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Dynamic capital structure with callable debt and debt renegotiations

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ABSTRACT

We consider a dynamic trade-off model of a firm's capital structure with debt renegotiation. Debt holders only accept restructuring offers from equity holders backed by threats which are in the equity holders' own interest to execute. Our model shows that in a complete information model in which taxes and bankruptcy costs are the only frictions, violations of the absolute priority rule (APR) are typically optimal. The size of the bankruptcy costs and the equity holders' bargaining power affect the size of APR violations, but they have only a minor impact on the choice of capital structure.

1. Introduction

Empirical evidence suggests that for most firms in financial distress, debt and equity holders agree—either voluntarily or as part of a Chapter 11 process—to restructure the firm's capital thereby allowing the firm to continue operation, see Weiss (1990), Gilson et al. (1990), and Morse and Shaw (1988). We consider a dynamic capital structure model in which the going concern value of the firm makes debt renegotiation optimal for debt and equity holders. If the firm is in financial distress, the equity holders can make a take-it-or-leave-it offer to the existing debt holders in order to reestablish an optimal capital structure for the firm. The debt holders always have the option to reject the offer, but their decision whether to accept or reject depends on what they anticipate will happen if they reject. A critical feature of our model is that debt holders do not accept offers from equity holders which are not credible. An example of a non-credible threat is if equity holders threaten to liquidate the firm even if it would be better for them to keep servicing the existing debt. In equilibrium, the equity holders only make renegotiation offers which are accepted by the debt holders, but the off-the-equilibrium-path rejection values of debt and equity are the key in determining the equilibrium offer. We find that debt holders rationally accept deviations from the absolute priority rule as the outcome of the renegotiation game. The intuition is that equity holders know that non-credible threats will be rejected by debt holders and, hence, equity holders postpone their renegotiation offer to the point at which liquidation becomes a credible threat. At this point it is rational for the debt holders to accept deviations from the absolute priority rule, since liquidation is the alternative.

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We also allow for callable debt and reissuance of debt when the firm does well and, hence, our model extends and unifies several strands of the literature on dynamic capital structure. Compared to existing models, the combination of renegotiation and callability significantly increases the tax advantage to debt.

We consider a firm with a simple capital structure consisting of equity and a single class of callable perpetual debt. Following Goldstein et al. (2001), we use the firm's earnings before interest and taxes (EBIT) as the driving state variable. For an initial level of EBIT, an optimal capital structure is chosen to maximize firm value by trading off the tax advantage to debt, the cost of financial distress, and future restructuring costs. Subsequent to the issuance of debt and equity, the equity holders continuously decide whether to continue servicing the existing debt or to restructure the firm's capital. As the firm's EBIT increases, equity holders prefer more debt to better exploit the tax shield. As the firm's EBIT decreases, the equity holders prefer less debt in order to reduce the cost of financial distress. The initial values of debt and equity rationally reflect the equity holders' *ex-post* incentives to restructure as well as the payoffs received if restructuring occurs.

For reasons that will be explained when we define our model, we solve for debt and equity values in a case where there are finitely many renegotiation options. The starting point is first to solve a case with no renegotiation possibility at the lower boundary. This benchmark case is comparable to Goldstein et al. (2001), and is in accordance with classical models such as Black and Cox (1976), Merton (1974), and Leland (1994). In these models, the firm is liquidated at the lower boundary, and the tax advantage to debt is lost permanently. Our benchmark model deviates from these models by assuming that the value of the firm's production technology in liquidation is equal to the value for a new entrepreneur who can start afresh and optimally lever the firm's assets.

With debt renegotiation, equity holders may continue to service the debt after a rejection by the debt holders. To handle this, we need a friction that leaves the firm in a different shape after one renegotiation round consisting of an offer, a rejection, and a continuation of debt service. The friction is the loss of one renegotiation option, which brings the firm one step closer to the case with forced liquidation at the lower boundary. This friction is similar in spirit to the finite number of sequential offers refinement of the Nash equilibria in the Rubinstein bargaining game, cf. Rubinstein (1982, 1987).

Our model shares an important feature with strategic debt service models, cf. Anderson and Sundaresan (1996), Mella-Barral and Perraudin (1997), Hege and Mella-Barral (2005), and Hackbarth et al. (2007): When liquidation is costly, the debt and equity holders have a common interest in saving the costs of bankruptcy. There are two key differences between our debt renegotiation model and the strategic debt service models. First, in strategic debt service models, a failed renegotiation proposal leads to a forced liquidation of the firm. They rule out the possibility that equity holders may continue servicing the debt with the existing coupon payments, i.e., that the assumed bankruptcy threat to force concessions from the debt holders may not be a credible threat. In our model, we insist on credible threats which forces equity holders to postpone their restructuring offer. Second, in most of the strategic debt service models, there is no restructuring of the firm's capital—the equity holders only bargain in order to obtain temporary coupon relief; an exemption from this is e.g. Mella-Barral (1999). François and Morellec (2004), Galai et al. (2007), and Broadie et al. (2007) look at settings in which debt is not serviced while in Chapter 11, but the (original) coupon must be paid if the firm leaves Chapter 11. These papers incorporate important aspects of the Chapter 11 code, e.g., the automatic stay, but a successful exit of Chapter 11 does not solve the underlying capital structure (financial distress) problem. Annabi et al. (2010) consider the outcome of Chapter 11 as a non-cooperative game. They focus on the judge's role, and the random intervention leads to a game in multiple rounds, but they do not consider the firm's optimal capital structure.

Goldstein et al. (2001) find that their dynamic capital structure model gives lower leverage ratios than static capital structure models, *ceteris paribus*, since the firm can subsequently increase its outstanding debt, if EBIT increases sufficiently. By adding debt renegotiation to the model, we find that leverage ratios increase compared to the results of Goldstein et al. (2001). This is due to the fact that debt renegotiation reduces the negative impact of financial distress relatively to a setting in which liquidation is the only outcome of financial distress. The introduction of debt renegotiations increases the tax advantage to debt by 50% relative to a dynamic capital structure model with no debt renegotiation for realistic parameter values.

Our model gives a simple explanation of the violation of the absolute priority rule for firms in financial distress. Such APR violations are well documented in the empirical literature, see Weiss (1990), Eberhart et al. (1990), Betker (1995), Bris et al. (2006), and Altman and Hotchkiss (2010). In debt renegotiation models in which renegotiation proposals can be backed by non-credible threats, it is not surprising that APR violations may occur. We show that APR violations occur even when we insist that successful renegotiation proposals must be backed by credible threats. On the equilibrium path, it is perfectly rational for the debt holders to accept a renegotiation proposal from the equity holders which leaves some value to the equity holders even though the debt holders do not recover their full principal. A rejection by the debt holders does not necessarily force an immediate liquidation of the firm. Equity holders may continue servicing the debt with the promised coupon until the conditions become even worse. In equilibrium, equity holders postpone their renegotiation proposal to the point at which liquidation is a credible threat. We show that equity holders' bargaining power has a significant impact on the absolute priority violations, but that it only has a minor impact on the choice of capital structure and on the *ex-ante* optimally levered firm value. Hackbarth et al. (2007) also consider anticipated deviations from absolute priority that depend on the toughness of the bankruptcy regime, but the violations are not a rational model outcome.

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