Rational Deviations from Absolute Priority Rules

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This paper uses a sequential bargaining model to analyze bankruptcy reorganizations. It is shown that deviations from absolute priority rules are rational responses by bondholders and the courts to management bargaining power engendered by the formal reorganization process. It is proved that even solvent firms may find it optimal to initiate bankruptcy proceedings. The factors that determine the extent of the deviations are also analyzed.

I. INTRODUCTION

> First, bargaining and settlement rather than adjudication determined the outcomes of the cases in our study. [W]ithin the category of large cases, the relative size of equity's recovery appeared not so much a product of the financial condition of the company, as it was the product of the quality and aggressiveness of equity's representation (LoPucki & Whitford, 1990, p. 194).

This paper uses a sequential bargaining model of corporate debt capacity to analyze formal and informal bankruptcy reorganizations.[1] It is documented by Warner (1977), Baldwin and Mason (1983), Franks and Torous (1989, 1991), LoPucki and Whitford (1990), Weiss (1990), Eberhart, Moore, and Roenfeldt (1990), and Betker (1993) that many successful Chapter 11 bankruptcy reorganizations and informal workouts are characterized by deviations from absolute priority rules. In particular, shareholders often receive more, in some cases substantially more, than would be dictated by absolute priority rules.[2]

The purpose of this paper is to model this phenomenon in the context of the bondholder-shareholder conflict. It is shown that deviations from absolute priority rules are in fact rational responses by the bondholders and the courts to management bargaining power engendered by the formal Chapter 11 reorganization process. Furthermore, it is proved that even solvent firms may find it optimal to initiate Chapter 11 bankruptcy proceedings. This finding rationalizes the fact that solvent firms have been known to initiate formal reorganizations (see, for example, the Charles A. Stevens case cited by Franks & Torous, 1989). Moreover, given the potential threat by shareholder-oriented management to initiate formal proceedings, deviations from absolute priority rules obtain optimally in informal workouts as well.

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There are currently two major positions in the theoretical finance literature that rationalize deviations from absolute priority rules. Longstaff (1990), Frierman and Viswanath (1991), Gertner and Scharfstein (1991), Daigle and Maloney (1992), and Eberhart and Senbet (1992) argue that deviations from absolute priority rules reduce the incentive for managers of financially distressed firms to shift the firm's assets into high-risk, negative NPV projects. Although call and conversion provisions in debt contracts also diminish the incentive for risk shifting, these standard provisions become increasingly ineffective as the firm approaches financial distress and as the concomitant probability of call or conversion approaches zero. Thus, deviations from absolute priority rules are rationalized as the dominant means for reducing risk shifting in financially distressed firms.

The other position argues that the formal bankruptcy process gives shareholders an option to delay the reorganization to the detriment of the firm's creditors. Deviations from absolute priority rules then compensate shareholders for the value of that option. Although this argument was made by a number of authors, no rigorously developed explicit formula for such deviations was obtained. In fact, Meckling (1977) and Franks and Torous (1989, 1991) make the option argument without formal development of a model.[3]

In this paper, a rigorous model of deviations from absolute priority rules, based on Bergman and Callen (1991), is proposed with the intent of developing a formula for those deviations. Section II discusses the threat of firm-value dissipation as the primary source of managerial bargaining power in formal bankruptcy reorganizations, and its implications for informal workouts. Section III develops a sequential bargaining model of rational deviations from absolute priority rules for standard debt contracts and torts. Section IV presents a number of further implications of the model. Section V concludes the paper.

II. FORMAL REORGANIZATIONS, MANAGERIAL BARGAINING POWER, AND INFORMAL WORKOUTS

The formal Chapter 11 bankruptcy framework enhances management bargaining power vis-à-vis creditors. In a formal process, management has a great degree of control over the firm's policies and, most critically, over the time spent in reorganization. Under this *debtor in possession* concept, the courts generally entrust the decision-making authority of the firm in a Chapter 11 reorganization to management and shareholders. In the absence of fraud, dishonesty, incompetence, or gross mismanagement, the courts have consistently ruled that management is to control the reorganization process.[4] Management even has the right to override creditor interests in a Chapter 11 bankruptcy, such as the right to sell off the firm's assets (see Jackson, 1986, pp. 216–217, note 27). Most important, time spent in reorganization is, to a great extent, under management control. During the first 120 days after bankruptcy filing, only management may propose a reorganization plan, and lengthy extensions are often granted (see White, 1984; and Franks & Torous, 1989). Although creditors could try to force through a reorganization plan, the costs of this procedure are sufficiently onerous that, in most cases, it is not a truly viable option. Although the courts readily accept management's valuation of the firm's assets, the case is different for creditors, who must support their valuations with costly appraisal hearings.

Management's (limited) authority over the time spent in formal reorganization is a crucial factor for enhancing managerial bargaining power. This is because the longer the firm is in

Chapter 11 reorganization, the more firm value dissipates. As emphasized in the next section of this paper, it is precisely the dissipation of firm value in Chapter 11 bankruptcy that gives management the bargaining power necessary to effect deviations from absolute priority rules.

As Weiss (1990) points out, there can be a number of reasons for firm value dissipation in a formal reorganization.

1. The formal reorganization process involves direct, out-of-pocket lawyers' fees and court costs.
2. Because formal reorganizations are noisy affairs, many of the firm's customers are bound to learn about it. As a consequence, sales might be lost, especially if the product or service involves a long-term relationship (Titman, 1984). For example, durable-goods customers may be afraid that warranties will not be honored, or they may be unwilling to make a downpayment on goods to be delivered at a future date. Airline customers may worry that tickets or frequent-flyer credits will be lost.
3. Management in a formal reorganization may spend too much valuable time planning the reorganization rather than concentrating on the current operations of the firm and on strategic planning for future profitability.
4. Current operating costs are likely to increase either as key personnel leave or as the firm pays more to keep them. Operating costs will also go up as suppliers refuse to grant normal credit terms. It is worth emphasizing, moreover, that these four causes of firm-value deterioration are likely to be increasing functions of the time spent in formal reorganization.

Although the model developed here does not directly account for them, there are other factors that enhance management bargaining power in Chapter 11 reorganization. Capital repayments to creditors are suspended in a formal process, and interest payments are not only suspended, but also frequently not paid at all. Moreover, in order to preserve valuable tax-loss carry-forwards, shareholders must agree to the reorganization plan (Weiss, 1990).

The upshot is that, as long as the firm is in formal reorganization, firm value will dissipate. As will be shown below, it is precisely this dissipation of firm value that confers a great deal of bargaining power on management, and results in deviations from absolute priority rules. It should not be assumed, however, that deviations from absolute priority rules will obtain only if management initiates formal bankruptcy proceedings. On the contrary, management has essentially the same bargaining power in an informal workout as in a formal procedure. This does not imply that formal bankruptcy proceedings are always preceded by a workout attempt. On the contrary, many, if not most, Chapter 11 bankruptcy proceedings are not preceded by an informal workout. It is worth noting, however, that informal workouts are usually far less successful than formal proceedings. On these issues, see Finkelstein (1993). After all, if an informal workout fails, management can always threaten to break off informal discussions and initiate formal proceedings.

Whatever managerial bargaining power is engendered by the Chapter 11 formal framework ultimately devolves on the informal process as well. Since managerial bargaining power, as will be seen, is what determines the deviations from absolute priority rules, the model in this paper rationalizes deviations from absolute priority rules *both* for the case of formal Chapter 11 bankruptcies and for the case of informal workouts. Therefore, without loss of generality, it is

assumed in the model that follows that, if it is optimal to declare bankruptcy, management initiates a formal Chapter 11 bankruptcy procedure.

III. A SEQUENTIAL BARGAINING MODEL AND DEVIATIONS FROM ABSOLUTE PRIORITY RULES

It is assumed here and throughout this paper that management acts in the shareholders' interest. Now, consider a firm with outstanding debt having a face value F and a finite maturity. At any time on or before maturity, shareholder-oriented management can decide to petition for a Chapter 11 reorganization. If the decision to trigger Chapter 11 bankruptcy is optimal, firm value is assumed to dissipate over the time spent in reorganization at a rate known to both negotiating parties.

Should management decide to trigger a formal reorganization, bargaining between management and bondholders will begin immediately in order to prevent firm-value dissipation. The negotiation process is assumed to follow the sequential bargaining protocol of Rubinstein (1982). Specifically, it is assumed that management launches the first bargaining round, in which it proposes to issue to the bondholders new debt claims that are worth less than the original ones. Management initiates the negotiations, since, by law, management is given the sole right to present reorganization plans to the court in the first 120 days of the formal bankruptcy procedure. This does not mean, however, that the parties cease to negotiate bilaterally out of court concerning the contents of the plan during that period. The right given management to present reorganization plans within the first 120 days, and oftentimes longer, is important only in so far as it gives management the power to affect the time spent in reorganization and, hence, the extent of firm-value dissipation.

The bondholders can choose either to accept or to reject the offer. If they accept the offer, management presents a formal reorganization plan to the courts, the original debt is discharged, and the new debt is issued. The bargaining process ends without dissipation of the firm's value. If the bondholders reject the offer, firm value deteriorates because of the passage of time.[5]

In the second round of the negotiation, it is the bondholders' turn to propose a counteroffer; that is, an amount they are willing to accept in exchange for discharging the original debt. If management rejects the counteroffer, no reorganization plan is forthcoming, and firm value again deteriorates until the third bargaining round when management makes another offer. The bargaining process continues in this fashion, terminating either when an offer is accepted by one of the sides, or when the courts conclude that no agreement is to be expected. In the latter case, it is assumed that the courts impose a Chapter 7 bankruptcy procedure, and the firm is liquidated. The time of liquidation is denoted by T. It is assumed for simplicity that time T is certain. A stochastic T would not add sufficient insight to the reorganization issue to warrant the complication.

More formally, let t_0 denote the time when Chapter 11 renegotiation is first triggered, and let V, a number, denote the value of the firm at time t_0. In order to simplify calculations, a default-free government bond as a numeraire is used. By this choice of numeraire, V is also the value of the firm at any time before t_0. If at time t ($t_0 < t$) negotiations are still continuing, a fraction $b(t - t_0)$ of the original value of the firm still remains, where $b(\cdot)$ is a real decreasing function with $b(0) = 1$. Then, the value of the firm at time t is

$$V(t) = V, \qquad \text{for } t \leq t_0,$$

$$= b(t - t_0)V, \quad \text{for } t_0 < t. \tag{1}$$

If bargaining does not terminate, a Chapter 7 bankruptcy liquidation is imposed by the courts, and bondholders receive $h(V(T))$—a function of $V(T)$, the liquidation value of the firm. Since absolute priority rules are bound to hold in Chapter 7 liquidations,[6] it is assumed that

$$h(V(T)) = min[F, V(T)]. \tag{2}$$

Alternative bankruptcy codes for assigning different priorities in liquidation could be incorporated by appropriate specifications of the function $h(V(T))$; each such rule would imply a different allocation of the pie in a Chapter 11 reorganization.

To simplify the notation in the analysis that follows, the time variable is transformed. Specifically, let $n = integer\ [N \frac{T-t}{T-t_0}]$ be the number of bargaining rounds still remaining at time t before the Chapter 7 liquidation is imposed. Here "integer" stands for the function that takes the integer part of its argument, and N is the maximum number of potential bargaining rounds. Further, define $\Delta := (T - t_0)/N$ to be the duration of each bargaining round, and denote by $\beta_n := b[(N - n)\Delta]$, the fraction of the original firm value still remaining when there are n remaining bargaining rounds, and by $V_n := \beta_n V$, the value of the firm in round n, after firm value deteriorates.

Figure 1 illustrates some of these definitions and the path of the firm's value. Prior to t_0, firm value is V. Chapter 11 reorganization is triggered at t_0, and firm value declines until an agreement is reached. If no agreement is obtained, firm value declines until time T, at which point the firm is liquidated. Management makes its opening offer in round $n = N$ (time t_0).

In order to prove the main result, some additional definitions are required. Specifically, consider the following S and B (where S represents stockholders; and B, bondholders) sequences defined by recursion for $n = 1, 3, 5, ..., N$.

$$S_0 := 0;\ B_0 := V_0;\ S_n := = V_n - B_{n-1};$$

$$B_n := B_{n-1};\ S_{n+1}; = S_n;\ B_{n+1} := V_{n+1} - S_n \tag{3}$$

These S and B sequences will be shown to be the optimal demands and counter-demands by management and by the bondholders, respectively, when renegotiation takes place. It follows from equation (3) that

$$S_0 = 0,$$

$$S_{n+1} = S_n = (V_n - V_{n-1}) + \ldots + (V_1 - V_0)$$

$$= [(\beta_n - \beta_{n-1}) + \ldots + (\beta_1 - \beta_0)]V(t_0)$$

$$:= \alpha_n(t_0)V(t_0). \tag{4}$$

Intuitively, S_n is the cumulative deterioration of firm value in those rounds in which management makes offers to the bondholders. Alternatively, S_n is the cumulative damage

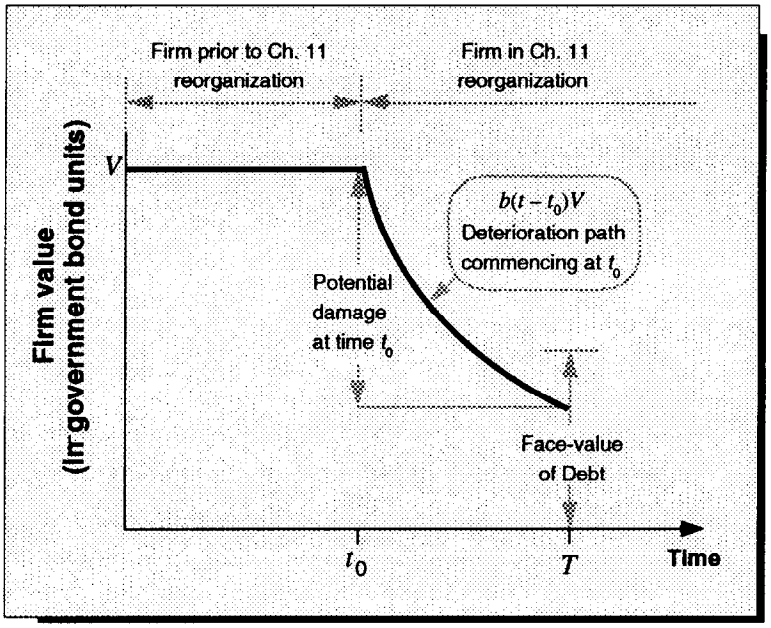

Figure 1. Value of the Firm as a Function of Time. Chapter 11 Proceedings at Time t_0. Then the Firm Starts to Deteriorate.

sustained by the firm in rounds in which bondholders refuse to accept management's offers. Similarly,

$$B_n = B_{n-1} = [(\beta_{n-1} - \beta_{n-2}) + \ldots + (\beta_2 - \beta_1) + \beta_0]V(t_0), \tag{5}$$

$$\text{for } n = 1, 3, 5, \ldots, N.$$

B_n is the cumulative deterioration of firm value in the rounds in which bondholders make offers. Note that both S_n and B_n are non-decreasing in n. Also

$$S_n + B_n = V_n, \quad (n = 0, 1, 2, \ldots, N). \tag{6}$$

Finally, define

$$\overline{V}(t_0) := \frac{F}{1 - \alpha_N(t_0)}, \tag{7}$$

where $\alpha_N(t_0)$ is as in equation (4).

Proposition 1.[7] The value, $\overline{V}(t_0)$ serves as a cutoff level. If the initial value of the firm V is larger than the cutoff, $\overline{V}(t_0)$, or is equal to it, then there is no benefit to the shareholders from initiating a Chapter 11 reorganization. If, on the other hand, V is smaller than the cutoff, $\overline{V}(t_0)$, then initiation of the reorganization process is advantageous to the shareholders, and manage-

ment triggers it. In that case, the bargaining game has a unique subgame-perfect equilibrium[8] that consists of the following two strategies (one for the shareholders and one for the bondholders): In round n (n odd) the shareholders propose to take a share equal to S_n; the bondholders accept any offer that gives them B_n or better, and reject any lesser offer. For n even, the bondholders propose to take a share equal to B_n; the shareholders accept any offer that gives them S_n or better and reject anything less. The outcome of the bargaining process is that in the opening round the shareholders propose to take for themselves

$$S_N = \alpha_N(t_0)V, \tag{8}$$

which is equal to the potential cumulative damage in the odd-numbered rounds. The bondholders immediately agree, and the shareholders present the agreed-upon reorganization plan to the court.

The intuition underlying the cutoff level is fairly straightforward. If management triggers a formal reorganization, firm value begins to deteriorate, which harms the shareholders as well as the bondholders. Indeed, when the value of the firm is greater than the cutoff level, shareholders stand to lose a sufficient amount, so that management policy to initiate a Chapter 11 reorganization is not credible. On the other hand, when the value of the firm is less than the cutoff, shareholders stand to lose little relative to the bondholders. Management's policy to trigger formal renegotiation and to let firm value deteriorate is then credible.

Despite the rather detailed bargaining protocol underlying this theorem, bargaining will conclude with an agreement in the first round. Firm value is not dissipated, and the outcome is efficient. Driving this result is the assumption of complete information to all bargaining participants. (However, when information is incomplete, the bargaining process may last many rounds, and an inefficient outcome will inevitably result.)

This theorem implies a schedule of final payoffs to shareholders as a function of the firm's liquidation value at time T, which differs from the schedule that is implied by strict priority rules. In equilibrium, rational bondholders will take this into account and limit ex ante the amount of debt they would be willing to buy from the firm. In another paper, Bergman and Callen (1991) explore more fully the implications of informal debt renegotiations on debt capacity and capital structure in a world of uncertainty and corporate taxes. The model presented there suppresses the relationship between firm value and time, and is therefore less useful than the present model in analyzing the issue of rational deviations from absolute priority rules.

Indeed, management and bondholders optimally negotiate toward a solution that deviates from absolute priority rules. The courts will also be favorably disposed toward such a solution, because it leads to an agreement between the parties concerned without (or with minimal) deterioration of firm value. It is optimal from society's point of view that no deterioration occurs. Whether the existing legal structure of reorganization is optimal for society is an interesting question that is beyond the scope of this paper. On this issue, see Harris and Raviv (1993). The deviations from absolute priority rules are described formally in the following corollary.

Corollary 1. Under the conditions of Proposition 1, the deviations from absolute priority rules as a function of firm value are given by

$$DAP(V) = S_N - max(V - F, 0) \tag{9}$$

This is the difference between what shareholders obtain through the reorganization process and what they would have obtained if absolute priority rules had been applied.

Up to this point, the model makes no assumption about the relative bargaining power of the two parties. Intuition suggests, however, that if the two parties are symmetric with respect to making the first proposal, the agreement reached will be such as to equally split the potential damage to the firm between them. This situation is consistent with the outcome to the Nash bargaining problem with two symmetrical bargainers.

Proposition 2 confirms this intuition. This proposition also yields an explicit formula for the deviations from absolute priority rules, given symmetric bargaining power.

Proposition 2. Assume that: (i) the potential deterioration path of the value of the firm is smooth in the sense that $b(\cdot)$ has a continuous first derivative, (ii) the bargaining rounds are of equal duration, and (iii) the bargaining process is accelerated by letting the duration of each round tend to zero. Then it is in the shareholders' interest to initiate a Chapter 11 reorganization at time t, if and only if, the value of the firm falls strictly below a cutoff level, which is given by

$$\overline{V}(t) := \frac{2F}{1 + b(T - t)}. \tag{10}$$

The shareholders' payoff is given by

$$S(t) = \begin{cases} \frac{1}{2}[1 - b(T - t)]V & \text{for } V \leq \overline{V} \\ V - F & \text{for } \overline{V} < V \end{cases} \tag{11}$$

The rational deviations from absolute priority rules are then given by

$$DAP(V) = \begin{cases} \frac{1}{2}[1 - b(T - t)]V & \text{for } 0 \leq V \leq F \\ F - \frac{1}{2}[1 + b(T - t)]V & \text{for } F < V \leq \overline{V} \\ 0 & \text{for } \overline{V} < V \end{cases} \tag{12}$$

where $S(t)$ replaces S_N in equation (9). The function $DAP(V)$ increases for $V \in [0, F]$, then decreases for $V \in (F, \overline{V},(t)]$, exhibiting a maximum where the firm value, V, equals the debt face-value, F.

The schedule of payoffs to the shareholders implied by Proposition 2 and the resulting deviations from absolute priority rules are depicted in Figure 2. In it, the pre-reorganization value of the firm is V, and, if debt renegotiation begins at time t_0, the total cumulative potential damage that can be inflicted on the firm during the renegotiation process is $[1 - b(T - t_0)]V$.

When the value of the firm is below the cutoff level, management triggers a Chapter 11 reorganization, yielding for the shareholders a deviation from absolute priority rules, which is half the potential cumulative damage. For values of the firm that are greater than or equal to the cutoff level, management does not trigger a Chapter 11 reorganization, since shareholders are content with the contractual residual payoff. Figure 2 illustrates that the maximum deviations occur when the value of the firm is near the face value of the debt. This theoretical result is

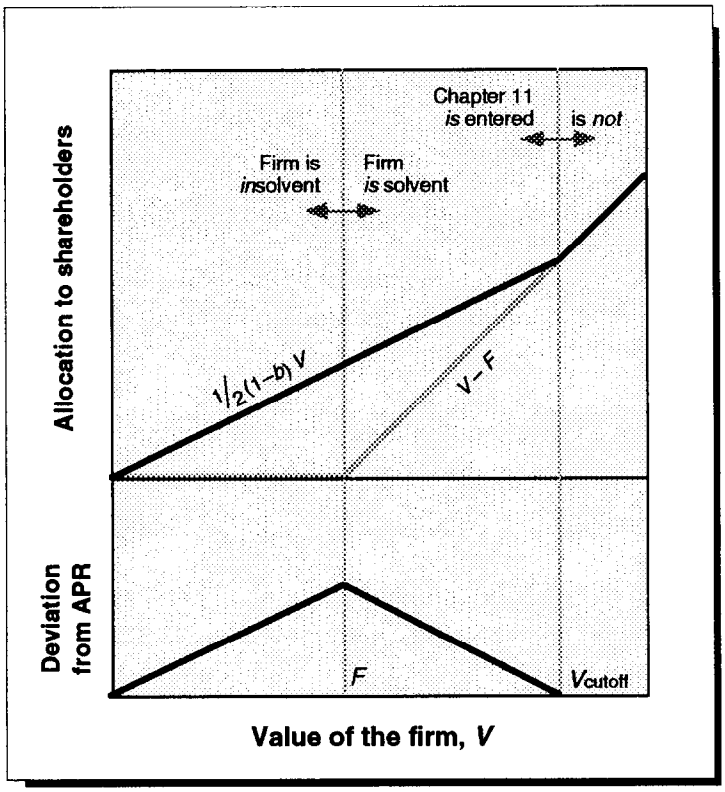

Figure 2. Firm-Value Allocation to Shareholders when the Firm Enters Chapter 11 Proceedings; Solid Lines Above. The Absolute-Priority-Rule Allocation is Drawn in Gray. The Difference between the Solid and the Gray Graphs, Shown Below, is the Deviation from Absolute Priority Rule. This Deviation Reaches a Maximum when the Firm-Value Equals the Face-Value of Debt.

consistent with empirical evidence provided by Franks and Torous (1991). Figure 2 also illustrates an important corollary of Proposition 2.

Corollary 2. Solvent firms, those whose initial value at t_0, V, satisfies the inequalities $F \leq V \leq \bar{V}(t_0)$, will also trigger Chapter 11 reorganizations.

Although intuition suggests that only management of insolvent firms, whose shareholders have nothing to lose, initiates Chapter 11 reorganizations, the corollary states otherwise. As long as firm-value is below the cutoff, management policy to trigger a formal reorganization and have firm-value dissipate is credible even though such dissipation ostensibly harms shareholders as well as bondholders.

The emphasis in this discussion has, thus far, been on renegotiation of contractual debt. There are situations, however, when debt—or liability—is created involuntarily in the form of tort claims (e.g., Union Carbide's Bhopal disaster, Manville and its asbestos workers, or the Texaco-Pennzoil conflict). Inception of the liability occurs as soon as the tort is perpetrated. Under the present model, it is predicted that, when the value of the liability thus created is large relative to the total value of the firm (or when the non-contractual liability is added to the

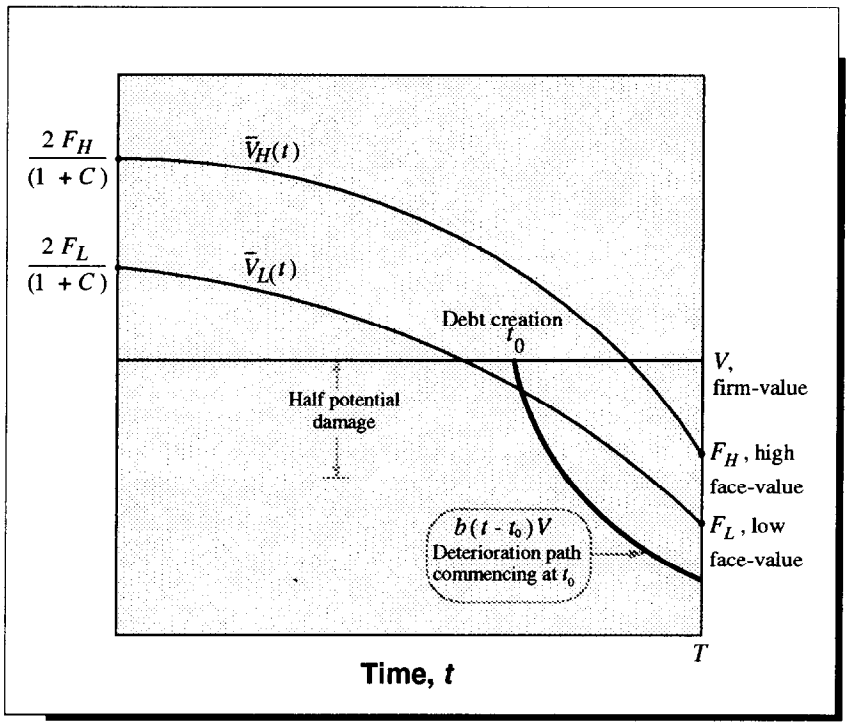

Figure 3. Cutoff Levels as a Function of Time for Two Different Levels of Tort Claims. For the Large Claim, Firm-Value is Below the Cutoff and Chapter 11 Procedure is Initiated, in which the Shareholders Receive More than their Entitlement Under Absolute Priority Rules. For the Small Claim, Firm-Value is Above the Cutoff, and Chapter 11 Procedure is Not Initiated. The Firm then Pays Off the Claim in Full.

outstanding contractual debt to form a total debt that is large enough), management will trigger a formal reorganization in order to reduce the total debt burden.

Consider, formally, a firm with value V, for which a non-contractual debt is created at time t_0. Consider Figure 3, which assumes that the total potential damage to the firm is limited, which would be the case if the debt is partially collateralized by non-depreciable assets. This is formalized by letting $b(\cdot)$ approach some constant C $(0 < C < 1)$ from above as t increases beyond bound. Figure 3 is drawn using the following properties of $\bar{V}(t)$, which are direct consequences of equation (10) and the assumed properties of $b(\cdot)$: (i) $\bar{V}(t)$ is decreasing in t, (ii) $\bar{V}(T) = F$, and (iii) $\bar{V}(t_0) \uparrow 2F/(1 + C)$ as $t_0 \downarrow -\infty$. If management decides to trigger a formal reorganization, the value of the firm deteriorates along the path. If the amount of tort claims to firm-value ratio, F_H/V, is a large enough proper fraction, then V, the value of the firm, is below the corresponding cutoff level, $\bar{V}_H(t_0)$. Consequently, management actually negotiates and forces a settlement, by which the shareholders receive half the potential damage from the renegotiation process—larger than the value of their residual claim $(V - F_H)$. Although the firm is financially solvent, yet management negotiates the debt opportunistically and successfully. If, on the other hand, the amount of tort claims to firm-value ratio F_L/V is a small proper fraction, then V is above the corresponding cutoff level $\bar{V}_L(t_0)$. Management does not negotiate, because if it does, shareholders would receive a settlement that is smaller than the value of their residual claim $(V - F_L)$.

These results have the following interpretation. When the value of the firm is larger than the value of the tort, both the shareholders and the tort-claimants stand to lose from carrying out the threat to let the firm deteriorate via the renegotiation process. In the former case (large tort claim), the shareholders stand to lose *less* than the tort-claimants. This lends credibility to the shareholders' threat, and they gain from negotiation. On the other hand, in the latter case (small tort claim), the shareholders stand to lose *more* than the tort-claimants, because their threat is not credible.

IV. FURTHER IMPLICATION OF THE MODEL

Meckling (1977) and Franks and Torous (1989, 1991) argue that the Chapter 11 bankruptcy process gives shareholders the option to delay repayment of the debt claims to the detriment of creditors. The value of this option then reflects itself in deviations from absolute priority rules. This option-typical argument is conceptually different from the game-theoretic argument developed in this paper. Specifically, in the standard options framework, the riskier the firm, the greater the value of the delay option and the greater the deviation from absolute priority rules. In contrast, in the game-theoretic model presented in this paper, there is no direct relationship between firm risk and deviations from absolute priority rules. What creates deviations from absolute priority rules in this model is shareholders' bargaining power derived from their ability to cause deterioration of firm assets as engendered by the formal bankruptcy process. Proposition 3 is a consequence of this observation.

Proposition 3. The greater the potential for firm-value dissipation, the greater the deviations from absolute priority rules.

It is proposed that a good surrogate for potential firm-value dissipation is the proportion of intangible assets in the total value of the firm, or, equivalently, Tobin's Q. Intangible assets are likely to be more susceptible to those factors that cause firm-value deterioration in the reorganization process (see Section II above). Thus, the greater Tobin's Q, the greater the deviations from absolute priority rules.

Proposition 4 argues that the stock price of a firm in a bankruptcy regime that allows for deviations from absolute priority rules is less risky (has a smaller return variance) than the stock price in a bankruptcy regime that strictly enforces absolute priority rules. The intuition for this result is clear. With debt outstanding and under absolute priority rules, the stock of a firm is like a call option on the value of the firm with its attendant volatility. On the other hand, deviations from absolute priority rules, which assign value to shareholders even when the value of the firm is less than the promised face value of the debt, make the stock look more like unlevered equity, whence the reduced volatility in its price return.

Proposition 4. The return on the stock of a firm in a regime that allows deviations from absolute priority rules is less volatile than the return on the stock of a similar firm in a regime where absolute priority rules are enforced.

Proposition 4 would appear to contradict the intuition of Jensen (1991) and of Bradley and Rosenzweig (1992), who argue that deviations from absolute priority rules create more noise in security prices. More important, recent empirical work by Eberhart and Sweeney (1993) would seem to confirm the conjecture that violations of absolute priority rules create more noise in security prices. The contradiction is more apparent than real, however. Proposition 4 is a comparative statement about the time series of security prices for a given firm in two potential

bankruptcy regimes. In contrast, the Eberhart and Sweeney findings are cross-sectional and quite consistent with the model presented here. Specifically, different firms likely have different bargaining power abilities—$b(T - t)$ in equation (12) differs across firms—so that a regime that permits violations of absolute priority rules may result in noisier security prices in the cross-section than a regime that allows only for absolute priority allocations.

The following proposition is another fairly immediate consequence of the model.

Proposition 5. (i) The greater the liquidation value of the firm in a Chapter 7 liquidation proceeding, the smaller the deviations from absolute priority rules in a Chapter 11 reorganization. (ii) If the firm is insolvent when reorganization is triggered, then the rational deviations from absolute priority rules increase with original firm value, V. If, on the other hand, the firm is solvent when reorganization is triggered, the deviations decrease with original firm value. Rational deviations are at a maximum when the firm is just solvent.

V. CONCLUSIONS

This paper uses a sequential bargaining model to analyze deviations from absolute priority rules that characterize successful Chapter 11 reorganizations and informal workouts. It is found that, under certain conditions, shareholder-oriented management will optimally trigger a bankruptcy reorganization, possibly even when the firm is solvent, in order to renegotiate existing debt contracts or torts. The resulting deviations from absolute priority rules are found to be a function of the extent to which firm value deteriorates in the event of a formal Chapter 11 reorganization. These deviations are also found to be a function of the linkage between Chapter 7 liquidation and Chapter 11 reorganization as expressed by the bankruptcy code in the best interest of creditors test. Furthermore, these deviations are a complicated function of the pre-reorganization value of the firm, increasing with firm value, if the firm is insolvent; and decreasing with firm value, if it is solvent. Also, the size of the rational deviations from absolute priority rules should be directly related to Tobin's Q, and unrelated to risk.

The implications of the model presented in this paper are potentially circumscribed by two major simplifying assumptions. It is assumed throughout that managers act in the shareholders' interest. But, as emphasized by Betker (1993), the agency problems between managers and shareholders of bankrupt firms can be severe, and Betker does present some empirical evidence to this effect. The nuance, however, is not completely clear. In their careful, comprehensive study of bankruptcy, LoPucki and Whitford (1990) find strong evidence that managers do act in the shareholders' interest:

> [I]n many of the reorganization plan negotiations studies (in which equity should have received zero), management did propose that equity share in the distribution, and creditors acquiesced. The view of some interviewees was that management had a duty to use its leverage to ensure that equity shared in the distributions. (Ibid., p.151)

In any case, to the extent that management does not act in the shareholders' interest, the phenomenon of deviations from absolute priority rules would be mitigated or even eliminated entirely. The overwhelming empirical evidence for the existence of deviations suggests, however, that management does act in the shareholders' interest.

The other major assumption of complete information (and a finite time horizon) implies that bankruptcy is resolved immediately without dissolution of firm value. This is clearly an oversimplification since many bankruptcies are characterized by time-consuming negotiations and dissolution of firm-value over time. Although, as mentioned above, there are models that do predict negotiation breakdown and firm value dissolution, they do not yield explicit formulas for deviations from absolute priority rules. Nor is it clear what implications these models have for deviations. This issue is left for future research.

APPENDIX

Proof of Proposition 1.

A dynamic programming procedure is used to compute the subgame-perfect equilibrium strategies. Receding backward from time T, each player, in its turn, makes an optimal proposal or an optimal response, taking into account the optimal plan to be followed by the opponent. This procedure guarantees uniqueness and subgame-perfection of the strategies, since by construction each player optimizes at all possible decision nodes, hence in all subgames. The underlying idea is that in a given round a bargainer optimally offers to give the opponent whatever the latter can force for itself in the subsequent round.

Consider first the case where the value of the firm falls below the cutoff level:

$$V \leq \bar{V}(t_0). \tag{A1}$$

It follows from equations (7) and (A1) that

$$V - F \leq \alpha_N(t_0)V = S_N. \tag{A2}$$

Consequently,

$$F \geq B_N \geq B_n \geq B_0 = V_0, \quad (n = 1, ..., N-1), \tag{A3}$$

where the left-most inequality follows from equations (6) and (A2), and the second and third—from B_n being non-decreasing in n.

An induction is used on n. Since by equation (A3) the value of the firm in the last round V_0 is less than the face value of the debt F, the outside partition (serving as boundary condition) calls for allocating the total remaining value of the firm to the bondholders. Hence, the bondholders optimally propose to take $B_0 = V_0$ and the shareholders inevitably agree.

Assume now the induction assumption, that the two players follow their respective equilibrium strategies (as outlined in the theorem) for all bargaining rounds $k = 0, 1, 2, ..., n-1$, where $(n-1)$ is even. It follows that in round n the shareholders optimally offer to give the bondholders a share that is equal to $B_n = B_{n-1}$. This is so, because the bondholders are bound to reject any lesser offer, since, by the induction assumption, the bondholders are going to demand B_{n-1} for themselves in round $n-1$, and the shareholders will agree. In other words, the shareholders do not stand to gain anything from offering the bondholders less than B_{n-1}. On the other hand, any offer in round n that is larger than B_{n-1} is accepted by the bondholders, since all subsequent agreeable offers B_k, $(k = 0, ..., n-1)$ are no better than B_{n-1} (B_k is non-decreasing in k).

It is important that the shareholders verify that their offer does not exceed the current market value of the debt; that is, that $B_n \leq F$. Otherwise, they should terminate bargaining immediately. In the present case, this condition is satisfied by equation (A3). Actually, condition (A3) is designed for exactly this purpose, and it, in turn, determines the cutoff level. Offering B_{n-1} to the bondholders means that the shareholders demand $S_n = V_n - B_{n-1}$ for themselves.

This completes the proof for $(n-1)$ even. The proof for the case $(n-1)$ odd follows exactly the same lines. Notice also that the share S_N, which the shareholders receive by bargaining, is in this case larger than $V - F$, the market value of their stock at time t_0 (see equation (A2)). Hence, debt renegotiation is, indeed, advantageous to the shareholders.

Now, consider the complementary case.

$$\overline{V}(t_0) > V. \tag{A4}$$

From equations (7) and (A4) it follows that

$$V - F > \alpha_N(t_0)V = S_N, \tag{A5}$$

which means that if the shareholders bargain, they can do only worse than just be content with their residual payoff. ■

Proof of Proposition 2.

The intuition for the proof is as follows. As the duration of the round shortens, the decline across adjacent bargaining rounds becomes equal, provided the decline is smooth enough so as to exclude too many spikes in its profile. Piecewise continuity of the first derivative of the decline function accomplishes that.

Let Δ denote the duration of every round. Then by the average value theorem $\beta_k - \beta_{k-1} = b[(N-k)\Delta] - b[(N-k+1)\Delta] = b'(\theta_k)\Delta$ for some $(N-k)\Delta \leq \theta_k \leq (N-k+1)\Delta$, $(k = 1, ..., N)$. Noting that $\beta_0 = b(N\Delta) = b(T - t_0)$ and using equation (4), we have

$$\frac{S_N - B_N}{V(t_0)} = \Delta\left[b'(\theta_N) - b'(\theta_{N-1}) + \ldots + b'(\theta_3) - b'(\theta_2) + b'(\theta_1)\right] - b(T - t_0) \tag{A6}$$

The inequality follows from the uniform continuity of the first derivative, which in turn

$$< \frac{\varepsilon\Delta(N-1)}{2} + b'(\theta_1)\Delta - b(T - t_0). \tag{A7}$$

follows from its continuity on the closed interval $[t_0, T]$. Hence,

$$\lim_{N\uparrow\infty, \varepsilon\downarrow 0} \frac{S_N - B_N}{V(t_0)} = -b(t_0). \tag{A8}$$

Therefore,

$$\lim_{N\uparrow\infty} \frac{S_N}{V(t_0)} = \lim_{N\uparrow\infty} \alpha_N = \frac{1 - b(T - t_0)}{2}. \tag{A9}$$

Using this result and taking the limits in equations (7) and (8) complete the proof. (Notice that the parameter t_0 has been replaced by the parameter t in order to get equations (9) and (10) of the corollary.) ■

Proof of Proposition 3.

Let $b_1(\cdot) \geq b_2(\cdot)$ be two deterioration functions. Let $\alpha_N^1(t_0)$ correspond to $b_1(\cdot)$, and $\alpha_N^2(t_0)$—to $b_2(\cdot)$. Then $\alpha_N^2(t_0) \geq \alpha_N^1(t_0)$, that is, the optimal deviations are greater for $b_2(\cdot)$. ■

Proof of Proposition 4.

Let the value of the firm, V_t, follow a stochastic differential equation $dV_\tau = \mu V_\tau dt + \sigma^V V_\tau dW_\tau$, where W_t, is a standard Wiener process. For simplicity, assume that the drift μ and the standard deviation of firm value returns, σ^V, are both constants, so that the firm-value process is a geometric Brownian motion. Using the Option Pricing Model, equity can be viewed as a European contingent claim on the value of the firm. The equity-value stochastic process is then fully determined by the effective payoff to equity at debt maturity. Under the absolute priority rules, equity is like a call-option with the face value of debt, F, as exercise price. Equity's value at time τ, before debt maturity, is then given by $E_\tau^{apr} = C(V_\tau;F)$, where C names the Black-Scholes call-option formula, and where only the dependence on underlying asset and exercise prices are shown explicitly, while time, interest rate, and standard deviation are suppressed.

Applying Itô's Lemma to E_τ^{apr} yields the standard deviation of the return on equity under the absolute priority rule regime (C'_1 denotes the first partial w.r.t. the first argument):

$$\sigma^{apr} = \left[\frac{\partial E_t^{apr}}{\partial V_\tau}\right]\left[\frac{V_\tau}{E_t^{apr}}\right]\sigma^V = C'_1\left(\frac{V_\tau}{F};1\right)\frac{V_\tau}{C(V_\tau;F)}\sigma^V. \tag{A10}$$

Under the deviations from absolute priority rules regime, equity value can be computed as the value of a contingent claim on the value of the firm with the payoff to shareholders given by equation (11) as boundary condition. Using the methodology in Garman (1976), this equity value is given by

$$E_\tau^{dev} = C(V_\tau;0) + (1-\alpha)C\left(V_\tau;\frac{F}{1-\alpha}\right). \tag{A11}$$

The standard deviation of equity return under the deviations from absolute priority rules regime is then given by

$$\sigma^{dev} = \left[\frac{\partial E_t^{apr}}{\partial V_\tau}\right]\left[\frac{V_\tau}{E_t^{dev}}\right]\sigma^V = \frac{\alpha + (1-\alpha)C'_1\left(\frac{V_\tau(1-\alpha)}{F},1\right)}{\alpha V_\tau + (1-\alpha)C(V_\tau,F/(1-\alpha))}V_t\sigma^V. \tag{A12}$$

It is then straightforward (but tedious) to show that $\sigma^{dev} \leq \sigma^{arp}$, where equality occurs only for $\alpha = 0$; that is, when the shareholders have no bargaining power. ■

Proof of Proposition 5

Assertion (i) follows from equation (12) and the fact that $b(T - t_0)$ is larger, the greater the liquidation value of the firm. Assertion (ii) is also a direct consequence of equation (12). ■

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NOTES

1. Models that emphasize other elements of financial distress are treated by Aivazian and Callen (1980, 1983), Haugen and Senbet (1978, 1988), Titman (1984), Brown (1989), Giammarino (1989), and Gertner and Scharfstein (1991).

2. Not all deviations from absolute priority rules involve shareholders (see Franks & Torous, 1989, Table 3). This paper does not directly analyze these other deviations, but the principle is the same.

3. Harris and Raviv (1993) provide yet another rationale for deviations from absolute priority rules, which concentrates on bankruptcy procedures that result in optimal liquidation decisions. They abstract from the effects of suboptimal investments, which is the focus of the current work.

4. Section 1104(a) of the Bankruptcy Code, Title 11, United States Codes. Mere management indiscretion is generally not a sufficient reason for the courts to appoint a trustee, since the courts assume that all Chapter 11 debtors will tend to have some degree of management difficulties (see McCafferty & Holthus, 1986).

5. When a player receives a refusal, he cannot retract; the value of the firm must deteriorate for another bargaining round. But that is only plausible, since realistically there must be some delay between the decision to retract and its implementation. When the duration of a bargaining round is shorter than the delay, the latter becomes an ironclad commitment. This chain of miniature but stout commitments drives the sequential bargaining model.

6. As in White (1989), Chapter 7 priority rules affect how bondholders and shareholders divide the pie in debt renegotiations, since these liquidation rules create a lower bound value for the debt below which debtholders are unwilling to negotiate (see also Aivazian & Callen, 1980, 1983). In fact, it is well recognized by the bankruptcy literature (Jackson, 1986, p. 214) that absolute priority rules in a Chapter 7 liquidation create a lower bound for the value of the debt in a Chapter 11 reorganization. This has been incorporated in Section 1129 of the Bankruptcy Code, which states that creditors have a right to receive at least as much as they would have under a Chapter 7 liquidation. This is one element of the *best interests of creditors* test.

7. Proofs for all propositions are in the appendix to this paper.

8. Subgames are those parts of the game in extensive form that commence at a given node and can be considered as a game on their own. Any strategy for the whole game induces a strategy in every subgame. A subgame-perfect equilibrium is an assignment of a strategy to each player, which induces Nash equilibria in every subgame. Intuitively, this amounts to saying that in a subgame-perfect equilibrium no player has reason to change his or her plan when arriving at *any* node in the game including those nodes that are not reached when playing the

equilibrium strategies. In other words, threats are credible. Selten (1975) defined and developed this refinement of the Nash equilibrium concept.

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