Reorganization strategies and securities valuation under asymmetric information

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ABSTRACT

This paper examines optimal reorganization strategies during financial distress and securities valuation under asymmetric information. We model strategic interactions between debtholders and equityholders in a game-theoretic setting that can accommodate the varying bargaining powers of the two claimants. Two reorganization strategies are considered: Chapter 11 (debt–equity swap) and private workout (strategic debt service). Using Chapter 11 as a costly state verification device, we characterize in equilibrium which firms choose Chapter 11 and which choose private workout. In particular, we show how the bank's belief about the type of firm evolves by observation of reorganization strategies. We also derive closed-form solutions to both the equity and debt valuation problems under asymmetric information and show that credit spreads increase with the degrees of asymmetric information.

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1. Introduction

The U.S. Bankruptcy Code, which includes both liquidation (Chapter 7) and reorganization (Chapter 11) processes, provides rules to resolve a number of important issues associated with distressed firms. When a firm is unable to service contractual debt payments, that is, *default*, the firm or its creditors can file with a federal bankruptcy court for protection under either Chapter 7 or Chapter 11. In Chapter 7, the firm ceases operations, and the creditors seize the alienable physical assets of the firm, that is, *liquidation*. In Chapter 11, the firm remains in control of its operations and aims for recovery, that is, *reorganization*. Modelling such corporate features is critical in debt valuation literature.

Most structural models assume that the dispersion of creditors discourages renegotiation, such as Leland (1994). In these models, there is no difference between reorganization and liquidation. However, substantial empirical evidence has documented that debtors' reorganization rarely coincides with liquidation because creditors must bear a high liquidation cost. Therefore, there is a considerable scope for debt renegotiation. Recently, the possibility of debt renegotiation has been recognized by a stream of models, including Anderson and Sundaresan (1996), Mella-Barral and Perraudin (1997), and Fan and Sundaresan (2000).[1]

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[1] Also, another stream of models draws a clear distinction between the notions of *bankruptcy* and *liquidation*, including Paseka (2003), Francois and Morellec (2004), and Broadie, Chernov and Sundaresan (2007).

Unfortunately, the structural models above have assumed no asymmetric information between debtors and creditors, despite the fact that it is present and pervasive in practice.[2,3]

This paper explicitly draws out the implications of asymmetric information on optimal reorganization strategies and securities valuation. We suppose that there exist a bank (creditor) and many firms (debtors). Each firm has private information about its liquidation cost, which represents its latent liabilities, and is only realized after the firm has been liquidated. The lower the liquidation cost, or the smaller the latent liabilities of the firm, the more financially sound we can anticipate it is. Two reorganization strategies are considered: debt–equity swap (Chapter 11) and strategic debt service (private workout).[4] Under private workout, debt is costlessly renegotiated, and the bank cannot disclose the firm's true type about the liquidation cost. However, under Chapter 11, the firm's true type is fully disclosed at a reorganization cost required by a third party (e.g., court).[5] This truth-revealing feature in Chapter 11 reorganization is a good example of the well-known *costly state verification* concept of Townsend (1979). We can easily infer that both the firm and the bank will agree on private workout instead of Chapter 11 if there is no asymmetric information, since Chapter 11 is costly. In contrast, in the presence of asymmetric information, the bank would appeal to Chapter 11 (a costly state verification device) rather than trust the firm to agree on private workout. Therefore, we conclude that the presence of asymmetric information destroys the efficiency of social welfare.[6]

The key issue under asymmetric information is how the bank's belief about the type of firm evolves through time. We suppose the bank can only accept or reject the reduced level of debt service offered by the firm with probability equal to one. If the bank's original belief about the type of firm is *tight* (defined in Section 3), then a pooling equilibrium is realized. All firms choose private workout and pay exactly the same reduced level of debt service. The bank's belief is fixed throughout. On the other hand, if the bank's original belief about the type of firm is *diffuse* (defined in Section 3), then a partial separating-partial pooling equilibrium is realized.[7] Higher-type firms are forced to file for Chapter 11 one-by-one, while lower-type firms pay exactly the same reduced level of debt service through private workout. Whenever a firm filing for Chapter 11 appears, the bank can rationally adjust the higher end of its original belief. This process continues until the updated belief is tight enough. After this happens, the belief is stabilized, and the remaining firms successfully engage in private workout. This updating rule of belief resembles the one used in Lambrecht and Perraudin (2003).

This paper adopts a setting that resembles Chen (2003) in which asymmetric information on cash flow is introduced. However, we extend Chen (2003) in the following dimensions. First, we provide a more reasonable scenario for how the reduced level of debt service is endogenously determined in equilibrium by considering the trade-off between the level and the probability of strategic debt service. Second, we remove the non-traded equity constraint in Chen (2003) by assuming that asymmetric information comes from the liquidation cost, not cash flow. As a result, the valuation of equity becomes possible. Note that the liquidation cost (a parameter that indicates the latent liabilities of the firm) is only realized after the firm is liquidated. In particular, we assume that the cost of Chapter 11 is proportional to liquidation cost (i.e., we consider liquidation cost before liquidation actually occurs). Therefore, we can set it as the source of asymmetric information. Third, while the cost of Chapter 11 is constant in Chen (2003), our model allows it to reflect the type of firm; more precisely, the cost of Chapter 11 increases with the type of firm. This specification is based on the intuition that, the higher the true type, or the more latent liabilities of the firm, the more costly the information disclosure is. Fourth, we draw a distinction between market valuation and the firm's true value due to asymmetric information. The overvaluation (undervaluation) problem of securities and credit spreads is important under asymmetric information, because after filing for Chapter 11, the true type of firm is perceived by the market, and a sudden change in the valuation of both equity and debt is incurred.

The remainder of this paper is organized as follows. Section 2 describes the model's setup. As a useful benchmark, we examine optimal reorganization thresholds and the equity and debt values under the two strategies in the full-information setting. In Section 3, as the main part of this paper, we extend the benchmark to the asymmetric-information setting. Concretely, we derive dynamic Bayesian–Nash equilibria and analyze the characteristics of different equilibria depending on the bank's belief. Closed-form solutions to both the equity and debt valuation problems under asymmetric information are then provided. Section 4 calibrates the model to realistic parameter values and shows model implications. Section 5 offers a conclusion. Proofs can be found in the Appendix.

2. Model

This section describes our model, which resembles two recent papers, Mella-Barral and Perraudin (1997) and Fan and Sundaresan (2000). We apply them to the valuation of equity and debt under two reorganization strategies: Chapter 11 (debt–equity swap) and private workout (strategic debt service) in the full-information setting. After that, we prepare assumptions about asymmetric information in detail for the next section.

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[2] An excellent overview of the literature on asymmetric information can be found in Mas-Collel, Whinston and Green (1995), Laffont and Martimort (2002), and Tirole (2005).

[3] While our paper focuses on the issue of asymmetric information, several papers analyzed agency problems due to conflicts of interest between equityholders and debtholders. See Leland (1998), Mauer and Ott (2000), Ziegler (2004), and Mauer and Sarkar (2005).

[4] Gilson, John and Lang (1990) reported that in a sample of 169 financially distressed firms, about half avoided liquidation by filing for Chapter 11 and half by private workout. In particular, three-quarters of private workout involves a reduction of debt obligations.

[5] According to Chapter 11 of the U.S. Bankruptcy Code, the debtor must make extensive, regular disclosures of its financial and operating data to the court.

[6] Giammarino (1989) also reached a similar conclusion when creditors suffer from an asymmetric information problem.

[7] Stiglitz and Weiss (1992) also showed that equilibrium may be characterized by pooling or partial separating-partial pooling in their model.