Corporate Finance: Capital structure and corporate control

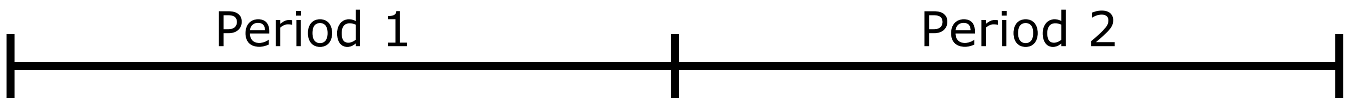
Yossi Spiegel
Recanati School of Business

Grossman and Hart, BJE 1980

"Takeover Bids, the Free-Rider Problem, and the Theory of the Corporation"

The free rider problem

- The timing:



The firm is established by an entrepreneur and is worth X

A raider appears and can increase value by R; the raider makes a tender offer X+P

- Consider an individual equityholder with equity participation α

- Let γ_Y be the prob. that the raid succeeds if the equityholder tenders and and γ_N if he does not tender. The equityholder will tender iff

$$\underbrace{\alpha\left[\gamma_Y\left(X+P\right)+\left(1-\gamma_Y\right)X\right]}_{\text{Tender}}\geq\underbrace{\alpha\left[\gamma_N\left(X+R\right)+\left(1-\gamma_N\right)X\right]}_{\text{Don't tender}}$$

The free rider problem

- Suppose that each individual equityholder is atomistic $\Rightarrow \gamma_Y = \gamma_N = \gamma$

- The condition for tendering:

$$\underbrace{\alpha[\gamma(X+P)+(1-\gamma)X]}_{\text{Tender}} \geq \underbrace{\alpha[\gamma(X+R)+(1-\gamma)X]}_{\text{Don't tender}} \quad \Rightarrow \quad \underbrace{P}_{\text{Tender}} \geq \underbrace{R}_{\text{Don't tender}}$$

- The raider's profit:

$$\underbrace{(X+R)}_{\text{Ex post payoff}} - \underbrace{(X+P)}_{\text{Payment}} = R - P \leq 0$$

- The raider gets nothing and will not ride if the ride requires a cost C!

Toeholds

- The minimal P to induce atomistic equityholders to tender is R

- If the raider has a fraction β in the firm to begin with then his payoff is

$$\underbrace{(X+R)-(X+R)(1-\beta)}_{\text{Payoff with takeover}} - \underbrace{\beta X}_{\text{Absent takeover}} = \beta R$$

- The takeover will take place iff βR > C, where C is the cost of takeover

Dilution

- If the takeover succeeds, the raider can "steal" ϕ from the firm (ϕ is implied by the firm's charter)

- The condition for tendering:

$$\underbrace{\alpha\left[\gamma(X+P)+(1-\gamma)X\right]}_{\text{Tender}} \geq \underbrace{\alpha\left[\gamma(X+R-\phi)+(1-\gamma)X\right]}_{\text{Don't tender}} \Rightarrow \underbrace{P}_{\text{Tender}} \geq \underbrace{R-\phi}_{\text{Don't tender}}$$

- The raider's payoff

$$\underbrace{X+R}_{\text{Ex post payoff}} - \underbrace{(X+R-\phi)}_{\text{Payment}} - C = \phi - C$$

- The takeover will succeed iff $\phi > C$

Probabilistic C

- Suppose that C ~ [0, ∞) according to F(C)

- The takeover succeeds with prob. F(ϕ)

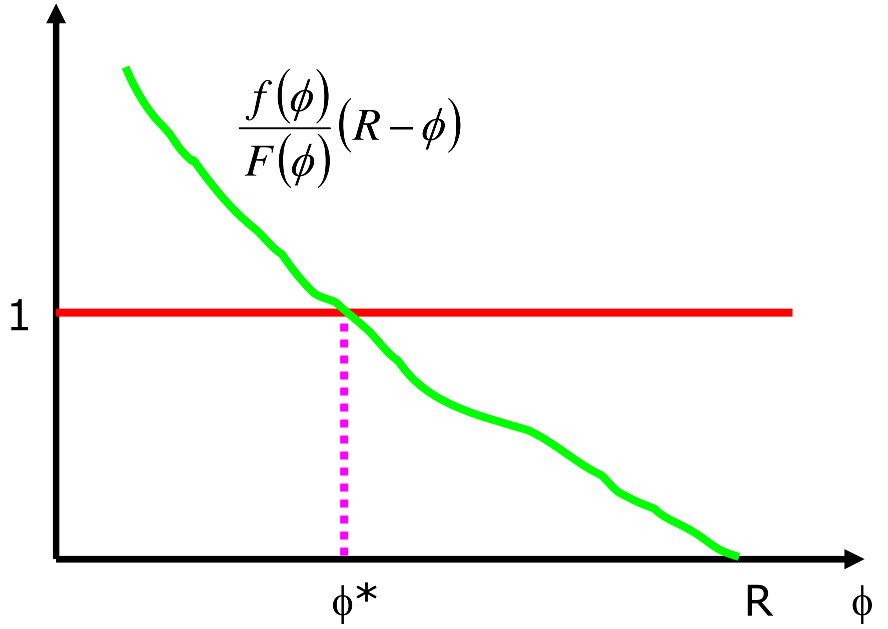
- The firm's value ex ante:

$$V(\phi) = F(\phi)(X + P) + (1 - F(\phi))X = X + F(\phi)\underbrace{P}_{R-\phi}$$

The optimal choice of ϕ

- F.O.C for ϕ:

$$V'(\phi) = \underbrace{f(\phi)(R-\phi)}_{\substack{\text{Marginal benefit}\\\text{from increased prob}\\\text{of takeover}}} - \underbrace{F(\phi)}_{\substack{\text{Marginal cost}\\\text{from decreased P}}} = 0 \quad \Rightarrow \quad \frac{f(\phi)}{F(\phi)}(R-\phi) = 1$$



Stulz, JFE 1988

"Managerial Control of Voting Rights: Financing Policies and the Market for Corporate Control"

The model

- The timing:

Stage 0	Stage 1	Stage 2
The firm is established, the entrepreneur keeps equity α and issues $1-\alpha$ to outsiders	A raider shows up and may offer p to acquire ½ of the shares	Cash flow X is realized irrespective of the takeover

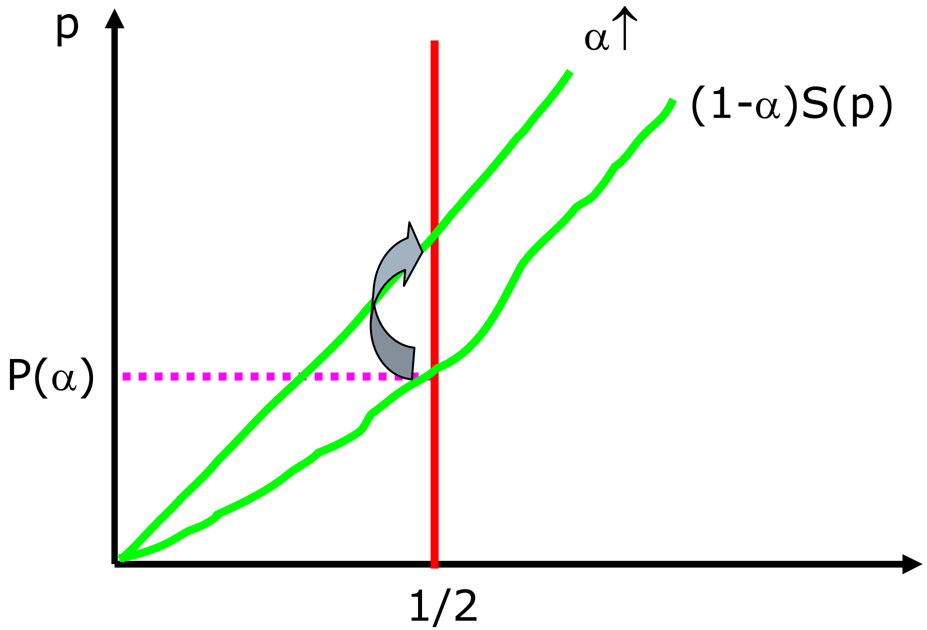
- The raider has benefits of control $B \sim [0, \infty)$
- To take over the firm the raider needs ½ of the equity
- The raider can try to acquire shares from outsiders. The supply of shares is $(1-\alpha)S(p)$, where $S'(p) > 0$ (more outsiders submit shares when p is higher)

Takeover

- To induce a takeover, p needs to be

$$(1-\alpha)S(p)=\frac{1}{2} \quad \Rightarrow \quad p=p(\alpha)$$

- $p'(\alpha) > 0$: $\alpha\uparrow \Rightarrow p\uparrow$



Takeover

- The raider will take over iff B ≥ p(α) ⇒ the prob. of takeover is 1-F(p(α))

- The entrepreneur's payoff:

$$Y(\alpha) = \underbrace{\alpha X}_{\text{Retained shares}} + \underbrace{B_E F(p(\alpha))}_{\text{Private benefits}} + \underbrace{(1-\alpha)[X + (1-F(p(\alpha)))p(\alpha)]}_{\text{Sold shares}}$$

$$= X + B_E F(p(\alpha)) + (1-\alpha)(1-F(p(\alpha)))p(\alpha)$$

The optimal choice of α

- F.O.C for α:

$$Y'(\alpha)=\underbrace{[B_E-(1-\alpha)p(\alpha)]f(p(\alpha))p'(\alpha)}_{\text{Effect on the prob. of takeover}}$$

$$+\underbrace{(1-\alpha)(1-F(p(\alpha)))p'(\alpha)}_{\text{Effect on the price of sold shares}}-\underbrace{(1-F(p(\alpha)))p(\alpha)}_{\text{Quantity effect}}$$

$$=0$$

- When $\alpha \to ½$, then $(1-\alpha)S(p) = ½$ iff $S(p) \to 1 \Rightarrow p \to \infty$ and $F(p) \to 1$:

$$Y'(1/2)=\left[B_E-\underbrace{\frac{p(1/2)}{2}}_{=\infty}\right]f(p(1/2))p'(1/2)<0$$

The optimal choice of α

- When $\alpha = 0$:

$$Y'(0) = \underbrace{[B_E - p(0)] f(p(0)) p'(0)}_{\text{Effect on the prob. of takeover}} + \underbrace{(1 - F(p(0))) p'(0)}_{\text{Price effect}} - \underbrace{(1 - F(p(0))) p(0)}_{\text{Ownership effect}}$$

$$= [B_E - p(0)] f(p(0)) p'(0) + (1 - F(p(0)))(p'(0) - p(0))$$

- If p’(0) > p(0) then y’(0) > 0 so α^* > 0

Israel, JF 1991

"Capital Structure and the Market for Corporate Control: The Defensive Role of Debt Financing"

The model

- The timing:

Stage 0	Stage 1	Stage 2
The firm is established by an entrepreneur and issues debt with face value D	A raider shows up and may takeover the firm	Cash flow X is realized and debt is due

- The value of the firm under the entrepreneur is 0
- The value of the firm under the raider is R ~[0, ∞) with mean ER
- If a takeover takes place, R is split between the entrepreneur and the raider in proportions γ and 1-γ

Analysis

- All-equity firm:
  - The raider comes, takes over the firm and pays γER
- Leveraged firm:
  - The raider takes over the firm iff $R > D$ and pays the entrepreneur $\gamma(R-D)$
  - If $R < D$ there is no takeover; since the firm is worth 0 under the entrepreneur, debtholders receive nothing

The choice of debt

- The value of the firm:

$$V(D) = \underbrace{\int_D^{\infty} \gamma(R - D)\,dF(R)}_{\text{Equity}} + \underbrace{\int_D^{\infty} D\,dF(R)}_{\text{Debt}}$$

- The f.o.c for D:

$$\begin{aligned} V'(D) &= -\int_D^{\infty} \gamma\,dF(R) + \int_D^{\infty} dF(R) + Df(D) \\ &= -(1-\gamma)(1 - F(D)) + Df(D) \\ &= 0 \end{aligned}$$

The choice of debt

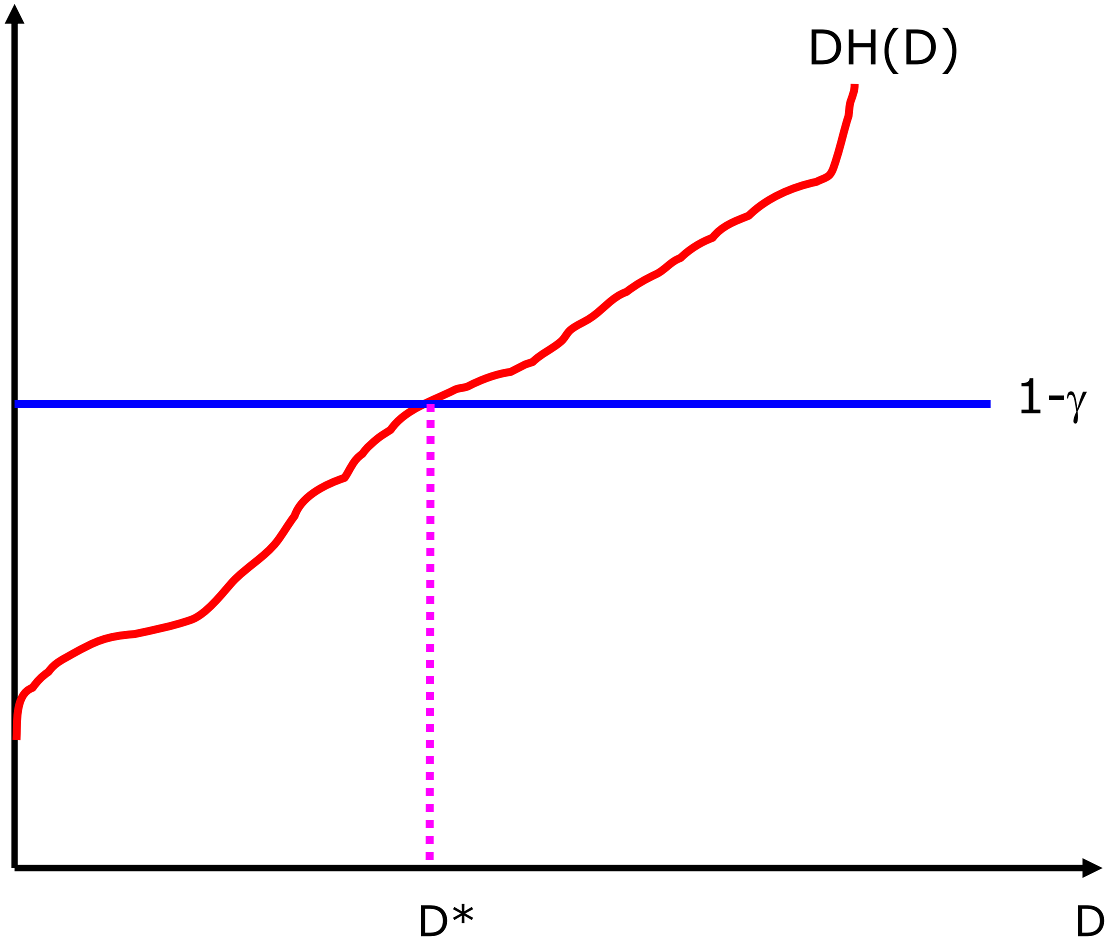
- Rewriting f.o.c:

$$\frac{Df(D)}{1-F(D)} \equiv DH(D) = 1-\gamma$$

- At the optimum,
  - $D^* > 0$
  - $D^* < \infty$

- Comparative stats:
  - $\gamma\uparrow \Rightarrow D\downarrow$

Illustrating the first-order conditions



Illustrating the model