

Discussion:
**Debt with Endogenous Safety Covenants:
Default and Corporate Securities**

Harjoat S. Bhamra
UBC, Sauder School of Business

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Objective

- ▶ Value corporate debt with an *endogenous* safety covenant
- ▶ What type of safety covenants are considered
 - Promise to repay principal if equity value falls below some threshold
- ▶ Why is this covenant endogenous?
 - In a typical structural model (e.g. Merton (1973) and Leland (1998)), equity value is endogenous, unlike asset value.

Motivation

- ▶ There is concern that issuing debt with safety covenants can *increase* the probability of bad events, such as default
- ▶ Firm's which have issued debt with endogenous safety covenants, such as Enron, have suffered a sharp *fall* in share price.

Questions:

- ▶ Inside a standard structural model, what impact do endogenous safety covenants have on the **share price** and **default probability** and why?

Model

- ▶ Exogenous asset value, V
- ▶ Debt value is D . Debt has face value K and matures at time T
- ▶ Equity value is E

No safety covenants: Merton (1973)

- ▶ The debtholder receives her principal K if $V_T > K$.
- ▶ If $V_T \leq K$, default occurs and the firm's assets V_T are transferred to the debtholders
- ▶ The debtholder owns a European-style option

$$D_t = E_t^{\mathbb{Q}}[e^{-r(T-t)} \min(V_T, K)]$$

- ▶ The equityholders own the firm's assets less the payment of K to the bondholders, unless default occurs, i.e. $V_T \leq K$, in which case the value of equity is zero.
- ▶ The equityholder owns a European-style call option

$$E_t = E_t^{\mathbb{Q}}[e^{-r(T-t)} \max(V_T - K, 0)]$$

With a Safety Covenant

- ▶ Safety covenant
 1. Debtholder can get back principal K , if $E \leq F$, where F is exogenous
 2. Equityholder can choose to pay back principal K to debtholder, if $E > K$

- ▶ Time at which debtholder chooses to get back principal is some stopping time τ_d

- ▶ Time at which equityholder chooses to repay principal is some stopping time τ_e

- ▶ Debt value now has two components

1. When $E \leq F$, the debtholder must decide when to exercise the option, provided that the equityholder has not previously paid back the debtholder, i.e. $t < \min(\tau_e, T)$

$$E_t^{\mathbb{Q}}[e^{-r(\tau_d-t)} \min(V_{\tau_d}, K)]$$

2. The debtholder receives $\min(V, K)$ at date τ_e , when the equityholder repays her

$$E_t^{\mathbb{Q}}[e^{-r(\tau_e-t)} \min(V_{\tau_e}, K)]$$

- ▶ Overall debt value is the optimal value (wrt τ) of the sum of the two components:

$$E_t^{\mathbb{Q}}[e^{-r(\tau_d-t)} \min(V_{\tau_d}, K) \mathbf{1}_{E_{\tau} \leq F} \mathbf{1}_{\tau < \min(\tau_e, T)} + e^{-r(\tau_e-t)} \min(V_{\tau_e}, K) \mathbf{1}_{\tau = \tau_e}]$$

- ▶ Debtholder owns an American option with payoff $\min(V, K)$.

- ▶ Similarly, equity value has two components

$$E_t^{\mathbb{Q}}[e^{-r(\tau-t)} \max(V_{\tau} - K, 0) \mathbf{1}_{E_{\tau} \geq F}]$$

and

$$E_t^{\mathbb{Q}}[e^{-r(\tau_d-t)} \max(V_{\tau_d} - K, 0) \mathbf{1}_{\tau_d < \tau \text{ or } (E_{\tau} \leq F \text{ and } \tau = \tau_d)}]$$

Debt holders' Optimal Stopping Problem

- ▶ Just ask for prepayment of principal whenever $E \leq F$.

Equityholders' Optimal Stopping Problem

- ▶ Hard: The equityholders can only decide to redeem the debt's face value whenever $E > F$, but E itself depends on the equityholder's decision!

(Some of the) Main Results

- ▶ Protection for debtholders is at expense of equityholders and the covenant reduces equity value
- ▶ Default probability is increased by the safety covenant

Minor Comments

- ▶ Paper has many results. Decide which ones to focus on
- ▶ More intuition