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Is Bankruptcy Costly? Recent Evidence on the Magnitude and Determinants of Indirect Bankruptcy Costs

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Abstract

In this study we estimate indirect bankruptcy costs for a recent sample of large corporate bankruptcies in the United States over the period, 1997 to 2004. We find indirect bankruptcy costs of approximately 2%, 6.2% and 14.9% of firm value in years -3, -2 and -1 relative to the year of bankruptcy announcement respectively. Together with the direct costs reported in Altman (1984), our results suggest total bankruptcy related costs around 6.09%, 9.71% and 17.43% of firm value over the corresponding three years. These figures affirm that, despite significant changes in industry and market structures, bankruptcy related costs have remained fairly stable over the last 25 years. Cross-sectional analyses designed to search for determinants of indirect costs reveal that leverage, degree of competition, and firm size are among the more significant factors that influence the magnitude of such costs. Finally, consistent with the trade-off model of capital structure, our findings suggest that a large majority of firms in our sample were overleveraged, some dangerously so, in the last two years leading up to the announcement of Chapter

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11. This suggests that excess leverage (suggesting financial distress rather than economic distress) may have been a significant factor contributing to their eventual bankruptcy.

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1 Introduction

In this study we answer three questions which form the basis of the trade-off theory of capital structure. First, what has been the magnitude of indirect bankruptcy costs in recent years? This is addressed using a recent sample of large U.S. bankruptcies over the period, 1997 to 2004. Second, are indirect bankruptcy costs systematically related to firm and industry characteristics? And finally, as per the trade-off model, since (tax shield) benefits of debt are *optimally* traded off against the costs of bankruptcy, does excessive leverage result in firm failure?

Knowledge of the magnitude of bankruptcy costs has important implications for the debate over the existence of an optimal capital structure. Academic literature is abundant but hitherto inconclusive regarding the exact nature of forces that shape capital structure. Following the invariance propositions in Modigliani and Miller [12] in a frictionless world, Modigliani and Miller [13] suggests 100% debt in the presence of corporate taxes. However, a casual observation of data will promptly reveal that firms stop well short of reaching anywhere close to that level of debt. Empirical regularities in the cross-sectional variation of debt levels are now routinely discussed in standard text books on corporate finance.

Of the several competing hypotheses that aim to explain this cross-sectional variation in debt levels, trade-off between the benefits (primarily tax shield) and costs (primarily bankruptcy related costs) have been recognized as a

possible explanation why different firms choose to lever up to different levels. However, critics of the trade-off model question the existence and magnitude of such costs (Miller [10]). These criticisms are not without substance. Early empirical evidence such as Warner [15] and others[3] suggests that the direct component of bankruptcy costs at around 5% of firm value is small relative to the benefits they are purported to trade-off.[4] However, evidence in Altman [1] suggests that the total costs of bankruptcy are in fact significantly higher once indirect costs are taken into account. Altman [1] was the first study that estimated indirect costs, albeit using a narrowly constructed sample of bankrupt firms. With indirect costs defined predominately as loss of profits, Altman showed that such costs ranged from 8%-12% of firm value over the three years immediately preceding the date of bankruptcy announcement.

The last two decades, however, have seen an almost total absence of research into the magnitude and determinants of such costs. This is surprising given its significance as one of the main counter-balancing forces to tax benefits in shaping capital structure. We fill this void in the literature and provide recent evidence on the size of the indirect costs of bankruptcy using a recent sample of large corporate bankruptcies. Essentially, we attempt to establish whether indirect bankruptcy costs are still significant and sizeable to trade off the tax shield gains of debt financing in a world of significantly increased agency costs as amply evident in the spectacular debacles of Enron and World Com (other recent evidence on such costs includes Bris, Welch and Zhu [5]).

Using a recent sample of large US bankruptcies, we find several interesting results. First, we find that indirect costs are indeed significant at approximately 2%, 6.2% and 14.9% of firm value in the three years -3, -2 and -1 relative to the year of bankruptcy announcement respectively. These, coupled with the direct costs reported in Altman [1], suggest total bankruptcy costs of around 6.09%,

[3] Altman [1].
[4] Warner finds that (direct) bankruptcy costs are 1% of firm value seven years prior to bankruptcy and rise to 5.3% prior to the petition announcement.

9.71% and 17.43% of firm value over the corresponding three years. These results are similar to those reported in Altman and indicate that total bankruptcy costs are indeed sizable to counter-balance the tax shield gains as per the trade-off model.

Second, in univariate regressions we find that leverage, degree of competition, liquidity, profitability and firm size are all significant determinants of indirect bankruptcy costs. However, in a multivariate regression, only leverage, intensity of competition and firm size remain significant. The fact that leverage is the most economically significant factor accentuates the notion that indirect bankruptcy costs are predominately caused by financial distress as opposed to economic distress.

Finally, we find that a large majority of the firms in our sample have expected costs of debt that far outweigh expected benefits for up to two years prior to bankruptcy. This indicates that these bankrupt firms were overleveraged, some dangerously so, immediately prior to petition. Moreover, almost every firm in the sample experienced deterioration in its leverage status from year t-2 to t-1 as bankruptcy became imminent.

The remainder of the paper is structured as follows. In Section 2 we briefly review previous literature that examined costs of bankruptcy and financial distress. In Section 3 we introduce the model and the methodologies used for estimating indirect bankruptcy costs, identifying the determinants of indirect costs and measuring the degree of indebtedness. The data are presented in Section 4. In Section 5 we present and discuss our empirical findings and Section 6 summarizes the paper.

2 Review of the literature

It is widely accepted that total bankruptcy costs can be divided into two distinct parts: direct and indirect costs of bankruptcy. Direct costs are those costs that are *directly* related to administering the process of bankruptcy. These costs

normally include legal expenses (such as bankruptcy filing fees and court charges), accounting and other professional costs. Indirect costs, on the other hand, are *indirectly* related to bankruptcy as they are the result of the distress induced by a heightened bankruptcy potential. Such costs include loss of sales and profits due to financial distress, decline in market shares and equity values, inefficient use of resources such as managers' time and energy (as attention shifts away from business operation to legal issues) and decrease in employee moral and productivity.

Prior to the 1980's, bankruptcy literature was primarily focused on measuring only direct costs. Although the rules and regulations set by the legal system governing the bankruptcy proceedings in the US ensures such direct costs exist, opinions are split on the size however. Baxter [3] reports that as much as 25.7% and 19.9% of realised asset value goes into administrative expenses for personal and small business bankruptcies respectively in the US. However, Warner [15], perhaps the most widely cited study on the direct costs of bankruptcy, measures direct costs for 11 US railroad companies that were under bankruptcy proceedings from 1933 to 1955 and finds that these costs averaged 1% of the market value of the firm seven years before entering into Chapter 11 and rose to 5.3% just prior to bankruptcy. Despite the significance of his study, Warner however cautions that his results should be interpreted cautiously since they are based on a narrowly defined bankruptcy cost definition. Also, his small sample of railroad bankruptcies is not necessarily indicative of the population of firms. Despite his criticism of Warner, Altman [1] obtains similar results on the magnitude of direct bankruptcy costs. He finds that direct costs average about 2.8% of firm value 5 years prior to bankruptcy and around 5% a year before filing.

Literature on the indirect costs of bankruptcy however is thin. In his widely cited paper, Altman [1] defines indirect bankruptcy costs as sales and profits forgone due to imminent bankruptcy. Using a sample of 19 bankrupt firms from retail and industrial sectors, Altman reports indirect bankruptcy costs in the

range 8.1% - 10.5% of firm value. These, together with direct costs, bring the total costs to 12.1% three years prior to the bankruptcy and to 17% one year prior. Altman concludes that, after including the indirect costs, the total costs of bankruptcy are large enough to be considered as an effective counterbalancing force to the tax shield benefits of debt.

A number of studies following Altman [1] find support for his assertion that indirect costs of bankruptcy are non-trivial. Kwansa and Cho [8] estimate such costs for a sample of bankrupt restaurant firms and show that indirect costs are certainly critical and substantial (averaging around 7%) despite their use of book value of debt instead of market value.[5] Chow and Pham [7] examine bankruptcies in the Australian context over the period 1978-1983. They find such costs as even more sizable – the loss of profits, on average, amount to almost 20% of firm value.

Though widely accepted, Altman's methodology is not without flaws, however. The most prominent criticism comes from Wruck [16], who argues that Altman's results suffer from the problem of reverse causality as "it is impossible to tell whether the loss in profits is in fact caused by financial distress or whether financial distress is caused by the loss in profits in the first place." This problem is further explained by Opler and Titman [9], who conjecture that "part of the observed drop in sales must be attributed to the fact that unexpected declines in sales are likely to have contributed to financial distress. In other words, the causality between the observed sales drops and financial distress may be opposite of that assumed by Altman". While recognising the potential shortcomings of his methodology, Altman admits that both events (unexpected lower earnings and distress) can occur simultaneously and can mutually influence each other at the same time. Although this should not impact on the measure of indirect costs, still, "the complexity of factors occurring at the same time makes it clear that it is

[5] Kwansa and Cho acknowledge that prior to and during bankruptcy, the loss of market value of debt would be much greater than the book value; hence their average of a 7% loss is a conservative estimate.

extremely difficult to isolate *completely* the indirect bankruptcy costs with existing techniques".

As a result, a few subsequent studies attempt to measure indirect costs using different techniques while minimising the reverse causality problem. Opler and Titman [9] explore the connection between firm leverage and indirect costs of financial distress. They examine how firms with different levels of leverage fare when their industries experience negative shocks. If financial distress is costly, then firms that are highly leveraged will experience greater operating difficulties in an industry downturn. Alternatively, if financial distress benefits firms by forcing efficient operations, highly leveraged firms will perform. Their results are consistent with the null hypothesis that financial distress is costly since sales (as well as the market value of equity) of firms in the top leverage decile decline by 26% more than firms in the bottom leverage decile. Their results provide support to findings in the literature that leverage plays a significant role not only in determining the probability of business bankruptcy but also in the magnitude of the costs of bankruptcy.

Andrade and Kaplan [2] point out that many previous studies that examine indirect costs of financial distress fail to distinguish *financial distress* from *economic distress.* By examining a sample of 31 highly leveraged transactions (HLTs), they find that on average HLTs have positive operating margins that are higher than their industry average. In other words, without their high degree of leverage, these firms would appear healthy (economically and financially) relative to other firms in the industry. Given this result, the authors argue that any losses incurred during the study period would be caused by pure financial distress (i.e. their high leverage), and not due to economic distress. Their results show estimated financial distress costs to be 10-20 percent of firm value.

Altman [1] also argues that indirect bankruptcy costs are not limited to firms which actually fail. Firms which have a high probability of bankruptcy, whether they eventually fail or not, can still incur these costs. Chen and Merville

[6] examine a large number of firms that meet this description, i.e. ongoing firms that despite being financially distressed never file for bankruptcy. They find that, for the firms that are financially distressed, the average profit loss is around 8% of their market value *per annum*. Although none of these firms filed for bankruptcy, the authors argue that the accumulated effects of such indirect costs on firm value are nevertheless considerable.

3 Empirical methodology

In this section we provide (i) a detailed description of the model and the procedure for estimating indirect costs of bankruptcy, (ii) the methodology for identifying the determinants of indirect bankruptcy costs and (iii) a methodology for measuring the bankrupt firms' leverage status according to the trade-off between the benefits and costs of debt.

3.1 Estimating Indirect Costs of Bankruptcy – A Regression Analysis

The methodology employed for estimating indirect costs of bankruptcy was developed in Altman [1]. Therefore, following a similar procedure, we define indirect bankruptcy costs as the loss of profits due to financial distress the intuition being that firms with a higher bankruptcy potential are more likely to experience declining sales in the face of competition. This has potential for a series of follow-on effects. First, managers may have to channel a greater degree of their time and energy towards the legal process rather than focusing on operations. Second, creditors may demand higher interest rates as compensation for the increased risk, and suppliers may transact on adverse terms to reduce their risk exposure. Finally, employees' fear of redundancy may cause loss in morale, which subsequently leads to lower productivity and quality of products.

According to Altman, indirect costs can be computed as the difference between estimated profit (under healthy conditions) and actual profit (under distressed conditions). This process consists of four steps: First, the bankrupt-firm sales over the ten-year period prior to the forecast year are regressed on industry sales in order to estimate the sensitivity of firm-sales to industry-sales. For example, if the forecast is for year t= -3 (the third year prior to bankruptcy), sales of the firm over the period (year, t= -13) to (year, t= -4) are regressed on industry sales as follows:

$$S_{i,\,t} = a + b\, S_{I,t}, \quad t= 10 \text{ years, from } t= -13 \text{ to } t= -4 \tag{1}$$

where, $S_{i,\,t}$ = Sales of firm i in period t and $S_{I,\,t}$ = Average Sales of industry I in period t.

Second, actual industry sales for year t= -3 are then used along with the estimated coefficient, b, in equation (1) to estimate firm-sales in that year. In doing this we assume that the sensitivity of firm-sales to industry-sales remains constant.

$$\hat{S}_{i,\,t} = a + b\, S_{I,\,t,} \quad t = -3, -2 \tag{2}$$

where, $\hat{S}_{i,\,t}$ = Expected sale. Third, applying the average profit margin on sales over the prior 10-year period to the expected sale figure, we derive expected profit as follows:

$$P^{e}_{i,\,t} = \hat{S}_{i,\,t} * PM \tag{3}$$

where, $P^{e}_{i,\,t}$ = Expected profit, and PM = Average historical profit margin. Finally, expected profit is compared with actual profit to determine indirect bankruptcy costs for that year (in this case for year t-3):

$$\Delta P_{i,\,t} = P_{i,\,t} - P^{e}_{i,\,t} \tag{4}$$

where, $\Delta P_{i,\,t}$ = Difference in actual and expected profit. This analysis is repeated for years, t-2 and t-1, with t-1 being the year when the last available financial

statement is published by the firm prior to bankruptcy. Therefore, in total, three estimates of indirect bankruptcy costs (t-3 to t-1) are obtained.

3.2 Determinants of Indirect Bankruptcy Costs – A Cross-Sectional Analysis

To isolate firm and industry specific determinants of indirect bankruptcy costs, we conduct a cross-sectional analysis by regressing indirect costs on several firm and industry characteristics hypothesized to influence the magnitude of such costs. The following variables are of interest.

Leverage: Leverage is of interest because the amount of debt in the capital structure not only has a direct effect on the probability of bankruptcy but empirical evidence in Opler and Titman [9] suggests that it also plays a significant role in determining the costs of financial distress. By focusing on firms in the industries that have experienced negative shocks, Opler and Titman find that firms in the top leverage decile lose 26% more sales (as well as market value of equity) than those in the bottom decile. They argue that, since financial distress is costly, highly leveraged firms should experience greater operating difficulties in an industry downturn than those with lighter levels of leverage. Therefore, we expect a positive relationship between indirect costs and firm leverage. Leverage is computed as total book value of debt divided by total asset.

EBIT: We include firm EBIT relative to the industry average EBIT with the aim to capture how profitability, or the economic health, of a firm affects indirect costs. It can be argued that the higher the relative EBIT, the more economically sound the firm will be and hence the better positioned it is at weathering distress conditions. Therefore, this variable should be negatively related to indirect costs. EBIT is the operating earnings before interest and taxes.

Herfindahl Index: A sales-based Herfindahl Index is widely used in the literature as a proxy for the degree of competition a firm faces within its industry. Given that indirect costs are defined as the loss of sales and profits when a firm is in a state of distress, increased competition with many competitors offering the same (or similar) products or service makes it easier for customers to switch to alternative suppliers resulting in higher costs of distress. Herfindahl Index ranges from zero to one where a higher value of the index suggests increased concentration. Hence, this variable should have a negative relationship with indirect bankruptcy costs. A sales-based Herdindahl Index is computed as $\frac{S_i}{\Sigma} S_j^2$, where S_i is sale of the firm, S_j is sale of another firm within the same industry, $S_i \neq S_j$.

Interest Coverage Ratio: Interest coverage ratio is widely construed in the literature as a proxy for financial liquidity and hence reflects the ability of a firm to service debt costs. In a state of distress, a relatively higher financial liquidity will enable management and employees to concentrate more on operations rather than on fending off distress related costs. This ratio is expected to be inversely related to indirect bankruptcy costs. We compute interest coverage ratio as earning before interest and tax divided by the annual interest expense.

Firm Size: Finally, we examine the effect of firm size on indirect bankruptcy costs. Ex ante, the effect of size on such costs is ambiguous. On the one hand, size can be a proxy for the amount of market clout a firm enjoys i.e., the larger a firm, the greater the market power it will enjoy. This size induced market clout and economies of scale should enable the firm to ward off distress more easily than its smaller competitors. Therefore, size would enter the regression with a negative sign. On the other hand, Brealey and Myers [4] argue that size is important to the costs of bankruptcy since the process of bankruptcy for large firms can be lengthy

and complex, which can significantly shift managers' attention away from business operations and hence result in an escalation of losses. Moreover, large firms are generally more transparent with more media and analyst coverage. Thus, early knowledge of distress may prompt customers to switch to alternative suppliers causing troubled firms to lose market share resulting in increased indirect costs. Therefore, a positive relation between size and costs is also possible. The size variable is computed as natural log of total assets.

Table 1: Determinants of indirect costs and their hypothesized signs

Independent variables used in cross-sectional analysis for the determinants of indirect bankruptcy costs. Total Debt is the book value of debt. Total Assets consist of the book value of debt and the market value of equity. Industry Relative EBIT and Interest Coverage Ratio are obtained from the Compustat database. The sales-based Herfindahl Index is calculated as $Si / \sum(Si^2)$ and Ln (Asset) is the natural log of total assets.

Variables	*Proxy Factor*	*Predicted Sign*
Total Debt/Total Assets	Leverage	+
Industry Relative EBIT	Profitability	-
Sale-based Herfindahl Index	Degree of Competition	+
Interest Coverage Ratio	Liquidity	-
Ln (Asset)	Size	+/-

In Table 1 we outline descriptive statistics of the variables used in this analysis along with their predicted signs. To ensure that causality runs from the regressors to the indirect bankruptcy costs, indirect bankruptcy costs are measured at t-1 while all the independent variables are measured at t-2 relative to the year of Chapter 11 announcement.

3.3 Measuring firm's degree of indebtedness – An Analysis of the Trade-Off Model

To address the last of the three questions we set out to answer, we determine the leverage status (overleveraged, underleveraged or optimally leveraged) of the sample firms by comparing the present values of future tax savings and total bankruptcy costs. This analysis should assist us in determining whether excessive debt in the sample firms was a factor in their eventual failure. To enable this comparison, we analyse the following trade-off:

$$\frac{P_{B,t}(BCD_t + BCI_t)\cdot(PV)_t}{MV_t} \quad \text{vs.} \quad \frac{T_c(iD)_t(PV)_t\cdot(1-P_{B,t})}{MV_t} \tag{5}$$

where

$P_{B,\,t\,=}$ Probability of bankruptcy estimated in period t

BCD_t = Direct bankruptcy costs estimated in t

BCI_t = Indirect bankruptcy costs estimated in t

MV_t= Market value of the firm in t

T_c = Marginal tax bracket of the corporation

iD = Interest expenses from period t to infinity

PV_t = Present value adjustment back to period t

The left-hand part of equation (5) represents expected bankruptcy related costs, while the right-hand part represents expected tax-shield benefits. The expected-benefit equation is formed with two underlying assumptions. The equation requires estimates of both direct (BCD) and indirect costs (BCI). Because the primary interest in this study is to search for recent evidence on BCI, the

dataset selected here prevents us from estimating BCD independently. Therefore, for these direct costs, the average measures from Altman's [1] study are used.[6]

$P_{B,t}$, the probability of bankruptcy at time t, is estimated using the following logit regression with the independent variables from Altman's Zeta model

$$Z = \ln\left(P_i \big/ 1 - P_i\right) = \beta_0 + \beta_1 \text{WCTA} + \beta_2 \text{RETA} + \beta_3 \text{EBITA} + \beta_4 \text{MVBV} + \beta_5 \text{STA} \quad (6)$$

where $P_i = \frac{1}{1+e^{-Z_i}}$.

WCTA = Working Capital/Total Assets

RETA = Retained Earnings/Total Assets

EBITA = Earnings before Interest and Taxes/Total Assets

MVBV = Market Value of Equity/Book Value of Total Debt

STA = Sales/Total Assets

To generate bankruptcy probability, the logistic model is estimated over the sample of bankrupt firms and a sample of industry-matched non-bankrupt firms.[7]

Optimal capital structure implies a trade-off between the benefits and costs of debt and, as such, firms are deemed over-leveraged if the expected costs of bankruptcy outweigh the expected tax gains and underleveraged if the reverse is true. We examine the degree of indebtedness in year t-1 and t-2 in an effort to trace deterioration in debt ratios as firms approach insolvency.

4 Data

We start with an initial list of 572 bankruptcies obtained from Altman's bankruptcy database maintained at the New York University. Since our primary

[6] Altman [1] reports measures of BCD at 4.3%, 4.6% 4.6% of firm value for the last three years prior to bankruptcy (t= -3, -2, -1). Also, the magnitude of such costs is fairly stable since Altman's reported results do not differ from those reported in Warner [15].

[7] Matching is conducted on the four-digit Standard Industry Classification (SIC).

interest is to examine recent evidence on indirect bankruptcy costs, we retain only firms that went bankrupt over the years 1997-2004. This group of firms is then examined for data availability so that a final sample with complete market and accounting data to permit analysis is retained as per the following algorithm. First, firms were removed from the sample if they were not listed on Compustat or listed but did not have complete data. Second, since the regression methodology we employ requires at least 13 years of sales and profit data, firms that did not have sufficient data on these variables were eliminated. Finally, firms were dropped if Comupstat did not have more than three other firms within the same four-digit SIC to form a reasonable industry sales series for the regression analysis. These data requirements resulted in a usable sample of 62 firms with complete data for analysis. A summary of the sample including firm name, bankruptcy date and industry group is contained in the Appendix.

Unlike Altman's sample of 19 firms belonging to just two industry sectors, industrial and retail, the sample of 62 firms used in this study represents seven different major industry sectors categorized according to their four-digit Standard Industry Classification (SIC). Industries represented include: consumer products, financing, manufacturing, retail, services, technology and transportation. There are no significant disproportionate sector weightings in the sample with retail firms only slightly out-numbering firms in other industry sectors.

Table 2 presents the market values of the 62 bankrupt firms over the three years prior to filing for the petition. Given the skewness in the data, we discuss our results based on median values. For the full sample, the median market value falls from 465.5 million to around 404 million from year t-3 to t-2. Firm values then experience a sharp drop of almost 20% in a single year from year t-2 to t-1.

When the full sample is segmented into the seven industry groups, the three asset- intensive sectors (transportation, retail and manufacturing) experience significant fall in values for all three years leading up to bankruptcy. In contrast, the values of firms belonging to the service and technology sectors drop sharply

only over the years t-2 to t-1, both falling almost 40 percent. This is not surprising, since firms in these two industry groups contain intangible assets and asset values deriving from capitalized future growth in earnings are more prone to sharp corrections when firm survival is in jeopardy.

Table 2: Firm-Value evolution in the three years preceding bankruptcy

Average and median values of bankrupt firms (categorised by industry groups) over the last three years prior to the bankruptcy petition are presented. The results for the full sample of 62 firms segmented into seven industry sectors: consumer product, financing, manufacturing, retail services, technology and transportation. The mean firm values (with medians in parentheses) are presented below each industry group and the over all average and median figures are given at the bottom.

	t-3	t-2	t-1
Consumer Products	828.18 (447.61)	644.84 (353.88)	601.93 (360.14)
Financial	1607.26 (438.46)	1395.92 (278.78)	1310.20 (413.10)
Manufacturing	1624.00 (774.73)	1554.95 (701.67)	1593.03 (701.36)
Retail	4286.46 (568.34)	7986.73 (359.33)	3938.25 (302.91)
Services	817.93 (462.75)	823.77 (491.06)	716.25 (304.22)
Technology	607.43 (439.82)	427.36 (517.31)	320.17 (322.31)
Transportation	3154.76 (315.70)	3623.67 (297.63)	4246.07 (297.34)
Overall	2193.89 (465.47)	3132.79 (403.99)	2131.31 (326.45)

If the median figures of firm value are used, our results are in-line with those of Altman [1] and Pham and Chow [7] but at variance with Warner [15], who finds that the values of his sample of railroad firms fall consistently over the years prior to petition. This variation could be attributed to differences in the way

firm value is measured. Consistent with Pham and Chow [7] and Altman [1], our study also uses the book value of debt as opposed to Warner's market value measures of debt. The difference could also be explained by the sample composition, as our sample of firms is far more heterogeneous (consisting of seven industry sectors) than that of Warner's.

5 Results and Discussion

In this section we present our empirical findings. Section 5.1 contains estimates of indirect bankruptcy costs obtained using Altman's [1] methodology described in Section 3.1. The determinants of indirect bankruptcy costs are presented in Section 5.2. Finally, the leverage status of the bankrupt firms is determined using the trade-off of costs and benefits of debt financing (see Section 3.3) and the findings are presented in Section 5.3.

5.1 Indirect Bankruptcy Costs

The results for the indirect bankruptcy cost (BCI)[8] and total bankruptcy cost [9] estimations in absolute and relative terms for the full sample over the years, t-3, t-2 and t-1 relative to the year of bankruptcy announcement are depicted in Table 3. For the full sample, the average indirect costs as a percentage of firm value are 2%, 6.21% and 14.95% over the last three years (t-3, t-2, t-1) relative to bankruptcy announcement respectively. The median figures are slightly lower at 1.79%, 5.11% and 12.83%. The differences between the two measures may be due

[8] BCI are estimated using models (1) through (4) described in the methodology section 3.1.
[9] Total bankruptcy costs are computed as the sum of BCI and BCD, where BCD (direct bankruptcy costs) are reported by Altman [1].

to the somewhat large variation in BCI across firms and a few significant outliers.[10]

Table 3: Indirect Bankruptcy Costs in the three years preceding bankruptcy

Average and median BCI as a percentage of firm value (categorized by industry groups) over the last three years prior to the bankruptcy petition are presented. The results for the full sample of 62 firms are segmented into seven industry sectors consumer product, financing, manufacturing, retail, services, technology and transportation. The mean IBC as a percentage of firm value (with medians in parentheses) are presented below each industry group and the overall average and median figures are given at the bottom. T-1 is the last year for which failed firm's financial information is available.

	t-3	t-2	t-1
Consumer Products	3.03% (4.58%)	10.83% (6.77%)	13.78% (11.11%)
Financial	4.51% (-0.41%)	5.72% (4.82%)	12.80% (15.17%)
Manufacturing	2.54% (2.41%)	3.00% (2.91%)	8.97% (10.24%)
Retail	6.27% (4.81%)	15.19% (10.26%)	22.99% (14.11%)
Services	6.27% (4.81%)	15.19% (10.26%)	22.99% (14.11%)
Technology	0.42% (0.99%)	3.02% (5.14%)	27.04% (26.17%)
Transportation	-3.79% (-10.50%)	3.39% (5.14%)	11.72% (11.63%)
Overall	**2.00%** **(1.79%)**	**6.21%** **(5.11%)**	**14.95%** **(12.83%)**

Results in Table 3 also show a clear variation in costs across industries. For example, average results for the year t-1 range from as low as 9% of firm value for the manufacturing sector to as high as 27% for the technology sector. As

[10] In results not reported, for the simple regression technique, in most cases, the fit was rather good with an average and median R-square of 69% and 78% respectively. In a number of cases, the fit is excellent with R-squares above 90%. Hence the estimated models considered suitable for purposes of prediction.

BCI are computed as a percentage of total asset value, falling firm value contributes to the size of BCI just as much as losing sales and profits. Therefore, because of the rapid decline in asset values, firms in the technology sector are taking a harder hit (losing on average 27% of firm value) due to imminent bankruptcy compared to companies in the manufacturing and transportation industries (losing 9% or 11% of value). The retail sector experiences the second highest IBC in our sample. However, this surprisingly high average is induced by a few significant outliers in the sample. The median figure reveals more reasonable estimates at 14.11%. Manufacturing and transportation appear to be the most resilient sectors to financial distress losing only around 9% and 11% of firm value respectively. This may be attributable to the large portion of tangible assets that tend to retain value better than assets whose value derives from future discretionary spending. Consumer products and finance companies, which lose around 13%-14% of their values, fall somewhere in the middle of the range. And finally, similar to the technology sector, rapid decline in firm value also contributes to the 16% BCI for firms in the service sector. When retail and manufacturing firms are taken together to form a combined sample (which is similar to Altman's [1] sample of retail and industrial firms) we obtain indirect bankruptcy costs of 4.41%, 6.63% and 11.54% which are in line with those the 7.1%, 6.6% and 10.5% reported in Altman [1].

Together with the direct costs (reported in Altman [1]), we find the total bankruptcy costs for the entire sample to be 6.09%, 9.71% and 17.43% respectively over the three years leading up to bankruptcy. While the estimates for years t-2 and t-1 are in line with Altman's 11.2% and 16.7%, our BCI estimate for the year t-3 is quite small compared to that reported in Altman's study (6.09% versus 11.7%). This difference could be due to several reasons. For example, the variation may be attributable to difference in sample composition. [11] Our sample

[11] Transportation sector posts an average negative cost (see Table 4) for the year t-3, which significantly lowers the overall average.

size is larger and more heterogeneous in terms of the range of industrial sectors represented. Because of this broad representation of industries, our results, which reveal an increasing trend in costs as bankruptcy approaches, are perhaps more representative of the wider economy.

The difference between our results and those of Altman's might reveal a change in the time series pattern of bankruptcy costs which firms incur now relative to those in the 1970's. The significantly lower BCI in year t-3 might be explained by improved efficiency in the transmission of information in recent years (Morck, Yeung and Yu [11]). If a more efficient market is able to identify troubled firms at an early stage of distress and eliminates them through ways of liquidation or merger and acquisition, then we should expect the length of period for which firms incur indirect costs to be shorter.

Overall, with a broad based sample of large U.S. bankruptcies over a recent period, we obtain estimates of BCI that are largely in line with those of Altman [1]. Together with Altman's estimates of direct costs, the total costs of bankruptcy are approximately 6%, 9% and 17% of firm value for the three years leading up to bankruptcy. Our results indicate that total bankruptcy costs, once taking into account indirect costs, are significant and large enough to be considered as the counter-balancing force to the tax shield benefits of debt as per the trade-off model.

5.2 Determinants of Indirect Bankruptcy Costs

In this section, we present results of a cross sectional analysis conducted to identify firm and industry specific factor(s) with potential to influence the magnitude of indirect bankruptcy costs. Hence, indirect costs as a percentage of firm value at year (t-1) are regressed on a number of selected variables described in Section 3.2, first separately (univariate analysis) and then collectively (multivariate analysis).

Table 4 contains the results of the cross-sectional analysis. Results from the univariate analysis (Models 1-5) suggest that all five variables are significant in explaining the cross-sectional variation in BCI.

For example, the coefficient of debt-to-asset ratio suggests almost a one-to-one association between indirect costs and leverage, i.e. a one percent increase in the ratio of debt-to-assets is associated with an increase in indirect costs by the same proportion. The significance of this variable indicates that firm leverage is an important determinant of indirect costs of bankruptcy. Relative EBIT is statistically significant implying that profitability, by itself, plays a role in explaining indirect costs.

However, a one percentage point rise in this variable causes indirect costs to fall by only one-tenth of a percent – an amount that is small economically.

Table 4: Regression results for determinants of indirect bankruptcy costs

Cross-sectional analysis to search for the determinants of indirect bankruptcy costs. Indirect costs as a percentage of firm values are measured at t-1, with t-1 being the last financial year prior to firms failure. All the independent variables are taken at a year prior to when IBC were measured, i.e. t-2. The table presents the coefficients of variables for univariate regressions (column 1-5) and multi-variate regression (column 6-7). Total Debt is the book value of debt. Total Assets consist of book value of debt and market value of equity. Industry Relative EBIT and Interest Coverage Ratio are extracted from the Compustat database. Sales-based Herfindahl Index is calculated as Si/Σ(Si^2) and Ln(Asset) is the natural log of total assets. T-statistics are given in parenthesis and * indicate significance at the 95% confidence level.

Independent Variables	**Dependent Variable: IBC/Value (t-1)**						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Intercept	*2.10*	*1.60*	*-3.20*	*1.55*	*2.64*	*-0.99*	*-3.24*
	(0.99)	(0.4)	**(-2.67*)**	**(2.77*)**	(1.6)	**(-1.98*)**	**(-3.24*)**
Ln (Asset)	*0.1249*						*0.430*
	(4.29*)						**(3.1*)**
Debt/Asset		*0.9985*				*0.8899*	*0.980 0*
		(2.77*)				**(2.56*)**	**(2.01*)**
EBIT (Industry Relative)			*-0.0010*			*-0.0363*	*-0.0001*
			(-2.66*)			(-0.6)	(-0.29)
Interest Coverage Ratio				*0.0363*			*-0.0004*
				(-2.5*)			(-0.46)
Herfindhl (Sale)					*-0.1172*		-0.1400
					(-4.51*)		**(-3.11*)**
R squares	0.76	0.68	0.61	0.58	0.79	0.73	0.94

The Herfindahl Index is, as expected, significant and correctly signed indicating that troubled firms in industries that are more competitive lose more profit than others. Interest coverage ratio, which represents financial liquidity, is also significant and negative as expected. This implies that more liquid firms suffer less during distress than those with a heavier burden of interest payments as a proportion to EBIT. Finally, the natural log of total asset enters the regression with a positive sign implying that larger firms incur higher BCI.

In Model 6, we regress indirect costs on the debt-to-asset ratio and relative EBIT. The result shows that, after taking profitability (economic health) into account, leverage (financial health) still remains a significant variable while relative EBIT loses its significance. In fact, the magnitude of the coefficient of debt-to-asset only decreases slightly and R-square of the regression increases marginally (from 0.68 to 0.73). All of these findings are consistent with our prior expectation that financial health has a larger influence on indirect costs than the economic health of a firm both statistically and economically. The fact that the profitability factor fails to improve much on the explanatory power of the cross-sectional variation of indirect costs in the presence of leverage affirms the notion that indirect costs of bankruptcy are predominately the result of financial distress rather than economic distress (Andrade and Kaplan [2]).

Results for the full model are presented in column 7. When all the five variables are included in the regression, only size, leverage and the degree of competition remain significant while liquidity and profitability lose significance. Such a result may obtain if liquidity and profitability are systematically related to factors that remain significant such as firm size and leverage. For example, large and more established firms tend to be more liquid while more profitable firms are, more often than not, small and growing. By the same token, firms with high leverage are generally less liquid and maybe less profitable.[12] With all five

[12] Note: the opposing arguments can be presented, for instance, firms that are less liquid may ex-ante employ less debt in their capital structure; and more profitable firms are able

variables in the regression, leverage remains the most economically significant variable. Therefore, consistent with results reported above, the significance of the leverage factor could be a reason why indirect bankruptcy costs are often referred to as the costs of *financial* distress (Andrade and Kaplan [2]). The high R-square value of 0.94 in the multivariate regression implies that the five variables collectively explain most of the cross sectional variation in the indirect costs of bankruptcy.

5.3 Measure of the degree of indebtedness

Following the procedures outlined in Section 3.3, we first present results for identifying a firm's degree of indebtedness in year t-2 relative to the year of bankruptcy announcement. Using the variables from Altman's Zeta model (WCTA(working capital/total assets), RETA (retained earnings/total assets), EBITA (earnings before Interest and taxes/total assets), MVBV (market value of equity/book value of total debt) and STA (sales/total assets) and firm-level data in the year t-2 relative to the year of bankruptcy, the logit regression (equation 6 in Section 3.3) produces fairly accurate results assigning a bankruptcy probability of greater than 50% to 23 of the 40 firms examined.

Tax shield benefits of debt and expected bankruptcy costs as a percentage of firm value are presented in columns 2 and 3 of Table 5. According to the trade-off model, firms are deemed over levered if the costs of debt outweigh benefits at a given level of leverage. This comparison is made by computing the ratio of bankruptcy cost to tax benefits and presented in the last column of the table. Results in Table 5, clearly show that only a quarter of the firms in the sample have ratios less than one while the majority of our sample firms have ratios ranging

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to command more debt, etc. What we are trying to establish here is the notion that the explanatory powers of the two insignificant variables may be taken by the significant ones due to the interrelations among the variables.

Table 5: Cost/Benefit comparison of debt financing two years prior to bankruptcy

Firms (Bankruptcy)	Bankrupt Probabili	Benefi	Cost	Rati Cost/Benef
WEIRTON STEEL	0.99	0.1	238.9	2184.8
Acclaim (Sep-	0.8	2.8	115.6	40.7
MATLACK SYSTEMS	0.9	1.5	52.4	34.0
SHELDAHL INC (Apr-	0.9	0.9	33.4	33.7
ACTERNA (May-	0.9	13.2	275.0	20.7
NATIONAL STEEL	0.7	37.8	617.4	16.3
COOKER RESTAURANT	0.8	4.1	43.6	10.5
READ-RITE (Jun-	0.4	10.8	111.9	10.3
US AIRWAYS GROUP	0.5	55.0	386.0	7.0
MISSISSIPPI CHEMICAL	0.8	14.0	80.7	5.7
LECHTERS (May-	0.5	9.5	54.6	5.7
HOUSE2HOME (Nov-	0.3	24.4	137.5	5.6
EAGLE FOOD CENTERS	0.7	7.1	39.6	5.5
LEVITZ FURNITURE	0.7	57.9	230.7	3.9
BUILDERS TRANSPORT	0.7	18.3	72.9	3.9
DRUG EMPORIUM	0.4	15.1	55.6	3.6
AVADO BRANDS (Feb-	0.6	35.7	121.5	3.4
WICKES INC (Jan-	0.5	37.2	114.1	3.0
FLEMING COMPANIES	0.5	358.4	969.9	2.7
HEILIG-MEYERS (Aug-	0.4	192.1	481.4	2.5
LACLEDE STEEL	0.6	15.6	38.9	2.4
STONE & WEBSTER	0.2	36.1	86.3	2.3
MATTHEWS STUDIO EQUIP	0.6	8.3	17.6	2.1
PICCADILLY CAFETERIAS	0.5	7.2	14.9	2.0
ENRON (Dec	0.3	1529.3	2458.7	1.6
INTERMET (Sep-	0.4	53.1	77.9	1.4
OWENS CORNING	0.5	426.3	612.3	1.4
NEWCOR (Feb-	0.5	23.6	25.7	1.0
AMERICAN HOMEPATIENT	0.7	32.3	34.1	1.0
BUSH INDUSTRIES	0.2	35.5	36.9	1.0
SERVICE MERCHANDISE	0.4	178.1	178.9	1.0
MICROAGE (Apr-	0.6	74.1	67.9	0.9
AMERICAN CLASSIC VOYAGES	0.2	25.0	21.0	0.8
JACOBSON STORES	0.4	26.7	18.7	0.7
THORN APPLE VALLEY	0.3	37.1	23.1	0.6
DECORA INDUSTRIES	0.3	45.5	22.7	0.5
FIBERMARK (Mar-	0.3	80.2	30.9	0.3
FRUIT OF THE LOOM	0.2	396.7	145.4	0.3
TULTEX CORP (Dec-	0.1	91.9	33.1	0.3
INTL FIBERCOM INC	0.1	18.5	5.4	0.2

from just over one (Service Merchandise for example) to as high as two thousand (Weirton Steel) signalling an extraordinarily high level of debt financing.

Table 6 presents the same analysis as in Table 5 but for year t-1 i.e. just the year before bankruptcy. As bankruptcy becomes imminent, the financial condition of nearly every bankrupt firm in our sample deteriorates. The logit model now assigns only four firms with a bankruptcy probability of less than 50%.

In fact, one of them is Enron which in year t-1 was assigned bankruptcy probability of only 21%. This is understandable given that accounting fraud was aggressively used to mask firm performance and firm failure was more a precipitous event rather than a gradual deterioration in operations. Similar to bankruptcy probability, these ratios exhibit a similar pattern of increase from year t-2 to t-1.

Nearly every firm sees its leverage condition worsen with some ratios reaching unsustainable levels. The sharp increase in the ratios is caused either by an increase in expected costs of bankruptcy or a decrease in the expected benefits of tax gain, but for most, both seem to happen simultaneously. Since bankruptcy reflects a state in which firms fail to meet debt obligations, failed firms must have more leverage in their capital structure than the level deemed theoretically optimal. Our results are consistent with this null hypothesis that a large majority of our sample firms were over levered, some dangerous so, during the two years leading up to bankruptcy.

6 Conclusions

In this study, we examine the magnitude of indirect bankruptcy costs for a sample of 62 large bankruptcies in the US over the eight year period, 1997-2004. On average, indirect costs amount to 2%, 6.2% and 14.9% of firm value in the years, t-3, t-2 and t-1 relative to the year of bankruptcy announcement,

respectively. These coupled with the direct bankruptcy costs reported in Altman [1] amount to total bankruptcy costs of 6.09%, 9.71% and 17.43% of a firm value over the corresponding three years. We do not, however, find persistent drop in firm values as documented in Warner [15].

Indirect bankruptcy costs vary considerably across industry groups. Firms with lower costs have significantly higher tangible assets and belong to industry sectors such as transportation and manufacturing. On the other hand, firms in industries with a higher proportion of intangible assets such as technology and services incur considerably more indirect costs than others.

We find that leverage, profitability, degree of competition, liquidity and firm size are all individually significant in explaining the cross-sectional variation in indirect bankruptcy costs. Consistent with the business complexity and transparency arguments, firm size is positively associated with IBC. When leverage and profitability are both included in the same regression, only leverage remains significant suggesting that financial health plays a larger role in explaining the cross-sectional variation of indirect costs than economic health. Finally, when all five variables are included in a multivariate regression, leverage, degree of competition and firm size remain significant, while liquidity and profitability lose significance. Leverage is by far the most economically significant variable reaffirming the notion that indirect bankruptcy costs are predominately the result of *financial* distress.

Finally, comparison of expected tax gains from interest expenses and expected bankruptcy costs reveal that a large majority of our sample firms employed excessive amounts of debt financing in their capital structures, especially in the year just preceding the year of Chapter 11 announcement suggesting that excessive leverage and hence financial distress may have been primary factor in their eventual failure.

Table 6: Cost/Benefit comparison of debt financing one year prior to bankruptcy

Firms (Bankruptcy)	Bankrupt Probabili	Benefit	Cost	Rati Cost/Benef
WEIRTON STEEL	0.99	0.0	97.5	28287.2
READ-RITE (Jun-	0.99	0.0	203.4	10549.3
LECHTERS (May-	0.99	0.0	74.2	9593.7
Acclaim (Sep-	0.99	0.0	130.8	7628.0
SHELDAHL INC (Apr-	0.99	0.0	23.7	1464.9
ATA HOLDINGS (Oct-	0.99	0.0	66.5	1105.3
ACTERNA (May-	0.99	0.4	335.0	780.9
MATLACK SYSTEMS	1.0	0.0	32.7	707.4
NATIONAL STEEL	0.9	2.5	411.5	163.2
HOUSE2HOME (Nov-	0.9	1.6	260.6	156.3
US AIRWAYS GROUP	0.9	3.9	473.1	120.9
COOKER RESTAURANT	0.8	0.3	24.1	73.6
LACLEDE STEEL (Nov-	0.9	0.6	41.2	68.0
STONE & WEBSTER	0.7	4.2	273.0	64.2
NEWCOR (Feb-	0.9	0.4	28.4	62.0
JACOBSON STORES	0.9	1.3	37.3	28.2
BUILDERS TRANSPORT	0.9	2.2	54.9	24.7
INTERMET (Sep-	0.9	4.0	92.3	22.5
PHP HEALTHCARE	0.9	1.9	32.1	16.9
OWENS CORNING	0.5	23.9	378.6	15.8
EAGLE FOOD CENTERS	0.9	2.2	33.1	14.6
MISSISSIPPI CHEMICAL	0.9	3.3	37.0	10.9
AVADO BRANDS (Feb-	0.8	11.0	94.4	8.5
MATTHEWS STUDIO EQUIP	0.9	2.1	15.0	7.0
PICCADILLY CAFETERIAS	0.8	1.8	12.0	6.6
LEVITZ FURNITURE	0.8	29.7	153.5	5.1
WICKES INC (Jan-	0.8	6.5	31.0	4.7
DRUG EMPORIUM	0.8	8.8	36.8	4.1
MICROAGE (Apr-	0.8	20.2	75.9	3.7
AMERICAN ECO (Aug-	0.7	8.4	23.2	2.7
GENICOM (Mar-	0.5	15.1	34.8	2.3
FRUIT OF THE LOOM	0.7	149.7	302.2	2.0
SERVICE MERCHANDISE	0.6	113.7	192.2	1.6
FLEMING COMPANIES	0.4	438.5	724.5	1.6
HEILIG-MEYERS (Aug-	0.2	161.5	266.7	1.6
AMERICAN CLASSIC VOYAGES	0.7	38.7	62.2	1.6
DECORA INDUSTRIES	0.7	20.0	29.9	1.4
AMERICAN HOMEPATIENT	0.9	9.2	12.9	1.4
GRAHAM FIELD HEALTH	0.6	13.9	15.2	1.0
TULTEX CORP (Dec-	0.4	53.1	55.9	1.0
BUSH INDUSTRIES	0.3	25.7	25.9	1.0
FIBERMARK (Mar-	0.6	43.5	30.7	0.7
ENRON (Dec	0.2	2239.6	1275.3	0.5
THORN APPLE VALLEY	0.5	30.4	14.9	0.4
GENESIS WORLDWIDE	0.9	1.5	0.3	0.2
INTL FIBERCOM INC	0.1	32.8	5.1	0.1

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Appendix

Bankrupt firms with their bankruptcy date and industry group

Firms	Bankruptcy Date	Industry
BUSH INDUSTRIES	Mar-04	Consumer Product
DECORA INDUSTRIES	Dec-00	Consumer Product
FIBERMARK INC	Mar-04	Consumer Product
FRUIT OF THE LOOM LTD	Dec-99	Consumer Product
MISSISSIPPI CHEMICAL CORP	May-03	Consumer Product
THORN APPLE VALLEY LTD	Mar-99	Consumer Product
TULTEX CORP	Dec-99	Consumer Product
VISKASE COMPANIES INC	Nov-02	Consumer Product
AMRESCO INC	Jul-01	Financing
AMWEST INSURANCE GROUP INC	Jul-01	Financing
MAXICARE HEALTH PLANS	May-01	Financing
PHP HEALTHCARE CORP	Nov-98	Financing
TRENWICK GROUP LTD	Aug-03	Financing
ACTERNA CORP	May-03	Manufacturing
GENESIS WORLDWIDE INC	Sep-01	Manufacturing
INTERMET CORP	Sep-04	Manufacturing
INTL FIBERCOM INC	Feb-02	Manufacturing
KAISER ALUMINUM CORP	Feb-02	Manufacturing
KEYSTONE CONS INDUSTRIES INC	Feb-04	Manufacturing
LACLEDE STEEL CO	Nov-98	Manufacturing
NATIONAL STEEL CORP	Mar-02	Manufacturing
NEWCOR INC	Feb-02	Manufacturing
OUTBOARD MARINE CORP	Dec-00	Manufacturing
OWENS CORNING	Oct-00	Manufacturing
WEIRTON STEEL CORP	May-03	Manufacturing
PEGASUS GOLD INC	Jan-98	Manufacturing
AVADO BRANDS INC	Feb-04	Retail
COOKER RESTAURANT/OH	May-01	Retail

DRUG EMPORIUM INC	Mar-01	Retail
EAGLE FOOD CENTRES INC	Apr-03	Retail
ENRON CORP	Dec-01	Retail
FLEMING COMPANIES INC	Apr-03	Retail
GRAHAM FIELD HEALTH PDS	Dec-99	Retail
HEILIG-MEYERS CO	Aug-00	Retail
HOUSE2HOME INC	Nov-01	Retail
JACOBSON STORES	Jan-02	Retail
LECHTERS INC	May-01	Retail
LEVITZ FURNITURE INC	Sep-97	Retail
MICROAGE INC	Apr-00	Retail
PICCADILLY CAFETERIAS INC	Oct-03	Retail
SERVICE MERCHANDISE CO	Mar-99	Retail
WICKES INC	Jan-04	Retail
ACCLAIM ENTERTAINMENT INC	Sep-04	Services
AMERCO	Jun-03	Services
AMERICAN ECO CORP	Aug-00	Services
AMERICAN HOMEPATIENT INC	Aug-02	Services
KUSHNER LOCKE CO	nov-01	Services
MATTHEWS STUDIO EQUIP GROUP	Apr-00	Services
MEDIQ INC	Jan-01	Services
STONE & WEBSTER INC	Jun-00	Services
GENICOM CORP	Mar-00	Techonology
READ-RITE CORP	Jun-03	Techonology
RECOTON CORP	Apr-03	Techonology
SHELDAHL INC	Apr-02	Techonology
ZENITH ELECTRONICS CORP	Aug-99	Techonology
AMERICAN CLASSIC VOYAGES CO	Oct-01	Transportation
ATA HOLDINGS CORP	Oct-04	Transportation
BUILDERS TRANSPORT INC	May-98	Transportation
CONTOUR ENERGY CO	Jul-02	Transportation
MATLACK SYSTEMS INC	Mar-01	Transportation
UAL CORP	Dec-02	Transportation
US AIRWAYS GROUP INC	Aug-02	Transportation

Source:

a). Altman's Database from New York University

b). Standard Industry Classification from US *Securities and Exchange Commission*