Journal of Banking and Finance 82 (2017) 40–58

Contents lists available at ScienceDirect

Journal of Banking and Finance

journal homepage: www.elsevier.com/locate/jbf

Resolution of financial distress under agency frictions

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ARTICLE INFO

Article history:
Received 10 March 2015
Accepted 19 May 2017
Available online 26 May 2017

JEL classification:
D82
G32
G33

Keywords:
Dynamic financial contracting
Moral hazard
Recapitalization
Liquidation

ABSTRACT

We introduce, in a dynamic-contracting framework with moral hazard, the possibility of recapitalization as an alternative to liquidation when a firm is distressed. This is achieved by considering a risk-averse agent and by allowing (but not requiring) the latter to inject additional capital into the firm when necessary. We show that firm recapitalization may arise in an optimal, long-term contract. As a consequence, we find that there are two mechanisms at a firm's disposal so as to deal with financial difficulties: one corresponds to a recapitalization process, the other to a liquidation one. The choice of mechanism is based on a cost-benefit analysis.

1. Introduction

There are two basic scenarios that a firm faces when it is unable to honor its commitments to its debtholders: it is either liquidated and disappears or it is recapitalized and continues operating. Our main objective is to study how this choice is made. More specifically, we examine the implications of agency conflicts and external financing costs on firm value and on the optimal resolution mechanisms of financial distress.

Thus far, the literature on corporate bankruptcy and distress[1] typically assumes exogenous capital structures of firms in financial distress and, given some agency issues, examines how to optimally restructure them. We adopt a different approach: using an optimal-contracting framework with moral hazard, we analyze optimal resolutions of financial distress. Proceeding in this way has two key advantages: *i*) capital structures must not be assumed ex-ante and *ii*) bankruptcy procedures can be determined endogenously. In our model, the mechanism to handle financial distress provides good-management incentives to corporate insiders.

We build on the standard, dynamic moral-hazard setting in which a risk-neutral entrepreneur raises funds from external, risk-neutral investors to finance a project. The contractual relationship between these two parties is hindered by the agency problem arising from the fact that the entrepreneur is better informed about the project and her actions than the investors. In the standard model, the only way for the latter to provide incentives to the former pertains the right to terminate the relationship and seize all assets, should the entrepreneur be unable to make the promised repayments. Hence, when facing a business failure, the firm has only one option: let the investors trigger liquidation. This implies that the standard model does not allow for an analysis of different mechanisms to address financial distress. In order to facilitate such an analysis, we deviate from the standard setup in two aspects: first, we assume that the entrepreneur is risk-averse in the sense that her marginal utility with respect to monetary income has a jump below a certain level. Second, we introduce the possibility of recapitalization by relaxing the entrepreneur's limited liability constraint and allowing her to contribute additional funds into the firm if this serves her own interests. Our focus is on the choice between liquidation and recapitalization. Note that, in practice, executing an equity infusion to avoid default is an option available to financially distressed firms. Distressed equity issuances are not rare: Jostarndt (2009) reports that in Germany, between 1996 and 2004, 123 out of 267 financially-troubled corporations issued new equity. Franks and Sanzhar (2006) document that distressed equity issuances were a significant proportion of the total seasoned issuances in the United Kingdom from 1989 to 1998.

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[1] For an excellent review, see Senbet and Wang (2012).

http://dx.doi.org/10.1016/j.jbankfin.2017.05.009
0378-4266/

Deviating from the aforementioned standard setting, we analyze a scenario in which a risk-averse entrepreneur contracts with a diffuse base of risk-neutral investors so as to finance a business project.[2] Once funded and running, the project produces observable cashflows, whose distribution depends on the unobservable effort exerted by the entrepreneur. We assume, for simplicity, that the possible effort levels are only *high* or *low*. The distribution of the cashflows under high effort first-order stochastically dominates the one under low effort. Exerting low effort, however, provides the entrepreneur with private benefits. In order to induce the entrepreneur to choose the high effort level, the investors can use performance-based incentives: the entrepreneur receives bonus payments after good performances but she is punished if performances are unsatisfactory. In line with the literature, we allow the investors to punish the entrepreneur by terminating the contract. In addition, the investors may request a monetary transfer from the entrepreneur. Given her risk aversion, such a transfer is costly to the entrepreneur. There is also a maximum amount she is willing to contribute, determined by the present value of the cashflows accruing to her, if the firm continues to operate.

Our contribution to the literature is twofold. First, we fully characterize, in an infinite-horizon setting, the optimal contracting mechanism when the entrepreneur exhibits a risk-averse behavior. Second, we study the implications of the optimal contract on the firm's decisions regarding how to deal with financial distress. We show that the optimal (abstract) mechanism can be implemented using debt, equity and cash reserves. In the proposed implementation, the entrepreneur is not only the firm's manager but also an inside shareholder; thus, her monetary transfers to investors may be interpreted as a recapitalization of the firm. The cost she has to bear has the natural interpretation of that of issuing new equity. The constraint on the amount she is willing to inject reflects the fact that, in reality, the participation of the existing shareholders in the recapitalization process is voluntary. The choice between the two punishment devices (termination or monetary transfers) corresponds to the firm's choice between liquidation and recapitalization. Our formulation captures two essential stylized facts related to real-world recapitalization processes: their cost and voluntary nature. We find that, if it is not too costly, the distressed firm is recapitalized up to the extent that the liquidation risk is totally eliminated. Importantly, we observe that any distressed equity issuance must be accompanied by debt concession, which is in line with the stylized fact reported by Franks and Sanzhar (2006).

The analysis of the optimal contract allows us to derive comparative statics. For instance, we find that the net issuance proceeds are decreasing in the recapitalization cost and increasing in the volatility of cashflows, as well as in the magnitude of debt concession. To complement our analytical findings, we conduct a numerical analysis in which we find that: *i*) the firm's value is decreasing in the recapitalization costs; *ii*) the marginal value of cash increases with the recapitalization costs and the volatility of cashflows; *iii*) the more severe the moral-hazard problem, the likelier that the liquidation regime is the optimal financial-distress mechanism; and *iv*) the recapitalization regime is more likely to be optimal when the liquidation value of the firm is low. Using these comparative statics, we derive some predictions related to the factors that tend to promote a distressed equity issuance.

Our work is closely related to the dynamic-agency models of Biais et al. (2004); 2007) and DeMarzo and Fishman (2007b). These authors analyze the design of financial contracts so as to mitigate the agency conflicts between investors and entrepreneurs. However, they focus on the use of liquidation for incentive purposes and do not consider recapitalization possibilities, i.e. in their models, transfers to the entrepreneurs must be non-negative. Our model extends the setting in Biais et al. (2007) by introducing the option of recapitalization, which we show may arise as an alternative to liquidation. Specifically, we deviate from their setup in two key aspects: *i*) we assume that the entrepreneur is risk averse and *ii*) we allow (but do not require) the entrepreneur to inject money into the firm when necessary.

Our assumption that capital injections during the firm's lifespan are possible is similar to Clementi and Hopenhayn (2006) and DeMarzo and Fishman (2007a), who use models of multi-period borrowing/lending under asymmetric information to investigate the investment decisions of firms, as well as their growth and survival rates. However, in contrast with these works, where new capital contributions result in firm growth, in our model additional capital serves to honor debt, so that the firm can be maintained as a going concern.

The optimal dynamic contracting problem is also analyzed in continuous-time settings by, among others, Biais et al. (2010), DeMarzo and Sannikov (2006), Hoffmann and Pfeil (2010) and Sannikov (2008). Although a discrete-time setting is more intuitive, the main advantage of a continuous-time approach is its tractability, which stems from the differential equations that characterize the optimal contract. This fact notwithstanding, we have opted to use a discrete-time model, our setup being sufficiently tractable to allow us to fully solve for the optimal contract.

The organization of the paper is as follows: in Section 2 we describe the model and formulate the optimal-contracting problem. In Section 3 we analyze the main properties of the optimal contract. In Section 4 we propose an implementation of this contract and discuss in detail its implications on the firm's decisions regarding financial distress. We conclude in Section 5. All proofs are provided in Appendix A. Various technical aspects of the optimal contract are treated in Appendix B, Appendix C and Appendix D.

2. The model

2.1. General contractual environment

We work in an infinite-horizon setting where (discrete) time is indexed by $t = 1, 2, \ldots$. The economy consists of a risk-averse entrepreneur and a group of risk-neutral investors. All agents discount the future at the constant rate $r > 0$. The entrepreneur has access to a risky project that requires the start-up capital I, which exceeds her initial wealth A. Hence, she needs to raise funds from investors. Once the latter have agreed to provide financing, a firm is created to operate the project.

The project generates random cashflows R_t in period t. Whenever the project is successful, the entrepreneur collects the high cashflows R_h. If the project fails, the cashflows are R_l, which is strictly smaller than R_h. The project's probability of success in period t depends exclusively on the effort e_t exerted by the entrepreneur. This results in cashflows that are independent across periods. For the sake of simplicity, we also assume that only two effort levels are possible: $e_t = 1$ (*high effort*) and $e_t = 0$ (*low effort*). The probability of success corresponding to the effort level e_t is $p(e_t)$ where:

$$p(e_t) = \begin{cases} p & \text{if} \quad e_t = 1; \\ p - \Delta p & \text{if} \quad e_t = 0; \end{cases}$$

and $0 < \Delta p < p < 1$ are given. The entrepreneur enjoys a private benefit equal to $B(1 - e_t)$, with B strictly positive. Hard work by the entrepreneur improves the expected profitability of the project, but it also prevents her from enjoying private benefits. The entrepreneur's effort is unobservable to outsiders and, therefore, cannot be contracted upon.

[2] Given the diffuse nature of the shareholder base, it is natural to assume that they behave like a risk-neutral player: the principal.