$V_L = f(\text{Assets}_{tb}, \text{Relgrth}_{tb, t1}, \text{Age}_{tb})$$

and

Equation 3

$$V_R = f(\text{Free assets}_{tb, tr}, \text{Cbtr}_{tr}, \text{Age}_{tb})$$

where:

$\text{Assets}_{tb}$  = Total assets at bankruptcy filing date,  
 $\text{Free assets}_{tb}$  = Total assets - debts at bankruptcy filing date,  
 $\text{Relgrth}_{tb, t1}$  = Growth rate of the industry relative to the entire manufacturing sector between filing and liquidation date,  
 $\text{Relgrth}_{tb, tr}$  = Growth rate of the industry relative to the entire manufacturing sector between filing and reorganization date,  
 $\text{Age}_{tb}$  = Age of the firm up to bankruptcy filing date,  
 $\text{Cbtr}_{tr}$  = Monthly total return on long term corporate bonds.

The linear functional form of equations (2) and (3) above, with homogeneity of degree one, allows the influence of each variable to be studied, without second-order interactions:

Equation 4

$$V_L = i_1 + a_1 (\text{Assets}) + b_1 (\text{Relgrth}) + c_1 (\text{Age}) + n_1$$

Equation 5

$$V_R = i_r + f(\text{Assets} - \text{Debts}) + b_r(\text{Relgrth}) + c_r(\text{Age}) \\ + g(\text{Cbtr}) + n_r$$

Assuming  $n_1$  and  $n_r$  are identically and independently distributed with the standard extreme value cumulative distribution, a logit model is constructed (refer to McFadden [20]), where,

Equation 6

$$\text{Log} (P/1-P) = i + a(\text{Assets}) + f(\text{Debts}) + b(\text{Relgrth}) \\ + c(\text{Age}) + g(\text{Cbtr}) + (n_r - n_1)$$

where:

$$P = \text{Probability that a bankrupt firm will be reorganized,} \\ a = f - a_1, \\ i = i_r - i_1, \\ b = b_r - b_1, \\ c = c_r - c_1.$$

With this specification a logistic regression of the probability of reorganization of a bankrupt firm against the independent variables given in equation (6) yields the contribution that each variable makes to raising the probability of reorganization. A priori, the coefficients  $f$  and  $g$  were expected to be negative: higher debt levels were expected to be associated with lower probability of reorganization, and higher opportunity cost of cash invested in bankrupt firms are expected to be associated with lower probability of reorganization.

#### DATA

A sample of fifty firms was selected from a list of the approximately 200 firms that filed for Chapter 11 between October 1, 1979, and December 31, 1982. This list was obtained from the Corporate Reorganization Department of the Securities and

Exchange Commission [24]. Sample companies were chosen from the population of Chapter 11 firms using the following criteria: 1) monthly return or price data was available publicly; 2) financial information on a firm was obtained from Moody's Industrial Manuals just prior to filing. Data on a firm's asset size, age, and debt composition was taken from the last available Moody's report before a firm filed for Chapter 11.

Growth rates of the industries of the bankrupt firms relative to the rest of the economy were derived from production statistics published in various issues of The Federal Reserve Bulletin. These growth rates were estimated as averages for the post-bankruptcy period up to reorganization or liquidation as the case may be. Corporate bond monthly total returns are obtained from the CRSP indices file containing Ibbotson and Sinquefeld estimated long term corporate bond monthly total returns.

Among the 50 firms in the sample, 35 were reorganized, 7 were liquidated, and 8 were still operating under court protection when the sample time period ended. These 8 firms were used as a hold-out sample on which to test the ability of the logit model to predict whether a company will reorganize or liquidate.

Three significant dates referred to in this paper are: the filing date, when a firm files for bankruptcy; the reorganization date, when the bankrupt firm's reorganization plan is approved; and the liquidation date, when the bankruptcy court converts reorganization proceedings into liquidation proceedings.

For the 35 firms which were successfully reorganized, the returns to investors who bought shares at the closing price on the day of the bankruptcy filing and held them until the reorganization plan was approved by the court, the average annualized rate of return was 44.5%. For the 7 firms which were liquidated, the average annualized return was -51% to investors who bought shares on the date of the filing and held them until the liquidation was announced. For the 8 firms which were still under court protection as of December 31, 1982 the returns to investors were calculated assuming they bought on the date of the filing and still held as of the end of the period. The average return was 37%. All returns were calculated assuming that the investor bought equal dollar amounts of the stock of each company in the sample, and had no information which would encourage investing in companies that would be successfully reorganized, or discourage investing in companies that eventually would be liquidated. Table 1 gives these results in detail.

Having the ability to predict which Chapter 11 firms would eventually reorganize would obviously be worthwhile given the above return information. A model which would help investors choose which bankruptcy situations to buy and which to avoid would raise the average profitability of investing in the shares of companies in reorganization.



TABLE 1  
Annualized Returns of Firms  
After Chapter 11 Filing, 1979-1983

FIRM	STOCK RETURN (%)	MONTHS
Advent (R)	-76.6	13
Airlift International	-24.0	30
Allied Technology (R)	-19.3	18
American International (R)	82.8	29
Arctic Enterprises (R)	348.0	10
Autotrain (L)	-41.1	29
Bobbie Brooks (R)	30.5	13
Colonial Commercial (R)	72.0	25
Combustion Equipment (R)	-25.0	47
Computer Communication (R)	-10.2	33
Data Dimension (R)	120.0	22
Empire Oil (L)	-100.0	12
Fashion Two-Twenty (R)	-44.0	9
FSC	19.9	26
Gamex (R)	111.3	18
Goldblatt Brothers (R)	48.8	29
Good L.S. (L)	-37.5	32
HRT	48.9	13
Inforex (R)	-5.5	11
Itel (R)	254.6	33
Keydata (R)	-12.5	24
Lafayette Radio (R)	-8.7	18
Lawhorn (R)	-30.0	12
Lionel (R)	32.0	21
Lynnwear (R)	-6.5	24
Manville	30.0	22
Mays (R)	39.8	23
McLouth Steel (R)	-38.1	16
Med Park (L)	-50.0	24
National Shoes (R)	69.3	36
NuCorp	-40.2	17
Penn Dixie (R)	0.0	21
Revere Ware (R)	12.0	14
Richton International (R)	3.0	20
Rusco (R)	120.0	15
SBE (R)	20.0	12
Sam Solomon (R)	177.5	24
Sambos	81.5	9
Saxon (R)	-12.0	21

(R) = Reorganized

(L) = Liquidated

TABLE 1  
Annualized Returns of Firms  
After Chapter 11 Filing, 1979-1983  
(CONT'D)

FIRM	STOCK RETURN (%)	MONTHS
Seatrian (R)	14.6	33
Shelter Resources (L)	-13.6	15
Stevcoknit (R)	131.3	17
South Atlantic	73.6	15
Tenna (L)	-33.3	36
Topps and Trowsers (R)	70.4	15
Unishelter (L)	-80.8	15
UNR	105.9	17
Upson (R)	2.3	42
Van Wyck (R)	57.1	29
Wickes (R)	29.1	19

(R) = Reorganized

(L) = Liquidated

## RESULTS

The model developed in this paper can be used on the date a company files for reorganization, and it can be used weeks or months after the date of filing to help weigh new information that becomes available about a company, its industry sector, or the returns on alternate investments. The model permits the screening of companies on the dates of their Chapter 11 filings. It also permits the updating of the estimated probability of successful reorganization using new observations of industry growth rates and monthly total returns on corporate bonds; thus the model captures the changing conditions that would influence whether companies already in bankruptcy proceedings for weeks or months will be reorganized or liquidated. The results reported here show the coefficients obtained using concurrent observations for two of the independent variables. This gives a baseline set of coefficients for the companies in the sample as they were reorganized or liquidated against the backdrop of industry growth and corporate bond returns that prevailed during the sample period. New bankruptcy cases can be evaluated against these baseline coefficients. The values of the logit model coefficients are given in Table 2.

The three explanatory variables that have a significant effect on the probability of reorganization of a bankrupt firm are the total assets and debts at the time of bankruptcy and the relative growth rate of the industry vis-a-vis the manufacturing

TABLE 2  
Probability Of Reorganization And Value  
Of A Firm Logistic Regression Parameters

Chi-squares are given in parentheses

Factors	Parameter Estimates (1)	Incremental Probability Of Reorganization (2)**
Intercept	0.57359 (0.35)	0.1434
Assets (millions)	0.05679 (2.03)	0.0142
Debts (thousands)	-0.00896 (1.74)	-0.0022
Relgrth	0.00469 (2.39)	0.0012
Age	-0.02530 (0.55)	-0.0063
Cbtr	0.17610 (1.19)	-0.0440

\*\* Please refer to the text; incremental probability of reorganization  $p^{1/4} (1) * (P (1-P))$ ; assuming  $P = 0.5$   
(2) = (1) \* 0.25.

sector in the post-bankruptcy period. The significance of the assets and debts support previous findings (refer to Casey et al. [13]) that net, unencumbered assets is a significant variable in discriminating between firms that reorganize and firms that liquidate. Additionally, the current study points to the importance of the relative growth rate of the industry of the bankrupt firm in the post bankruptcy period in determining the probability of survival of the firm.

Table 2 results also indicate that a million dollar increase in debts hurts the odds of reorganization more than a million dollar increase in assets would aid the odds. As expected, the higher relative growth rate of the industry in the post-bankruptcy period reduces the probability of liquidation of the bankrupt firm. As expected, an increase in the corporate bond total return adversely affects the odds of reorganization in favor of liquidation. Age of the firm does not significantly affect the odds of reorganization.

The effect of a change in the independent variables on the probability of reorganization,  $P^*$ , can easily be shown to be:

Equation 7

$$P^* = \text{Parameter} * (P(1-P))$$

Assuming a 50-50 odds of reorganization, i.e.,  $P = 0.5$ , the last column of Table 2 indicates the incremental effect of the independent variables on the probability of reorganization. Keeping in mind the level of significance of the independent variables, for a firm with an even chance of reorganization ( $P = 0.5$ ), a 0.25% decrease in the monthly corporate bond return (or about a three percent annual rate) increases the probability of reorganization by as much as a million-dollar increase in the assets. This highlights the importance of the overall economic climate as much as firm specific variables in assessing the probability of reorganization of a bankrupt firm.

The model's ability to predict successful reorganization was tested by computing the probability of reorganization on a hold-out sample of eight firms which had not reorganized as of December 1985. Among these eight firms, the model indicated that five had a high probability of reorganization. The five are: HRT, Manville, UNR, FSC, and NuCorp Energy.

As of April 1989, four of these five companies have been reorganized or bought out. UNR and Manville were reorganized and HRT and FSC were bought out. The fifth firm, NuCorp Energy, was liquidated and its officers were sued for fraud. The model successfully predicted a favorable outcome four out of five times; and the fifth time it failed because the financial information it used was unreliable.

#### IMPLICATIONS OF THE RESULTS

Investors trying to choose which stocks to buy of companies in Chapter 11 bankruptcy can use this model to select companies that will successfully reorganize and avoid companies that will be liquidated. The logit parameters of the valuation model indicate the importance of size, and debt position ("free assets") on the filing date, as positive indicators of successful reorganization. For investors who prefer to wait after the filing date until more evidence concerning each bankrupt company can be gathered, the growth rate of the bankrupt company's industrial sector, and the monthly total return on long term corporate bonds are associated with the probability of successful reorganization. The probability of earning large absolute returns from these investments is highest if the stocks are held until reorganization occurs.

## ENDNOTES

1. A March 6, 1989 article in *Pension and Investment Age* entitled "\$1.5 Billion Targeted for Ailing Firms" indicates investments in funds which trade bankrupt stocks will approach the \$1.5 billion mark in two years.
2. This information was obtained from interviews with the managing partners of the Merrill Lynch Phoenix Fund and Mutual Shares.

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