

Valuation of Bankrupt Firms

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This study compares the market value of firms that reorganize in bankruptcy with estimates of value based on management's published cash flow projections. We estimate firm values using models that have been shown in other contexts to generate relatively precise estimates of value. We find that these methods generally yield unbiased estimates of value, but the dispersion of valuation errors is very wide—the sample ratio of estimated value to market value varies from less than 20% to greater than 250%. Cross-sectional analysis indicates that the variation in these errors is related to empirical proxies for claimholders' incentives to overstate or understate the firm's value.

Phar-Mor Inc. filed a reorganization plan in U.S. Bankruptcy Court, but said the plan doesn't yet have the support of its main creditor groups. ... The two groups are "some distance apart" over the valuation of the company, with Phar-Mor's valuation a compromise position between the secured creditors' lower figure and the unsecured creditors' higher figure. ... The creditors have been meeting since May in a bid to reach an accord on the gap.—*Wall Street Journal*, August 1, 1994.

Valuation plays a central role in Chapter 11 bankruptcy negotiations. The firm's estimated value determines the value of the assets to be divided among prebankruptcy claimants and drives projected payouts and recoveries. But bankruptcy is an administrative process. The factors

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that lead to a reliable estimate of value in a market process are absent in bankruptcy. There is no active market for control of the assets of the bankrupt firm because it is strongly discouraged by the structure of Chapter 11. There is no oversight from the capital markets because management has access to debtor-in-possession financing. The securities of bankrupt firms often trade infrequently [Hotchkiss and Mooradian (1997)]. Perhaps as a result, there is very limited analyst coverage. This absence of market forces makes valuation more complex and less precise.

U.S. bankruptcy law resolves valuation through negotiation. The reorganization plan is premised on an estimate of value for the restructured firm. The debtor's management has substantial control over the process, with an exclusive right to initially propose a reorganization plan. Creditors who disagree can vote against the plan or acquire more claims to influence the vote. Creditors can also lobby for an alternative value, join an official committee, or align themselves with management to develop a plan that best serves their interests.¹ Creditors can petition the court to remove exclusivity and file a competing reorganization plan, or can request a formal valuation hearing.² In practice, both valuation hearings and competing plans are relatively uncommon in large public company bankruptcies. In general, the cash flow forecasts and the values they imply arise from judicial weighting of competing economic interests.

This study explores the relation between the market value of 63 publicly traded firms emerging from Chapter 11 and the values implied by the cash flow forecasts in their reorganization plans. We estimate the value of the forecasts using the capital cash flow approach. Kaplan and Ruback (1995) show this approach yields relatively precise estimates of value for a sample of highly leveraged transactions. We also use a comparable companies approach. In addition, in 28 cases we have estimates of value directly provided by management as required under "fresh start" accounting. We find that estimates of value are generally unbiased, but the estimated values are not very precise. The dispersion of valuation errors is very wide—the sample ratio of estimated value to market value varies from less than 20% to greater than 250%. These

¹ In several cases (see, e.g., the National Gypsum and E-II cases in the appendix) where the plan is premised on a valuation sufficiently low to give senior creditors control, senior creditors allegedly gained management's support by providing them with employment contracts and/or stock and options in the reorganized firm.

² The most common reason to hold a valuation hearing is to assess whether a reorganization plan is "fair and equitable" (U.S. Bankruptcy Code Section 1129(b)(2)) pursuant to a cram down hearing. A cram down hearing must be held whenever one or more classes of claimholders votes against the reorganization plan. The plan can be "crammed down" on dissenting classes if the present value of the cash and securities to be distributed to that class equals the allowed value of the class members' claims or if no more-junior class receives any consideration.

large valuation errors cannot be wholly attributed to our choice of models or potential errors in our specific assumptions, such as the discount rate or long-term growth rate.

One explanation for the imprecision of the cash flow-based valuations is that the administrative bankruptcy process may limit the amount and quality of available information. With the inability to capitalize on superior information about future cash flows through an acquisition or open market transactions, potential market participants have substantially less incentive to collect information about the bankrupt firm or to reality test management forecasts. Therefore the substitution of the administrative process for the market process reduces the quantity and quality of information. We investigate this explanation by showing that equity analysts reduce coverage during the bankruptcy process. We also show that using analyst information when it becomes available improves the precision of our estimates of value.

Strategic distortion of the cash flows is a second explanation for the lack of precision in the cash flow valuations [Gilson (1995)]. Valuation errors in Chapter 11 have significant wealth consequences. Underestimating value benefits claimants who receive shares in the reorganization and managers who receive shares or stock options. The estimated value also affects the allocation of assets and relative payouts. Underestimating value increases the proportional claim of senior claimants because of relative priority. Therefore senior claimants have incentives to underestimate cash flows to increase their recovery in Chapter 11 proceedings. The junior claimants, of course, have the opposite incentive: overestimating value increases their recovery. For example, in the 1993 reorganization of National Gypsum Co., management valued the company at \$182 million, while junior creditors valued the same firm at over \$1 billion.³

The strategic distortion explanation for the imprecision of the cash flow forecasts implies that the valuation errors are systematically related to proxies for the competing financial interests and relative bargaining strengths of the participants. We hypothesize that these errors will be related to four factors: the relative bargaining strength of competing (senior versus junior) claimholders, management's equity ownership, the existence of outside bids to acquire or invest in the debtor, and senior management turnover. Cross-sectional regression analysis of the valuation errors shows estimated values tend to be lower (relative to postbankruptcy market values) when a creditor gains control

³ The appendix to this article describes several highly publicized cases in our sample where we can observe competing estimates of value based on news stories. In most Chapter 11 cases, however, we observe only cash flow projections presented by management in bankruptcy court documents.

of the reorganized firm by exchanging a large block of the firm's senior debt, but larger when the creditor uses junior debt to gain control. Estimated values are also lower when management receives stock or options under the plan of reorganization, creating a windfall for managers. Finally, estimated values are lower when firms sell new equity securities to a third-party investor under the plan of reorganization. Collectively, our findings suggest valuations are used "strategically" in a negotiation to promote a desired bargaining outcome.

1. Sample

Our sample of companies is derived from listings of 1,342 Chapter 11 filings between 1979 and 1993 compiled by the SEC and by New Generation Research. Based on news articles and postbankruptcy filings with the SEC, we determine that 377 of these firms emerge from Chapter 11 by December 1993 as public companies. Of this subsample, 134 firms have their stock listed on the NYSE, AMEX, or Nasdaq following bankruptcy. We are able to obtain disclosure statements for the final confirmed reorganization plan for 104 firms. Our final sample consists of 63 firms for which the disclosure statement contains more than 2 years of postrestructuring cash flow projections, providing sufficient information for our discounted cash flow valuation.

The sample firms emerge from Chapter 11 between 1984 and 1993; 13 firms (20.6%) emerge in 1990 or 1991, and 34 firms (54%) emerge in 1992 or 1993. The concentration of firms emerging in later years reflects the increasingly detailed projections contained in disclosure statements, particularly since the implementation of fresh start accounting after 1991.⁴ The quality of the cash flow projection data varies within the sample. Some firms provide detailed explanations of the assumptions used to derive the projections. Others give the minimal information necessary to calculate our measure of capital cash flows; 15 firms (23.8%) require some additional assumptions on our part such as tax rates, working capital, or capital expenditures. The number of years of projected cash flows also varies within the sample: 32 firms (50.8%) have 5 to 10 years of projected cash flows; 18 (28.6%) have 4 to 4.5 years; 13 (20.6%) have less than 4 years.

Firms have significant unused net operating losses (NOLs) when they leave bankruptcy; the sample median ratio of NOLs to the book value of total assets is 24.7%. Firms vary in their assumptions about how the reorganized firm will utilize NOLs. These assumptions range from total

⁴ Fresh start accounting requires that certain firms reorganizing in Chapter 11 restate their assets and liabilities at estimated current market values. A further description of fresh start accounting is provided in Section 2.4.

Table 1
Sample description

Variable/characteristic	Mean	Median	Minimum	Maximum
Total assets (\$millions)	722.7	328.4	7.5	7501.1
Total sales (\$millions)	906.3	385.5	5.9	8037.1
EBITDA/sales	0.022	0.036	-1.089	0.636
Industry-adjusted EBITDA/sales	-0.063	-0.041	-1.011	0.509
NOLs/total assets	0.598	0.247	0.000	5.122
No. of months in Chapter 11	15.5	13.1	1.1	43.5
No. of years of projected cash flows	4.8	5.0	2.0	10.3
Prereorganization total debt/total capital	1.98	1.42	0.25	14.2
Pro forma total debt/total capital	0.57	0.62	0.02	0.95
		No. of firms	Percentage of sample	
Prepackaged bankruptcy		20	31.7%	
Failed highly leveraged transaction (HLT)		12	19.0	
Fresh start accounting used		28	44.4	
Company's stock trades continuously throughout bankruptcy		36	57.1	
Vulture investor purchases public debt, gains control		8	12.7	
Vulture investor purchases bank debt, gains control		5	7.9	
Old stockholders receive < 20% of new equity under plan		46	73.0	
Official equityholders committee formed		19	30.6	
Management receives stock or options under plan		32	50.8	
CEO owns > 20% of prereorganization common stock		13	20.6	
Third party equity investment under plan		12	19.0	
Prebankruptcy CEO still in office when plan is proposed		26	41.3	

Sample consists of 63 firms that emerge from Chapter 11 between 1984 and 1993 as publicly traded companies and that provide more than 2 years of usable post-Chapter 11 financial projections in the disclosure statement. Total assets, revenues, and EBITDA (earnings before interest, taxes, and depreciation and amortization) are measured as of the fiscal year-end before the firm's reorganization plan becomes effective. Prereorganization and pro forma total debt/total capital are based on the pro forma balance sheet showing the effects of the reorganization. "Control," in the context of a vulture investment, means a vulture acquires more than 50% of the firm's common stock under the reorganization plan and/or becomes the new CEO. "Third party equity investment" includes investments in common stock or securities that are convertible into common stock. "Plan" denotes the Chapter 11 reorganization plan. Data sources: Chapter 11 disclosure statements, 10K and 8K reports, Compustat, and the *Wall Street Journal*.

disregard of the value of NOLs (2 cases), projections of restricted NOL use (31 cases), to unlimited use of NOLs (30 cases).

Table 1 provides descriptive statistics for the sample. The sample consists of relatively large firms, based on the median book value of total assets of \$328.4 million and median revenues of \$385.5 million. Although the firms appear highly levered, operating performance appears somewhat better than prebankruptcy levels reported by Gilson (1989, 1990) and Hotchkiss (1995). Unlike these studies, operating cash flow (EBITDA) is positive; the difference may reflect the number (19%) of failed highly leveraged transactions in the sample [See Andrade and Kaplan (1998)]. There are no substantial industry concentrations within the sample; the largest concentration is in retail department or variety stores (5 firms, 7.9%).

2. Valuation Techniques

Our experimental design compares the value calculated from management's cash flow forecasts to the actual market value. The value implied by the forecasts is estimated using discounted cash flow and comparable company multiple methods. These methods are widely used by bankruptcy practitioners and investors [e.g., Scarberry et al. (1996)]. We also examine estimated values based on pro forma balance sheets for the reorganized firm in cases where the firm implements fresh start accounting.

2.1 Calculating market value

The market value equals the total market value of the firm when its reorganization plan becomes effective and the stock is first traded. Market value is defined as the sum of the market value of equity and warrants distributed under the plan, plus the pro forma face amount of debt and preferred stock (unless market prices are available). Values are calculated as of the present value (PV) date assumed in the reorganization plan. The PV date is generally management's forecast of the effective date for distributions under the plan. In practice, the two dates rarely coincide and new common stock may not trade until several days after the effective date. For half of our sample, the PV and stock trade dates are within 90 days. To ensure consistent timing, we discount the firm's market value of equity to the PV date, using a discount rate based on the capital asset pricing model (CAPM) and the levered equity beta (see Section 2.2.3 for details of discount rate calculations). This value is added to the value of the reorganized company's debt to calculate the market value.

The sample firms have actively traded stocks once they begin to trade. Forty-five firms are listed on the NYSE or AMEX, with the remainder included on the Nasdaq, and all but four firms trade every day in the first 30 days. However, practitioners suggest the share price when the stock first trades may be temporarily depressed because creditors often sell shares received under the plan. Therefore we also examine valuation errors based on the discounted market value of equity 1 month, 3 months, and 6 months following the date the stock first trades.

The mechanism for distributing stock under the plan is not the same for all sample firms.⁵ Sometimes the prebankruptcy stock is canceled and new common stock is issued; for these firms we measure the market value of the new stock using the closing share price on the issue day as

⁵ Eberhart, Altman, and Aggarwal (1998) provide a detailed discussion of data issues in determining the postrestructuring stock price.

reported in the S&P Daily Stock Price Record. Other times, the old stock remains outstanding and creditors are issued additional shares. For these firms we use the share price on the day the shares are distributed. For 22 firms the market value of warrants is obtained from the Stock Price Record or Capital Changes Reporter. For 11 firms it is estimated using the Black–Scholes model.⁶

2.2 Valuation using discounted cash flows

We use a capital cash flow (CCF) model to value cash flows, as developed in Ruback (1998). Capital cash flows measure the cash available to all holders of capital and include the benefit of interest and other tax shields. The CCF method values the firm by discounting capital cash flows at the discount rate for an all equity firm with the same risk. The firm's estimated going concern value equals the discounted value of projected capital cash flows plus a terminal value representing the present value of cash flows after the projection period.

Ruback (1998) shows that the CCF approach is algebraically equivalent to discounting the firm's free cash flows by the weighted average cost of capital (WACC). The capital structures of the firms in our sample generally change during the forecast period. The CCF approach is therefore easier to implement than the free cash flow approach because the WACC would have to be recomputed each period.⁷ The CCF approach is also better suited for the complicated tax situations of our sample firms.

2.2.1 Capital cash flows. During the projection period, we calculate capital cash flows using the formula

$$\begin{aligned} &\text{Net income} + \text{cash flow adjustments} + \text{cash and noncash interest} \\ &= \text{capital cash flows.} \end{aligned}$$

Cash flow adjustments include adding back depreciation, amortization, deferred taxes, and after-tax proceeds from asset sales, and subtracting working capital investment and capital expenditures. Basing the capital cash flows on net income utilizes the firm's own estimate of future tax payments.

⁶ The maturity and exercise price are based on information provided in the disclosure statement, and we assume a volatility of 15%. The median value of these warrants as a percentage of the total value of equity is less than 1%.

⁷ The CCF approach discounts all cash flows including projected tax shields at the before tax cost of assets, in contrast to the adjusted present value (APV) method which generally discounts tax shields at the cost of debt. The CCF approach assumes debt is maintained as a fixed proportion of value, so that interest tax shields have the same risk as the firm. Gilson (1997) shows that debt ratios generally do not change for several years following emergence from bankruptcy.

2.2.2 Terminal value. The terminal value is calculated assuming that capital cash flows grow at a constant rate in perpetuity, starting with the last year of the projections. However, 50 firms in our sample (79%) have unused net operating loss carryforwards (NOLs) at the end of the projection period. These NOLs are not forecasted to continue in perpetuity. Therefore the terminal value is estimated in two parts. The first part extends the financial projections and simulates a firm's use of NOLs until the NOLs are used up or expire. During this extended projection period, capital cash flows are calculated as

$$\begin{aligned} & \text{EBIT} - \text{estimated corporate tax } [(\text{EBIT} - \text{interest}) * \text{tax rate}] \\ & + \text{cash flow adjustments} + \text{tax shield due to NOLs} \\ & = \text{capital cash flows,} \end{aligned}$$

where EBIT is earnings before interest and taxes.

The use of NOLs by the reorganized company is limited ("Section 382 limitation") when the firm experiences an ownership change, which occurs when any group of 5% shareholders collectively increases its total ownership percentage by more than 50%.⁸ The amount of the NOL that can be used per year after the change of ownership equals the fair market value of the reorganized company's equity multiplied by the "long-term tax-exempt rate" published by the Internal Revenue Service (IRS). A firm in Chapter 11 can avoid this limitation (the "bankruptcy exception") if old shareholders and historic creditors hold more than 50% of the reorganized firm's shares. However, if the firm experiences a subsequent ownership change within 2 years after leaving Chapter 11, all of the remaining NOLs are lost. Therefore some plans prevent a change in ownership by limiting transfers of shares during the 2 years following reorganization. Because of the potential loss of NOLs due to a future ownership change, the debtor may choose the Section 382 limitation rather than the bankruptcy exception. We estimate the annual amount of NOLs used as the minimum of pretax income, the projected Section 382 limitation (if any), and the remaining balance of NOLs. *Tax shield due to NOLs* equals this number multiplied by the firm's assumed marginal tax rate.⁹

In the second part of our terminal value calculation, we calculate the value of the firm as a growing perpetuity of capital cash flow in the year following the extended forecast period. By definition, this cash flow does

⁸ See Gilson (1997) for a more detailed explanation of tax issues.

⁹ When not explicitly stated in the disclosure statement, we use a federal marginal tax rate expected to be in effect at the time of the transaction and a state tax rate of 5%. For transactions completed before the Tax Reform Act (TRA) of 1986, we assume a federal tax rate of 46%. For transactions completed after the TRA, we assume federal tax rates of 46% in 1986, 38% in 1987, and 34% thereafter.

not include any NOL benefits. The present value of this portion of the terminal value is added to the present value of the capital cash flows during the extended forecast period to estimate the terminal value. During the extended projection period, and in the terminal value calculation, we assume that capital cash flows grow at a 4% annual rate.¹⁰

2.2.3 Discount rates. Capital cash flows and the terminal value are discounted using the expected return implied by the CAPM for the unlevered firm:

$$r^u = r_f + \beta^u(r_m - r_f),$$

where r_f is the risk-free rate, β^u is the firm's unlevered beta, and $(r_m - r_f)$ is the market risk premium. The risk-free rate equals the long-term Treasury bond yield for the month of the PV date. We use a market risk premium of 7.4%, which is the median of the arithmetic average return spread between the S&P 500 and long-term Treasury bonds from 1926 until the PV date.

To measure systematic risk in nondistressed settings, beta is typically estimated using the firm's historical stock returns. In the case of bankrupt companies, such betas are generally not meaningful. Historical stock returns are generally negative as the debtor heads into financial distress, and they bear little resemblance to the returns that stockholders expect from a successfully reorganized debtor. Bankrupt firms also undergo substantial asset restructuring, making historical performance less relevant. Finally, these firms often do not have traded stock.

To measure the sample firms' systematic risk we estimate *industry betas* (β^e) using monthly returns from a portfolio of all NYSE-, AMEX-, and Nasdaq-listed firms in the same two-digit SIC code as the sample firm.¹¹ Firms must have complete data on both CRSP and Compustat. Equity betas are calculated by regressing returns over the 60 months prior to the PV date on returns on the S&P 500. We obtain the unlevered industry beta (β^u) using the value-weighted ratios of equity, preferred, and debt to total capital for firms in the relevant industry as follows:

$$\beta^u = \frac{[\beta^e \times E + \beta^P \times P + \beta^d \times D]}{[E + P + D]},$$

¹⁰ Section 5 examines the sensitivity of our results to this and other model assumptions.

¹¹ We verify postrestructuring SIC codes from 10K statements in the year of restructuring; these codes often differ from those listed on CRSP and Compustat as described in Hotchkiss (1995) and Gilson (1997).

where E equals the market value of the firm's equity at the PV date, P equals the face amount of preferred stock, and D equals net debt, defined as the book value of short-term and long-term debt, less cash and marketable securities.¹² P and D are measured using data from Compustat at the fiscal year end prior to the PV date. Based on Cornell and Green (1991), we assume the preferred stock and debt have a beta of 0.25; results are qualitatively unchanged using a beta of 0.35.

2.3 Valuation using comparable company multiples

We also estimate value as a multiple of projected EBITDA in the first forecast year. The multiple is the median ratio of total capital to EBITDA for firms in the same industry.¹³ If EBITDA is negative in the first forecast year, we use the first positive projected EBITDA (2 cases), and if the first forecast period is less than a year, we annualize the reported EBITDA (15 cases). Industry median ratios are calculated using all firms on Compustat with the same four-digit SIC code and sales of at least \$20 million. In 13 cases where there are less than five firms in the industry group, we match on three- or two-digit SIC codes. This method assumes that the industry comparables on average match the bankrupt companies' growth and risk. This concern is especially relevant to our sample because forecasted EBITDA could be temporarily low after firms emerge from bankruptcy, thus understating their long-run growth prospects. The multiyear cash flow forecasts used in the capital cash flow analysis, in contrast, presumably incorporate any postbankruptcy changes in performance.

2.4 Fresh start accounting estimates

Statement of Opinion (SOP) 90-7, *Financial Reporting by Entities in Reorganization under the Bankruptcy Code*, requires "fresh start accounting" for all firms that filed for Chapter 11 on or after January 1, 1991, or that had a plan of reorganization confirmed on or after July 1, 1991.¹⁴ This directive requires some firms to restate their assets and liabilities at their going-concern values. Fresh start accounting must be adopted when (1) the going-concern value of the debtor's assets at reorganization is less than the value of all allowed prepetition liabilities and prepetition claims, and (2) prepetition stockholders retain less than

¹² Because the interest tax shields are assumed to have the same risk as the firm, the tax deductibility of interest does not alter the beta of the firm. As a result, no tax adjustment has to be made when calculating asset betas. See Ruback (1998) for further discussion.

¹³ See Berger and Ofek (1995) and Kaplan and Ruback (1995) for a discussion of this methodology. In contrast to our method using a multiple of projected cash flow, these articles measure values based on the last 12 months historical cash flows. See also Kim and Ritter (1998) on the use of the comparable company method for valuing IPOs.

¹⁴ See Newton (1994) and Lehavy (1998) for discussions of fresh start accounting.

50% of the reorganized firm's voting common shares. Twenty-eight firms in our sample (44%) adopt fresh start accounting. Fresh start values are generally estimated using DCF and comparable company methods.¹⁵

Fresh start values are contemporary estimates of values that emerge from the administrative bankruptcy process. These values are produced by the accountants and managers, and as a result use information beyond the forecasts and incorporate the competing interests of the claimants.¹⁶ They are not mechanically related to the cash flow forecasts. Several practitioners we interviewed suggested the fresh start value can be set deliberately high to increase the depreciable basis of the debtor's assets, to increase the annual amount of NOLs that can be used under the Section 382 limitation, and to reduce the amount of cancellation of indebtedness income created. Practitioners also suggested that commercial banks prefer a lower fresh start value to lower depreciation expense, which results in higher future earnings.

3. Comparison of Estimated and Market Values

Table 2 reports the overall results for the three valuation methods. The capital cash flow and comparable company multiple methods rely on the management forecasts, whereas the fresh start values are management's accounting estimates, and are not mechanically related to the forecasts. We compute the valuation error as the log of the ratio of the estimated value to the market value. All three methods produce unbiased estimates of value. The median valuation error is less than 1% for the capital cash flow method, less than 5% for other two methods, and none of the three medians are statistically different from zero. The similarity between the results of the capital cash flow and comparable companies methods suggests that using a single year of EBITDA for the latter method is not distorting the results.

The valuation errors for both the capital cash flow and comparable company multiple approaches exhibit substantial variation. For the capital cash flow method, the minimum valuation error is -173.5% and the maximum error is 95.2%. Redefining the valuation error as the simple ratio of estimated value to actual value, the range is 17.6% to 259%. About one-fourth of estimated values are within 15% of market values. The mean absolute error (MAE), which is relevant when the

¹⁵ Disclosure statements rarely describe the assumptions used to generate fresh start estimates of value. In one case where these assumptions are provided, they do not coincide exactly with assumptions given with management's cash flow projections in the same document.

¹⁶ DeAngelo (1990) describes the information and methods used by investment bankers to estimate values in corporate control transactions.

Table 2
Valuation errors

	Discounted capital cash flow valuation	Comparable company multiple valuation	Fresh start valuation
Median	− 0.6%	4.7%	− 3.2%
Mean	− 9.1%	− 10.4%	− 4.7%
Standard deviation	54.6%	79.4%	23.4%
Minimum	− 173.5%	− 269.3%	− 66.0%
Maximum	95.2%	115.8%	48.8%
Percentage within 15%	25.4%	21.0%	71.4%
Mean squared error	23.3%	36.9%	4.8%
Mean absolute error	37.7%	47.0%	14.2%
N	63	62	28

The valuation error equals the natural log of the ratio (estimated value/market value). “Estimated value” equals our estimate of the firm’s total enterprise value using various approaches. “Market value” equals the sum of the market value of equity and warrants distributed under the reorganization plan, plus the pro forma face amount of debt and preferred stock (unless market prices are available). Discounted cash flow values assume a terminal value growth rate of 4% and a market risk premium of 7.4%. For each sample firm the industry beta is the median unlevered equity beta for all firms on Compustat with the same two-digit SIC code as the sample firm, using monthly common stock returns for the prior 60 months. Comparable company multiple values are estimated using EBITDA reported in the first year of sample firms’ financial projections; corresponding multipliers are calculated for all firms on Compustat with the same four-digit SIC codes as the sample firms. Fresh start values are based on the pro forma balance sheet for the reorganized company. Sample consists of 63 firms that emerge from Chapter 11 between 1984 and 1993 as publicly traded companies. Valuations are based on cash flow forecasts in official debtor disclosure statements. None of the mean or median values in the table are significantly different from zero up to the 10% level, using a *t*-test for means and Wilcoxon rank-sum test for medians.

cost of valuation error increases linearly, is 23.3%. The mean squared error (MSE), which is relevant when the cost of valuation errors is quadratic, is 37.7%. For the comparable company method, the range is higher, from −269.3% to 115.8%. Similarly, about one-fifth of the errors are within 15%, and the MSE and MAE are higher at 36.9% and 47%, respectively.

As a benchmark, Kaplan and Ruback (1995) use similar valuation methods for their sample of highly leveraged transactions (HLTs) and report the same summary statistics. For the capital cash flow method, they report that 62.7% of the valuation errors are within 15%, the MAE is 18.1%, and the MSE is 6.7%. For the comparable companies method, they report that 37.3% of the valuation errors are within 15%, the MAE is 24.7%, and the MSE is 9.1%. These summary statistics for HLTs are uniformly lower than the corresponding statistics for our sample of firms emerging from bankruptcy.

There appears to be less correspondence between the value of a bankrupt firm and the associated forecasted cash flows than for HLTs. Both bankruptcies and HLTs often produce wholesale changes in the firm’s business, making future cash flows difficult to predict and value.

However, HLTs are market transactions, where cash flow projections are examined by potential bidders and by capital markets, including potential debt-holders. In contrast, bankruptcy is an administrative process, without potential bidders and without the need to obtain financing from the capital markets. We hypothesize that it is the substitution of the administrative process for the market process that is responsible for the lower correspondence between the cash flow forecasts and market values for our sample of firms emerging from bankruptcy.

Consistent with our hypothesis that the bankrupt firms are not inherently more difficult to value, the valuation errors for fresh start values of the 28 firms with such estimates exhibit less dispersion. The percentage within 15%, the MAEs and the MSEs for the fresh start valuations are comparable to the HLT results. These estimates include more information than cash flow forecasts since accountants working with management have access to more firm-specific information than is available to creditors (or to us) in disclosure statements.¹⁷

4. Sensitivity Analysis

Our capital cash flow and comparable company valuations rely on several assumptions about cash flows and corporate taxes, long-term growth rates, discount rates, the utilization of NOLs, and the date on which firms' postbankruptcy market values are measured. Before exploring the aspects of the administrative bankruptcy process that could be responsible for the valuation errors, we examine the sensitivity of our results to our assumptions.

4.1 Assumptions about cash flows and tax rates

The quality of information in sample disclosure statements varies considerably. In some cases we had to make assumptions to construct the cash flow data, and these assumptions could be responsible for the lack of correspondence between values based on forecasts and market values. To test the importance of these assumptions, we separately examine the valuation errors for firms that reported the highest quality projections. For these 29 firms, we did not make any significant assumptions about tax payments or other components of cash flows. If errors in our cash flow and tax assumptions are driving our results, the values should be more precise when we limit the analysis to the subsample without such assumptions.

¹⁷ Restricting our sample to the 28 firms using fresh start accounting, the dispersion of valuation errors using our cash flow-based estimates is lower than reported in Table 2; on average across methods, the percentage within 15% increases by 8.5%, the MSE falls 9.5% and the MAE falls 7%.

The percentage of errors within 15% increases to 27.6% for the comparable company method, but actually declines to 17.2% for the capital cash flow method (not reported). The mean squared errors improve to 26.1% and 24.3%, respectively. The range of valuation errors is only slightly reduced for these firms.

4.2 Growth rates and discount rates

Table 3 reports three alternative measures of how discounted cash flow values change in response to changes in the assumed terminal value growth rate and the discount rate. We estimate the percentage change in value that results from a one percentage point increase in either rate (line 1 in each panel). We also estimate the growth rate or discount rate that produces a zero valuation error (line 2). Finally, we estimate the absolute change in each rate necessary to eliminate the valuation error (line 3).

Table 3
Sensitivity of discounted cash flow values to model assumptions

	Mean	Median	S.D.	Min	Max
<i>Panel A: Growth rate</i>					
1. Change in estimated value resulting from a one percentage point increase in growth rate	7.7%	7.4%	3.1%	1.6%	20.5%
2. Growth rate that produces zero valuation error	2.5%	4.2%	8.1%	-25.0%	17.1%
3. Absolute change in growth rate needed to eliminate valuation error (percentage points)	6.2%	5.0%	5.4%	0.2%	29.0%
Distribution of absolute changes	< 1%	1-2%	2-3%	3-4%	> 4%
No. of firms	6	8	8	5	36
% of sample	9.5%	12.7%	12.7%	7.9%	57.1%
<i>Panel B: Discount rate</i>					
1. Change in estimated value resulting from a one percentage point increase in discount rate	-8.8%	-8.8%	2.4%	-19.7%	-2.8%
2. Discount rate that produces zero valuation error	14.2%	14.1%	4.8%	5.2%	30.3%
3. Absolute change in discount rate needed to eliminate valuation error (percentage points)	4.0%	3.0%	3.3%	0.0%	16.2%
Distribution of absolute changes	< 1%	1-2%	2-3%	3-4%	> 4%
No. of firms	8	10	15	6	24
% of sample	12.7%	15.9%	23.8%	9.5%	38.1%

The table reports the sensitivity of discounted capital cash flow valuation errors to the terminal value growth rate (panel A) and the discount rate (panel B). The valuation error equals the natural log of the ratio (estimated value/market value). "Estimated value" equals our estimate of the firm's total enterprise value using various approaches. "Market value" equals the sum of the market value of equity and warrants distributed under the reorganization plan, plus the pro forma face amount of debt and preferred stock (unless market prices are available). The base case valuation assumes a terminal value growth rate of 4% and a market risk premium of 7.4%. Discount rates are calculated using unlevered industry betas (see Table 2). Valuations are based on cash flow forecasts in official debtor disclosure statements. Sample consists of 63 firms that emerge from Chapter 11 between 1984 and 1993 as publicly traded companies.

The opportunity to influence estimated values through the assumed growth rate can be significant for bankrupt companies. Cash flows during the projection period are typically below steady-state levels, so the terminal value accounts for a disproportionate fraction of total value. For the median firm in our sample, the terminal value accounts for 70.5% of total value. From panel A, changing the growth rate can have a substantial impact on estimated values. A one percentage point increase in the rate produces a mean and median increase in estimated value of 7.7% and 7.4%, respectively; the maximum value increase is 20.5%.¹⁸

Notwithstanding these concerns, the assumption of a 4% growth rate appears to be reasonable for our sample. The median zero-error growth rate is 4.2%, which is close to our base case assumed rate. Furthermore, in 31 cases we would need to increase the growth rate to eliminate the error, while in 32 cases we need to decrease the growth rate. For 57.1% of the sample (36 firms) we would have to change the growth rate (+ or -) more than 4% to eliminate the error. Given the magnitude of this required adjustment, it is implausible that sample valuation errors can be entirely attributed to errors in the assumed growth rate. Similar conclusions follow from panel B, which reports the sensitivity of estimated values to discount rates.

We also considered the influence of our beta estimate on the results. As an alternative to industry betas, we use a *market beta* that assumes that the systematic risk for all firms in the sample equals the risk of the assets of the market. For each year we calculate the leverage of nonfinancial and nonutility firms in the S&P 500 to estimate the unlevered asset beta for the market. This produces a mean and median market beta of 0.92 for the sample firms. When the market beta is used, however, the mean valuation error is significantly negative. The market beta is generally higher than the industry beta in our sample, resulting in higher discount rates (sample median rates are 14.7% and 13.0%, respectively) and more negative valuation errors. The measures of precision are similar to the results based on industry betas.

4.3 NOL utilization

Sample firms face various legal restrictions on their ability to use their large NOLs. Based on our interpretation of the restrictions, the present value of the tax benefit from NOLs represents 5.7% of the median sample firm's estimated value, and 9.9% on average (under our base

¹⁸ This maximum increase occurs for Continental Airlines. Continental's value was unusually sensitive to changes in the growth rate because its financial projections included large fixed capital expenditures (representing new aircraft purchases), which therefore had a strong "levering" effect on capital cash flows [see Gilson (1992)].

case discounted cash flow model assumptions). The maximum percentage contribution to value is 55.0%. Thirty-one firms in the sample assume an annual limitation (Section 382) on the use of NOLs. If we assume instead these firms face no restrictions (other than the statutory 12-year time limit), firms' estimated value increases on average by 6.7% (median 2.4%).

In estimating discounted cash flow values, we also made certain assumptions about how taxable income grows and how NOLs are used after the firm's projection period ends. If instead we calculate the terminal value using the last year of the firm's projections (when some NOLs still remain), estimated value increases by 5.4% on average. To put this figure in perspective, Kaplan and Ruback (1995) find discounted cash flow valuations are on average within 10% of actual market values.

Finally, some practitioners suggest discounting NOL tax shields with a higher rate than that used to discount other cash flows, given the uncertainty about future ownership changes and the firm's ability to fully utilize its NOLs under Section 382. Our results do not change materially when we use a higher discount rate for these tax shields.

4.4 Postbankruptcy market values

Stock prices of newly reorganized firms may be temporarily depressed due to the "overhang" of new stock issued to creditors. Eberhart, Altman, and Aggarwal (1998) suggest that this price pressure may create a profit opportunity. Such short-term price pressure could distort our measure of market value, thereby distorting our comparisons.

To assess whether such short-term price pressure is present in our sample, we examine valuation errors based on the stock price at 1, 3, and 6 months following the first trade. As reported in Table 4, the median valuation error remains insignificantly different from zero, and there is no noticeable change in the mean absolute error for any of the valuation approaches.

Valuation errors should be more negative the later we measure the realized value if there is initially downward pressure on the stock as creditors sell the shares they receive. We also analyze firms' longer run stock price performance by calculating the buy-and-hold return from investing one dollar in the stock on the first day of trading and holding onto the stock for various periods up to 2 years, divided by the corresponding return on the S&P 500. For holding periods of 1 month, 3 months, 6 months, 1 year, and 2 years, the sample median returns relative to the S&P are, respectively, 1.01, 0.98, 0.95, 1.02, and 0.99 (not shown in the table). Notwithstanding the difficulty of interpreting long-run returns [Kothari and Warner (1997)], this analysis suggests our results are not obviously driven by price pressure.

Table 4
Sensitivity of valuation errors to date of realized value

	Discounted capital cash flow valuation			Comparable company multiple valuation			Fresh start valuation		
	Median error	Mean absolute error	N	Median error	Mean absolute error	N	Median error	Mean absolute error	N
First trade	-0.6%	37.7%	63	4.7%	47.0%	62	-3.2%	14.2%	28
+1 month	0.9%	38.9%	63	6.8%	44.6%	62	-2.7%	15.7%	28
+3 months	-1.1%	37.6%	63	11.4%	44.8%	62	-1.6%	17.5%	28
+6 months	-0.5%	37.3%	62	11.2%	48.7%	61	-3.9%	16.9%	28

The valuation error equals the natural log of the ratio (estimated value/market value). "Estimated value" equals our estimate of the firm's total enterprise value using various approaches. "Market value" equals the sum of the market value of equity and warrants distributed under the reorganization plan, plus the pro forma face amount of debt and preferred stock (unless market prices are available). The discounted capital cash flow valuation assumes a terminal value growth rate of 4% and a market risk premium of 7.4%. Discount rates are calculated using unlevered industry betas (see Table 2). Comparable company multiple values are estimated using EBITDA reported in the first year of sample firms' financial projections. Fresh start values are based on the pro forma balance sheet for the reorganized firm. *First trade* refers to the close of the first day on which the reorganized firm's common stock is traded; months 1, 3, and 6 are relative to the first trade date. Valuations are based on cash flow forecasts in official debtor disclosure statements. Sample consists of 63 firms that emerge from Chapter 11 between 1984 and 1993 as publicly traded companies. None of the median errors are significantly different from zero up to the 10% level, using a Wilcoxon rank-sum test.

5. Sources of Valuation Errors

We hypothesize that the lack of correspondence between the values implied by the cash flow forecasts and the actual market values is due to the administrative nature of the bankruptcy process. We highlight key differences between the administrative bankruptcy process and a market process. The first is that the lack of a market process removes many of the incentives of market participants to collect and reality test information about cash flow forecasts and the firm's prospects. This means that the quantity and quality of information is likely to be lower for companies emerging from bankruptcy. Second, the administrative process allows the strategic use of valuation because different estimated values imply different payoffs. The weighting of competing interests could cause the cash flow forecasts to differ from their unbiased expected values. We explore these two explanations in this section.

5.1 Quantity and quality of information

We explore two measures of the quantity and quality of information. First, we examine the precision of the value measures when the equity of the bankrupt firm continues to trade throughout the bankruptcy. Being able to observe the market price of the stock could enable claimholders to estimate firm value more accurately and provide market participants the opportunity to compare the financial projections to the market value. Second, we examine the impact of analyst coverage on the value estimates. We use the number of analysts to proxy for the level of

Table 5
Valuation errors for firms whose stock trades throughout bankruptcy

	Discounted capital cash flow valuation	Comparable company multiple valuation	Fresh start valuation
Median	-0.6%	-2.2%	0.3%
Mean	-13.5%	-26.8%*	4.3%
Standard deviation	54.8%	90.4%	21.4%
Minimum	-173.5%	-269.3%	-33.9%
Maximum	53.9%	69.8%	48.8%
Percentage within 15%	25.6%	18.4%	66.7%
Mean squared error	15.8%	28.4%	5.9%
Mean absolute error	32.8%	45.0%	14.6%
N	39	38	12

The valuation error equals the natural log of the ratio (estimated value/market value). "Estimated value" equals our estimate of the firm's total enterprise value using various approaches. "Market value" equals the sum of the market value of equity and warrants distributed under the reorganization plan, plus the pro forma face amount of debt and preferred stock (unless market prices are available). See Table 2 for a description of valuation methodologies. Sample consists of 39 firms whose common stock traded throughout the bankruptcy.

* denotes mean is significantly different from zero at the 10% level using a *t*-test.

market attention, and we use the analysts' forecasts as a proxy for market estimates.

5.1.1 Market trading. There are 39 firms in our sample whose common stock continuously trades throughout the bankruptcy. We hypothesize that there should be more correspondence between the cash flow forecasts and market value for these firms with traded equity throughout the process, because the market price helps to anchor participants' perceptions of value, leaving less opportunity to issue misleading estimates. Table 5 provides summary statistics in the format of Table 2 for the subset of firms with traded equity. Comparing these results to Table 2 suggests that trading does not appear to have a substantial impact on the valuation errors. There is some reduction in the MSE and MAE for both the capital cash flow and the comparable company methods, but the change is small.

Another market-based mechanism to resolve valuation disputes is to issue securities whose payoffs are explicitly tied to the firm's future market value [Bebchuk (1988), Hausch and Seward (1995)]. Such securities provide a hedge against mistakes in valuation and are often used in corporate mergers [Datar, Frankel, and Wolfson (1998)]. Only one firm in our sample issued such securities, however.¹⁹

¹⁹ This was SPI Holdings, which issued a contingent value right (CVR) to junior claimholders along with new common stock in the reorganized firm. The terms of the CVR were complicated, but essentially it had a cash payoff that varied inversely with the future market price of the reorganized firm's common stock. The CVR therefore hedged junior claimholders against future declines in the value of their new shares.

5.1.2 Analyst coverage. Panel A of Table 6 shows that analyst coverage of bankrupt firms is quite low. We obtain data on analyst coverage from IBES and Nelson's Directory of Investment Research. IBES includes only analysts from full-service brokerage houses, while Nelson's includes any equity analyst following the stock, even those providing minimal coverage. Based on either source, coverage declines significantly as the firm becomes distressed, and is quite low in bankruptcy when cash flow forecasts are made for the plan. Coverage stays at this lower level for the next year after emergence. The level of analyst following is considerably lower than has been reported in studies of nondistressed firms.²⁰ The low number of analysts suggests that the administrative bankruptcy process, and the relative lack of trading in bankrupt firms' common stock, reduces incentives for equity analysts and other market participants to collect and analyze information.

5.1.3 Analysts' forecasts. We collect all consensus analyst annual earnings forecasts for our sample firms from the IBES summary tape. We use forecasts *announced* by the analysts within 1 year (before or after) of the date on which sample firms exit from Chapter 11. The resulting set of earnings forecasts coincides with some portion of sample firms' own financial projections for 13 firms in our sample, covering 32 firm-years. IBES reports the mean and median earnings forecast made by analysts at a given point in time, but for 26 of the firm-years there is only one analyst who follows the firm.

Roughly two-thirds (21) of the firm-years represent relatively near-term forecasts of either the first or the second year following firms' emergence from Chapter 11. Eighteen of the forecasts were announced some time *after* the firm exited from Chapter 11 so that analysts had the benefit of more information than management. The median gap is 5 months.

In our simulations we replace management's own forecast of annual earnings with the corresponding consensus analyst earnings forecast and reestimate our valuation models. In most cases analysts forecast earnings for only a portion of the firm's projection period, such as the first year of a 4-year projection period. For the remaining firm-years, we scale management's earnings forecasts upward or downward to produce the same proportional adjustment as in the last year for which forecasts are available. We do not make this adjustment when earnings forecasted by management or analysts are negative.

²⁰ Conditional on inclusion in Nelson's, Bhushan (1989) finds mean (median) analyst coverage of 13.94 (10.0) for a sample of 1,409 firms. Conditional on inclusion in IBES, Bhushan and O'Brien (1990) find mean (median) analyst coverage of 8.17 (5.0) for a sample of 716 firms.

Table 6
Analyst coverage*Panel A: Level of analyst coverage*

	IBES			Nelson's		
	% of firms	No. of analysts who follow firm		% of firms	No. of analysts who follow firm	
	followed	Mean	Median	followed	Mean	Median
2 years prior to filing date	66.7%	4.6	2	69.0%	6.6	4
Prefiling date	58.7%	2.4	1	67.7%	5.2	3
Pre-effective date	27.0%	0.6	0	60.3%	2.9	1
Posteffective date	36.5%	0.9	0	66.7%	2.8	1
Posteffective date + 1 year	49.2%	1.7	0	61.9%	3.3	1

Panel B: Valuation errors using analysts' earnings forecasts

	Discounted capital cash flow valuation	Comparable company multiple valuation
Median	9.9%	3.0%
Mean	-0.5%	3.6%
Standard deviation	71.3%	28.5%
Minimum	-216.1%	-39.6%
Maximum	73.2%	56.2%
Percentage within 15%	30.8%	46.2%
Mean squared error	24.6%	10.1%
Mean absolute error	38.0%	24.3%
N	13	13

The valuation error equals the natural log of the ratio (estimated value/market value). "Estimated value" equals our estimate of the firm's total enterprise value using various approaches. "Market value" equals the sum of the market value of equity and warrants distributed under the reorganization plan, plus the pro forma face amount of debt and preferred stock (unless market prices are available). Data on analyst coverage are obtained from the IBES database and Nelson's Directory of Investment Research. IBES includes only analysts from full-service brokerage houses. Nelson's lists coverage by any equity analyst who follows a company, even if he/she provides only minimal coverage. In panel A, the *filing date* represents the date on which a firm files for Chapter 11; the *effective date* is the date on which new claims under the reorganization plan are distributed. In panel B, the firm's value is estimated using the IBES consensus (median) analyst earnings forecast in place of management's earnings forecast. Sample consists of 63 firms that emerge from Chapter 11 between 1984 and 1993 as publicly traded companies.

The valuation errors using the analysts' forecasts are summarized in panel B of Table 6. Although there are data for only 13 firms, comparing these summary statistics with Table 2 suggests that the analysts' forecasts are more precise than the management forecasts. The analysts' forecasts are unbiased, and are generally more accurate than relying on management forecasts alone. Furthermore, the measures of precision also improve when the analyst information is included. The percent within 15% improves to 30.8% from 25.4% using the capital cash flow approach and to 46.2% from 21% using the comparable company method. The MSE and MAE are roughly unchanged for the capital cash flow method, but improve markedly for the comparable company method.²¹

²¹ For the 13 firms included in panel B, the MSE is significantly smaller (at the 10% level) than the MSE for the same firms using management's projections.

The evidence that analysts' forecasts have a closer correspondence to market values than the management forecasts, together with the evidence that there is little analyst attention to bankrupt firms, provides evidence that the administrative process is limiting the generation of information. Also, managers may simply be ignoring information to obtain value estimates consistent with their objectives. That information, when used, leads to better estimates of value. This evidence, like our finding that fresh start values are more precise than those based on the cash flow data, suggests that at least some of the valuation errors arise from the lack of market influences on the bankruptcy process.

5.2 Strategic valuations

In this section we describe how the incentives of the parties involved in negotiating the reorganization plan can influence estimates of value. We hypothesize that such biases are related to four factors: the relative bargaining strength of competing (senior versus junior) claimholders, management's equity ownership, the existence of outside bids to acquire or invest in the debtor, and senior management turnover. Although we develop empirical proxies for these factors that we use in our cross-sectional regression analysis, we think some of the more powerful evidence is contained in the qualitative case studies that we include in the appendix. We summarize six bankruptcy cases in which the disputes about value became public. It is clear from reading the case studies that positions on the value of the bankrupt firm were self-serving. This is strong evidence that the administrative bankruptcy process is influenced by strategic use of valuations.

Regression results are reported in Table 7. Valuation errors are defined using capital cash flow (regressions 1 and 4) and comparable company multiple approaches (regressions 2 and 5). Regressions 3 and 6 combine our various estimates of value; the dependent variable in these regressions equals the error based on the fresh start value for the 28 firms required to use fresh start reporting, and the average of the capital cash flow and comparable company values otherwise.²² The regressions exclude two observations for which we could not obtain the firms' prereorganization management ownership data. Since several variables are related to the firms' prereorganization solvency, we also include two control variables to ensure we correctly interpret our explanatory variables. The first variable we include, *Prereorganization leverage ratio*, is defined as prereorganization total debt divided by postreorganization realized value plus cash distributed under the plan. We also use a 0–1 dummy variable, *Old shareholders receive < 20% of new equity*, since the firm is more likely to be solvent if old shareholders

²² We do not report regressions using the fresh start valuation error as the dependent variable because several of our explanatory variables have no nonzero values for this subset of 28 firms.

Table 7

Ordinary least squares regressions relating valuation errors to variables describing potential biases in valuations

Explanatory variables	Full sample			Stock trades throughout bankruptcy		
	(1)	(2)	(3)	(4)	(5)	(6)
	CCF	CCM	Combined FS/CCF/CCM	CCF	CCM	Combined FS/CCF/CCM
Intercept	-0.05 (0.761)	-0.03 (0.875)	0.04 (0.749)	-0.09 (0.740)	-0.02 (0.956)	0.11 (0.608)
Vulture purchases bank debt, gains control	-0.02 (0.947)	-0.55 (0.148)	-0.29 (0.177)	0.37 (0.495)	-1.75** (0.045)	-0.41 (0.364)
Vulture purchases public debt, gains control	0.32 (0.125)	0.84*** (0.003)	0.44*** (0.006)	0.42* (0.098)	0.90** (0.026)	0.45** (0.033)
Equity committee is formed	-0.04 (0.790)	0.00 (0.989)	0.01 (0.906)	0.10 (0.552)	0.06 (0.821)	0.11 (0.462)
Mgt. receives stock or stock options in plan	-0.21 (0.121)	-0.50*** (0.008)	-0.33*** (0.003)	-0.40** (0.020)	-0.55** (0.040)	-0.46*** (0.002)
% CEO stock ownership pre-organization	0.25 (0.595)	0.83 (0.183)	0.37 (0.297)	0.49 (0.466)	0.76 (0.472)	0.23 (0.682)
Third-party equity investment in firm	-0.39** (0.035)	-0.48* (0.059)	-0.41*** (0.005)	-0.37* (0.100)	-0.83** (0.049)	-0.59*** (0.007)
Incumbent CEO in office when plan proposed	0.26* (0.073)	0.00 (0.982)	0.06 (0.588)	0.37** (0.044)	-0.04 (0.874)	0.04 (0.810)
Old shareholders receive < 20% of new equity	0.29* (0.067)	0.28 (0.178)	0.30** (0.016)	0.26 (0.132)	0.08 (0.773)	0.25* (0.082)
Pre-reorganization leverage ratio	0.03 (0.375)	0.10** (0.041)	0.07** (0.017)	0.03 (0.686)	0.05 (0.602)	0.06 (0.272)
N	61	60	61	39	38	39
R ²	0.24	0.36	0.43	0.39	0.46	0.54
Adjusted R ²	0.10	0.25	0.33	0.21	0.28	0.40

The valuation error equals the natural log of the ratio (estimated value/market value). "Estimated value" equals our estimate of the firm's total enterprise value using various approaches. "Market value" equals the sum of the market value of equity and warrants distributed under the reorganization plan, plus the pro forma face amount of debt and preferred stock (unless market prices are available). Estimated values are based on discounted capital cash flow values ("CCF"), comparable company multiple values ("CCM") and fresh start values ("FS"). Combined FS/CCF/CCM valuation error uses the fresh start value for 28 firms required to use fresh start accounting, and the average of the CCF and CCM values otherwise. *Stock trades throughout bankruptcy* denotes the subsample of firms whose common stock was traded throughout the reorganization. *Plan* refers to the Chapter 11 reorganization plan. A vulture investor is assumed to "gain control" of the firm if its debt investment is converted into a greater than 50% fully diluted stake in the firm's common stock under the plan and/or it appoints a new CEO. *Third-party equity investment in firm* is defined as an investment in the firm's common stock and/or convertible securities under the plan of reorganization. *Incumbent CEO* is the CEO who was in office prior to the firm's filing for Chapter 11. *Preorganization leverage ratio* equals the ratio of total debt to total assets (book values) reported prior to the firm's reorganization. With the exception of % CEO stock ownership preorganization and preorganization leverage ratio, each explanatory variable is a 0–1 dummy variable that equals 1 if the indicated condition holds. Sample consists of 63 firms that emerge from Chapter 11 between 1984 and 1993 as publicly traded companies. Valuations are based on cash flow forecasts in official debtor disclosure statements. *p*-values are shown in parentheses. ***, **, and * denote significantly different from zero at the 1%, 5%, and 10% level, respectively.

retain a significant portion of the firm's equity. Results are insensitive to other percentage cutoffs used to indicate insolvency.

Overall, results indicate that valuation errors are strongly related to our proxy variables. Given the high variability of sample valuation errors, adjusted R^2 values are surprisingly large, ranging from 10% to 40%. Since some valuation errors are large and the sample size is relatively small, we also examine (but do not report) regressions delet-

ing the most influential observations from each regression (those having standardized residuals greater than 2). The coefficients and *t*-statistics from these regressions are similar to those shown in Table 7.

5.2.1 Relative bargaining strength of competing (senior versus junior) claimholders. Junior claimholders in Chapter 11 cases typically argue for relatively higher firm values, while senior claimholders typically argue for lower values. Provided distributions under a plan of reorganization approximately follow the relative priority rule, basing the plan on a higher estimated value benefits junior classes by supporting a larger payout to their claims. Junior claimholders have an incentive to argue that value is high even if, privately, they believe the value is low. By a similar argument, senior claimholders benefit when the reorganization plan is premised on a low firm value. Junior and senior claimholders negotiate over the division of assets that have a fixed but unknown value. Any wealth gain that either group realizes *ex post* (as a result of the firm's true value being different from the plan estimated value) must come at the expense of the other group.²³

The case studies of Salant and National Gypsum Company in the appendix provide examples of the tension between junior and senior creditors. During National Gypsum's bankruptcy, vulture investors acquired a large fraction of its senior debt. The firm's disclosure statement included financial projections for a 5-year period following the bankruptcy. The projections assumed that revenues would grow over years 1–3 and then decline in each of years 4 and 5, reflecting an anticipated recession in key markets. The official committee of unsecured creditors argued that the debtor's forecasts were overly pessimistic, grossly understating the firm's value, and proposed its own plan based on more optimistic projections.

Table 8 compares key line items from the two sets of projections. The differences are striking. In the final forecast year, projected revenues under the unsecured creditors plan exceed the debtor's forecast by \$120.9 million (20.0% of the high value); the difference in capital cash flows is \$62.8 million (88.3%). Using the discounted cash flow valuation model described in Section 2, estimated firm value is \$1,037.0 million using the unsecured creditors' projections and only \$182.9 million using the debtor's projections.

²³ Conflicts between senior and junior creditors have been increasingly acknowledged in financial press accounts of bankruptcy reorganizations, although a number of these accounts assume that valuations are mostly lowballed:

Frequently, investors who specialize in buying the senior debt of bankrupt companies conspire to keep values low so that when a company emerges from bankruptcy proceedings, they get most of its value, including its stock. If the company has been undervalued, the market will send its shares soaring—and they make out like bandits [Strom (1994)].

Table 8
Comparison of competing financial projections submitted by the debtor and by junior creditors in the National Gypsum Company bankruptcy

Financial item	Actual 1991	Year of projections					
		Est. 1992	Est. 1993	Est. 1994	Est. 1995	Est. 1996	Est. 1997
1. Net revenues							
B&T Creditors	\$442.9	\$458.0	\$496.8	\$572.8	\$629.1	\$618.0	\$604.3
Debtor	<u>442.9</u>	<u>450.8</u>	<u>477.4</u>	<u>520.9</u>	<u>561.3</u>	<u>521.7</u>	<u>483.4</u>
B&T Creditors – Debtor	0.0	7.2	19.4	51.9	67.8	96.3	120.9
2. Gross margin							
B&T Creditors	19.8%	17.5%	23.3%	29.6%	33.0%	31.6%	30.3%
Debtor	<u>19.8</u>	<u>21.2</u>	<u>24.3</u>	<u>28.5</u>	<u>31.5</u>	<u>29.9</u>	<u>28.1</u>
B&T Creditors – Debtor	0.0	– 3.7	– 1.0	1.1	1.5	1.8	2.2
3. Depreciation and amortization							
B&T Creditors	\$48.7	\$43.6	\$43.8	\$43.8	\$44.1	\$45.4	\$46.8
Debtor	<u>48.7</u>	<u>43.6</u>	<u>32.9</u>	<u>34.1</u>	<u>35.4</u>	<u>37.2</u>	<u>38.7</u>
B&T Creditors – Debtor	0.0	0.0	10.9	9.7	8.7	8.2	8.1
4. Net interest expense							
B&T Creditors	\$0.7	\$0.7	\$38.0	\$37.9	\$34.7	\$31.9	\$29.8
Debtor	<u>0.7</u>	<u>0.7</u>	<u>14.8</u>	<u>17.5</u>	<u>17.5</u>	<u>15.1</u>	<u>12.6</u>
B&T Creditors – Debtor	0.0	0.0	23.2	20.4	17.2	16.8	17.2
5. Capital cash flows							
B&T Creditors			50.1	63.4	98.8	81.2	71.1
Debtor			<u>20.0</u>	<u>29.1</u>	<u>40.4</u>	<u>23.3</u>	<u>8.3</u>
B&T Creditors – Debtor			30.1	34.3	58.4	57.9	62.8
Estimated enterprise value (Dec. 31, 1992)							
B&T Creditors		\$1,037.0					
Debtor		<u>182.9</u>					
B&T Creditors – Debtor		854.1					

These comparisons are based on information in the competing official disclosure statements submitted by the debtor and by the Bond and Trade Creditors Committee (B&T Creditors) in the Chapter 11 reorganization of National Gypsum Company (both dated September 4, 1992). The table reports financial items from the projections that enter in the calculation of capital cash flows, and for which the two parties' estimates differed materially. Dollar amounts represent millions of dollars. Capital cash flows (line 5) are calculated assuming a steady-state growth rate of 4% and an unlevered equity discount rate of 10.0%. The company's fiscal year ends on December 31. Both sets of projections were made in late 1992, and included an estimate of the company's financial results for the remainder of 1992, but the plan of reorganization was assumed to become effective on December 31, 1992. The company's plan of reorganization was confirmed on March 9, 1993, and it became effective on July 1, 1993.

While tension between senior and junior claimants exists in all bankruptcy cases, we develop empirical proxies which represent the likelihood that incentives of senior or junior interests have successfully influenced the plan's value. The incentive to pursue a particular value should increase with the size of the creditor's claim. Vulture investors who acquire large holdings of debt could be especially influential [Hotchkiss and Mooradian (1997), Gilson (1995)]. Large debt holdings may either be converted into controlling equity stakes under the plan of reorganization, or, if they represent more than one-third of the claims in a class, be used to block approval of the plan.

Vultures gain a controlling equity stake by acquiring senior debt in 7.9% of sample cases, and by acquiring junior debt in 12.7% of the

sample cases (Table 1). Our empirical tests use dummy variables to indicate these cases where, ex post, vultures used a significant position to successfully influence the plan. In addition, the presence of an equity committee indicates that a party to the negotiations represented the interests of the most junior claimants. An equity committee is present for 19 firms in our sample (30.6%).

The regression results in Table 7 support our hypotheses that estimated values will be lower (higher) when senior (junior) claimants have an influential position in the restructuring. The estimated coefficient on *Vulture purchases bank debt, gains control*, indicating a vulture investor uses a block of senior bank debt to gain control of the reorganized firm, has the predicted sign but is significant only in regression 5. However, the significant positive coefficient on the next variable, *Vulture purchases public debt, gains control*, is consistent with the hypothesis that vultures are able to influence the process to increase values when they acquire control using junior debt. The regressions also include the 0–1 dummy variable, *Equity committee is formed*, as a proxy for stockholders' bargaining power. This variable is not significant in any of the regressions.

5.2.2 Management's equity ownership. Debtor management has an incentive to produce a biased estimate of value when it owns equity in the firm. The bias can run in either direction. If managers own stock in the firm prior to reorganization, like nonmanagement stockholders and other junior claimholders, they will favor a higher firm value.²⁴ Management prereorganization stockholdings in our sample are often large. The CEO alone owns more than 20% of the stock for 20.6% of our sample firms (see Table 1). We expect estimated values to be higher as management ownership increases.

Managers also commonly receive stock and/or stock options in the reorganized firm as incentive compensation [Gilson and Vetsuypens (1993)], which should cause managers to favor a lower firm value. For 50.8% of sample firms, senior managers receive new stock or options under the reorganization plan (Table 1). Yermack (1997) finds that firms time the award of management stock options to follow stock price declines, resulting in a lower exercise price. In Chapter 11, managers are often granted common stock based on a fixed target number or

²⁴ For example, in the 1994 Chapter 11 reorganization of R. H. Macy & Co., Laurence Tisch, a director of Macy's, at one point argued on behalf of the board that the company's going concern value was \$3.8 billion—well above the \$3.5 billion value that was then being asserted by a group of senior creditors that included GE Capital and Fidelity Investments, and above the values that had been recommended by the board's own financial advisors. At the time it was alleged in the press that Tisch's valuation was influenced by the fact that he had a large investment in Macy's junior bonds and a 15% equity stake in the company in the form of common and preferred stock [Jareski (1994)].

percentage of outstanding shares, so a low firm value will make managers' compensation appear lower or "fairer" to creditors. With stock option grants, a low firm value will reduce the projected postreorganization common stock price and, since options are generally issued at the money, the option exercise price. If the firm is undervalued, this provides a windfall to managers. In the case of E-II Holdings (appendix), the CEO was granted a significant number of stock options that vested based on how much the company's postbankruptcy cash flows exceeded cash flows projected in the reorganization plan. Junior creditors viewed the compensation plan as evidence that management had conspired with senior creditors to materially understate the firm's value.

Each regression includes two variables that measure senior management's incentives to behave like stockholders. Valuation errors are unrelated to the amount of common stock that CEOs own prior to adoption of the reorganization plan (*% CEO stock ownership prereorganization*). However, the estimated coefficient on *Mgt. receives stock or stock options in plan* is negative and significant for all but the first capital cash flow regression. This finding is consistent with managers lowballing the financial projections when they receive stock or stock options to make their compensation appear lower, and is consistent with findings by Yermack (1997).²⁵

5.2.3 Existence of outside bids to acquire or invest in the debtor.

Estimated values can also be influenced by outside offers to acquire or invest new money in the firm. The direction of the bias again depends on debtor management's motives. If managers wish to retain control, the firm's stand-alone projections may be upward biased to make the firm appear more expensive. Managers can also retain control by persuading the judge that high-value outside bids are infeasible, which happened in the case of Allegheny International (see the appendix).

If an acquisition offer has already been made, and managers either hold junior claims or represent the interests of junior claimholders, they may use such an offer to justify upward-biased projections. In the case of Storage Technology (appendix), the CEO rejected senior creditors' enterprise valuation as too low, based on "dozens" of higher-value outside offers he had received to buy the firm. On the other hand, if managers wish to bring in a friendly investor who will allow the current management structure to stay in place, they will have an incentive to

²⁵ If the comparable company multiple does not fully reflect the firm's future growth prospects (so that estimated value is too low), and high-growth firms are more likely to give options to managers, then the negative coefficient on *Mgt. receives stock or stock options in plan* could be spurious using this valuation method. However, EBITDA growth rates are not correlated with this or any other explanatory variables. Moreover, including EBITDA growth rates in the regression does not change our results.

provide downward-biased estimates so the investor will be able to purchase an interest in the firm more cheaply.

For 17.5% of the sample a third-party invests new equity in the debtor under its reorganization plan (Table 1). The investments are typically large. The median percentage of equity acquired is 54.2% on a fully diluted basis, and the investments range in size from 13.6% to 82.4%. Based on descriptions in disclosure statements and news articles, these cases can generally be characterized as friendly to the debtor management. Unlike acquisitions outside Chapter 11, in 9 of 12 cases the CEO in office when the plan providing for the equity investment is proposed remains in office after the firm emerges from bankruptcy.²⁶ We therefore expect that a dummy variable indicating an outside equity investment will be associated with lower estimated values.

The regression analysis shows that valuation errors are significantly more negative when an outside investor purchases equity in the firm as part of the reorganization plan. The estimated coefficient on *Third-party equity investment in firm* is negative and significant in each regression. One interpretation of this finding is that managers of these firms sell new equity to investors friendly to management at a substantial discount and publicly issue low estimates of value. For 9 of 12 cases, we can also compare the purchase price for the equity, based on information in the disclosure statement, to the stock price when it first trades; in all but one of these cases, the shares are purchased at a significant discount to the traded price of the stock.²⁷

5.2.4 Senior management turnover. Senior managers' incentives to support higher estimates of firm value could also increase with the length of their current position at the firm. Hotchkiss (1995) finds that managers of bankrupt firms typically produce overly optimistic cash flow (EBITDA) forecasts, but the positive bias is greatest for firms run by "incumbent" CEOs (those who were in office before the firm filed for bankruptcy). Relative to replacement CEOs, incumbent CEOs have a stronger incentive to portray their firms in a favorable light because more of their human and reputational capital is firm specific. In the

²⁶ One case where management is retained is the 1993 reorganization of Continental Airlines; a *Wall Street Journal* article (5/12/93) describes the choice of Air Partners as an investor as "an indication that Robert Ferguson's position in that post (CEO) is assured." In one of the three cases where management does not remain following the reorganization, Carter Hawley Hale, the investor (Zell) is an old business associate of the CEO (Hawley). At the time of the plan, Zell states that no management changes are contemplated. However, Hawley (age 67) announces plans to retire 1 day after the firm emerges from bankruptcy and retires with 500,000 shares in stock options, despite the fact that old equity holders received no distribution under the plan (*Los Angeles Times*, 9/3/96).

²⁷ This is consistent with evidence of Barclay and Holderness (1989) that private placements of equity by firms of worse financial condition are often at discounts.

National Convenience Stores case (appendix), incumbent senior management effectively entrenched themselves by proposing an enterprise value that was fully 50% higher than the value incorporated in the final reorganization plan. Management's plan also significantly restricted trading in the firm's stock after bankruptcy, making it more difficult to replace managers. For 41.3% of sample firms the prebankruptcy CEO is still in office when the reorganization plan is proposed (Table 1); we expect these cases to be associated with higher estimated values.

The management turnover variable (*Prebankruptcy CEO in office when plan proposed*) is positive and significant for the CCF error. This is consistent with the evidence of Hotchkiss (1995) that managers whose tenure predates the bankruptcy filing issue optimistic forecasts to create the appearance of a turnaround and restore their reputations.

6. Summary

This study compares the market value of firms that reorganize in bankruptcy with estimates of value based on management's published cash flow projections. Our analysis is based on a sample of 63 public firms that reorganized under Chapter 11 of the U.S. Bankruptcy Code during 1984–1993. We estimate values using discounted cash flow and comparable company multiple valuation methods. We find that these methods generally yield unbiased estimates of value, but the range of valuation errors is very wide—the ratio of estimated value to market value in the sample varies from less than 20% to greater than 250%. These large differences cannot be wholly attributed to potential errors in our model assumptions, such as the discount rate or the long-term growth rate. We show that the valuation errors can be associated with the lack of information about these firms. We also show that the errors are related to strategic biases in the cash flows that are related to the incentives of participants to distort value. We interpret these findings as evidence that valuing firms emerging from bankruptcy is more complex and less precise because of the substitution of the administrative bankruptcy process for a market process.

Appendix: Case Studies of Six Chapter 11 Reorganizations Where There Was Significant Disagreement Over Enterprise Evaluation

This appendix presents brief case studies describing six Chapter 11 bankruptcies in which there was significant public disagreement among claimholders and/or company management over the estimated enterprise value of the reorganized company, resulting in substantial modification of the reorganization plan ("Plan"), or the proposal of alternative plans. Each case study describes key events that took place during the bankruptcy, the conflicts over value, and the ultimate outcome in the case. The cases are based on information contained in Chapter 11 disclosure statements, 10K reports, *Nexis*, *Dow Jones*

News Retrieval, and other public sources. At the end of each case we report the company's actual enterprise value immediately following Chapter 11, when its reorganization plan becomes effective (*Postbankruptcy enterprise value*). This latter value equals the face value (market value if available) of interest-bearing debt, and the market value of common stock (plus any preferred stock or warrants) on the first day the firm's stock trades after it leaves Chapter 11.

Allegheny International

The debtor filed for Chapter 11 in February 1988, and three months later the judge terminated the debtor's exclusivity. In November 1989, vulture investor Japonica Partners presented the company's board with an all-cash acquisition offer, which was rejected. The debtor filed its own Plan a month later. Under the debtor's Plan, which assumed an enterprise value of **\$518 million**, most of the holding company debt would be converted into new common stock, representing 91% of the reorganized firm's equity. Japonica subsequently filed its own Plan, which placed a substantially higher value on the company, and proposed to retire virtually all company debt for \$621 million in cash. Japonica also purchased large amounts of institutional and public debt in the company, which in principle allowed it to block the debtor's Plan. The judge, who took exception to Japonica's tactics, disqualified its votes and confirmed the debtor's "all-stock" Plan. In the end, as the largest creditor of Allegheny, Japonica received almost all of the equity in the reorganized company. *Postbankruptcy enterprise value: \$963 million.*

E-II Holdings

The company filed for Chapter 11 in July 1992. The company's debt was roughly evenly divided between senior and junior publicly traded bonds. Vulture investor Leon Black held large stakes in both the senior and junior bonds; vulture investor Carl Icahn owned a large percentage of the junior bonds. The debtor's Plan effectively valued the company at **\$824 million**. Icahn alleged in court that Black and E-II's CEO had conspired to "materially understate" the firm's value to enhance the recovery of the senior bondholders and give Black control of the reorganized firm's equity, leaving little recovery for the junior bonds. It was further alleged that the CEO's cooperation had been secured with the offer of a generous compensation package. (The CEO would be paid an annual salary of \$1 million, and be allowed to run the company from a resort island off the coast of Florida. He would also be granted a significant number of common shares and stock options, which would vest based on how much the company's future cash flows exceeded cash flows projected in the plan.) Icahn proposed his own Plan, which valued the firm at **\$1,345 million**, but the judge refused to put it to a vote. The judge confirmed the debtor's Plan over Icahn's objections through a "cram down" in May 1993. *Postbankruptcy enterprise value: \$940 million.*

National Convenience Stores

The debtor filed for Chapter 11 in December 1991. The debtor's initial Plan assumed an enterprise value for the company of over **\$300 million**. Creditor's claims would be largely reinstated, and common and preferred stockholders would retain their full equity interest. Creditors strenuously objected to this Plan because they felt it burdened the company with excessive debt, and within a few months the debtor proposed a second Plan. The modified Plan assumed an enterprise value of only **\$210 million**, the firm's debt would be substantially reduced, and preferred and common stockholders would be wiped out. The Plan would also severely restrict trading in the company's common stock to preserve its NOL carryforwards. The Unsecured Creditors' Committee refused to endorse the Plan, because it believed these restrictions would depress the company's value by 25% to 35%. The company's largest common stockholder, who held 18% of the stock, argued that

enterprise value was in excess of **\$300 million**, and therefore the debtor's plan was unconfirmable because it provided no recovery for common stockholders. With the modified Plan lacking sufficient creditor support, the debtor proposed a third Plan. This Plan also assumed an enterprise value of \$210 million, but contained fewer trading restrictions on the stock and less generous stock option grants for senior management. The Plan was confirmed in February 1992. *Postbankruptcy enterprise value: \$240 million.*

National Gypsum

The debtor filed for Chapter 11 in October 1990 following a severe cyclical downturn in its markets. Eventually the judge terminated exclusivity, and the debtor and the junior bondholders' committee issued competing Plans. The debtor's Plan, which effectively assumed an enterprise value of under **\$200 million**, proposed a 100% recovery for the firm's senior bonds, including almost 70% of the firm's common stock. Most of the senior bonds had been purchased at substantial discounts below face value by several prominent vulture investors, including Fidelity Investments, Goldman Sachs Water Street Fund, and Trust Company of the West. Junior bondholders, and prepetition stockholders, would receive nothing. Under junior bondholders' competing Plan, the firm was assumed to be worth over **\$1 billion**. According to the bondholders' committee, the debtor's Plan contained unduly pessimistic revenue forecasts and significantly undervalued the company's assets. The debtor, in contrast, argued that the junior bondholders' Plan was premised on "overly optimistic projections, valuation, and...excessive leverage which risks damage to (the firm's) cyclical business." The debtor's Plan was confirmed in March 1993. Shortly after the company emerged from Chapter 11, it significantly raised its product prices and cut its payroll, which junior bondholders and stockholders cited as evidence of deliberate debtor "lowballing." *Postbankruptcy enterprise value: \$464 million.*

Salant

The company filed for Chapter 11 in June 1990, 3 years after having emerged from a prior Chapter 11 reorganization. The debtor filed its first Plan in December 1991 and two amended Plans the following April and June. Under the June Plan, common shareholders would retain their shares, giving them a 40% stake in the reorganized firm; junior creditors would be paid with a package of cash, debt, and additional stock. The Plan assumed a common stock value of \$22.50 a share—almost five times the then-current market price. The junior creditors' committee objected strenuously to all three of the debtor's Plans, arguing the company's investment bankers had grossly overvalued the common stock. The committee felt the debtor's Plan gave creditors too much debt, and too little equity, producing an overleveraged capital structure. The largest holder of the junior debt was vulture investor Leon Black. The court refused to allow creditors to propose their own plan, which would have given shareholders a much smaller equity stake and creditors a larger one. Salant's CEO described this plan as a "thinly-veiled attempt to acquire ownership of Salant for less than its full value." Eventually a compromise Plan was confirmed in July 1993 that balanced "the significantly divergent viewpoints held by the Debtor and the Unsecured Creditors regarding the enterprise value of Salant." *Postbankruptcy enterprise value: \$301 million.*

Storage Technology

The company filed for Chapter 11 in October 1984. A few months later the company hired Ryal R. Poppa, a professional turnaround manager, as its new CEO. In early 1986, with negotiations on a Plan under way, the committee representing senior bank lenders objected to the debtor's proposed Plan, arguing that management had significantly overestimated the company's enterprise value. In a speech to analysts Poppa stated: "We believe the company is valued between **\$500 and \$600 million**, but the creditors are saying

the company is only worth about **\$250 million.**" Senior lenders, who were owed approximately \$700 million, had informally proposed their own Plan that would settle their claims with cash, new debt, and almost all of the firm's stock. Most of the senior was believed to have been purchased by vulture investors for 40 to 50 cents on the dollar. In rejecting the lenders' lower valuation, Poppa noted he had received "dozens" of offers to buy the company, but had rejected all of them as inadequate. In the last year of the reorganization, the company experienced a dramatic operating turnaround. The debtor's Plan, confirmed in June 1987, assumed an enterprise value of **\$874 million**, and settled lenders' claims in full with cash, new debt, and common stock. *Postbankruptcy enterprise value: \$1,202 million.*

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