Collateral, Risk Management, and the Distribution of Debt Capacity

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Financing and Risk Management Trade-off

Punchline

- **Financing and risk management are fundamentally linked**
  - ... as both involve promises to pay
  - ... which are limited by collateral constraints
- This **fundamental trade-off** has important implications for
  - ... corporate risk management
  - ... the distribution of debt capacity

Main Results

Two main results

- Result 1: **More constrained firms do less risk management!**
  - ... contrary to received theory
  - ... consistent with empirical evidence

- Result 2: **Distribution of debt capacity** shifts to less productive/better capitalized firms.
  - More constrained firms may be forced to downsize.
  - Less capital deployed by more productive/poorly capitalized firms in downturns.

Model of Dynamic Collateralized Financing

Key: Collateral constraints

- **Collateral constraints** due to limited enforcement
  - We derive collateral constraints similar to Kiyotaki/Moore (1997)
    - ... from limited enforcement similar to Kehoe/Levine (1993)

- This talk: **Simplest version of model**
  - Skip derivation and start directly with collateral constraints
  - 2 periods, 2 states
  - Fixed price of capital

Model

Firm

- 3 dates: $t = 0, 1$, and 2
- **Risk neutral firm's objective:** expected present value of dividends

$$E\left[\sum_{t=0}^{T} \beta^t d_t\right] \tag{1}$$

- Internal funds w_0 at time 0
- Investment of k_t at time t yields cash flow

$$A_{t+1}(s) f(k_t)$$

at time $t + 1$ where $f(\cdot)$ is **concave production function**, $A(s)$ is productivity in state s

Model (Cont'd)

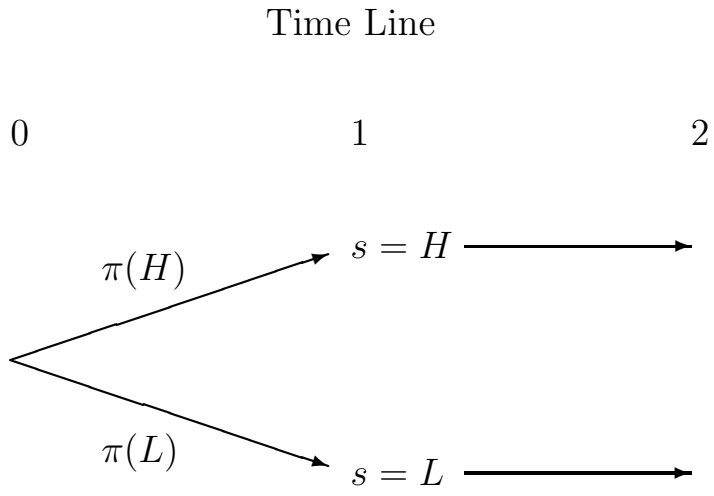
Financiers

- Risk neutral and discount future at rate $\beta < 1$
- Large endowment of funds in all dates and states
- ... willing to lend in state-contingent way at expected return $R \equiv 1/\beta > 1$

Model (Cont'd)

Simplest case.

- **Two states at time 1:** state $s \in \mathcal{S} \equiv \{H, L\}$
- Cash flow either high or low: $A(H) > A(L) > 0$



Financing with Collateral Constraints

Firm's problem

- Maximize expected present value of dividends (1) by choosing
  - ... dividend, investment, financing, and risk management policy

  subject to **budget constraints** at date 0, 1, and 2,

$$w_0 + \sum_{s \in \mathcal{S}} \pi(s) b_1(s) \;\geq\; d_0 + k_0 \tag{2}$$

$$A_t(s) f(k_{t-1}(s)) + k_{t-1}(s) + b_{t+1}(s) \;\geq\; d_t(s) + k_t(s) + R b_t(s), \tag{3}$$

- and **collateral constraints** for each date and state

$$\theta k_{t-1}(s) \;\geq\; R b_t(s), \tag{4}$$

- and **limited liability constraints** (and non-negativity of capital)

$$d_t(s) \geq 0, \quad k_t(s) \geq 0. \tag{5}$$

Risk Management Subject to Short Sale Constraints

Equivalence

- Financing with state-contingent debt subject to collateral constraints (4) equivalent to non-contingent debt plus

  - ... **risk management with one-period Arrow securities subject to short sale constraints**

$$h_t(s) \geq 0$$

where $h_t(s) \equiv \theta k_{t-1}(s) - Rb_t(s)$

Financing - Risk Management Trade-off

Main result: Constrained firms hedge less!

- **Firms with sufficiently low net worth do not engage in risk management** (Proposition 7)
  - Or: ... exhaust debt capacity against all states
  - More generally: **more constrained firms hedge less!**

- Intuition:
  - Financing need for investment overrides hedging concerns.

- Consistent with the **evidence**:
  - Smaller (and low dividend paying) firms hedge less.

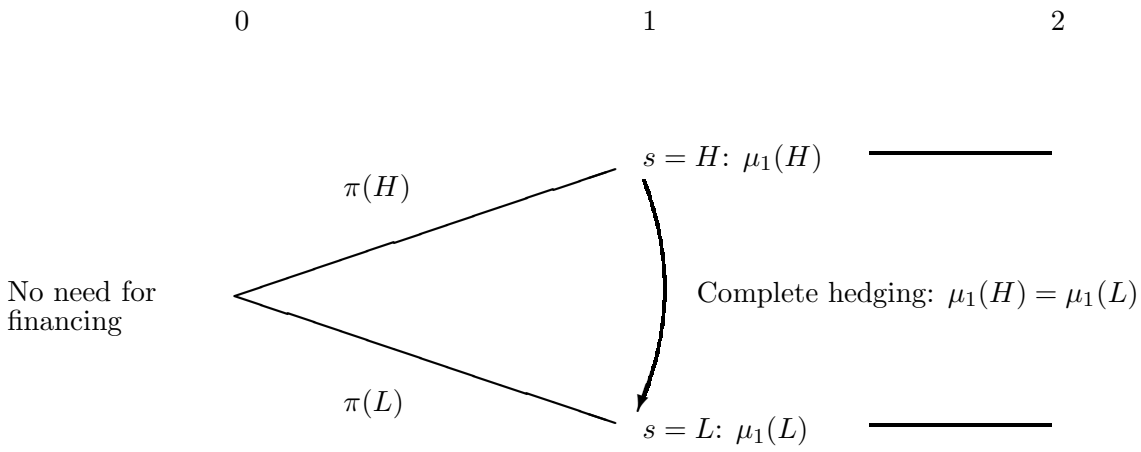
- But isn't this the opposite of what received theory predicts? – Indeed.

Reconsidering Risk Management

Risk management as in Froot/Scharfstein/Stein (1993)

- They assume
  - ... complete markets, perfect enforcement at $t = 1$, and no financing need at $t = 0$

  and show that optimal hedging policy implies **"full hedging"**
  - ... and equalizes marginal value of net worth across states at $t = 1$

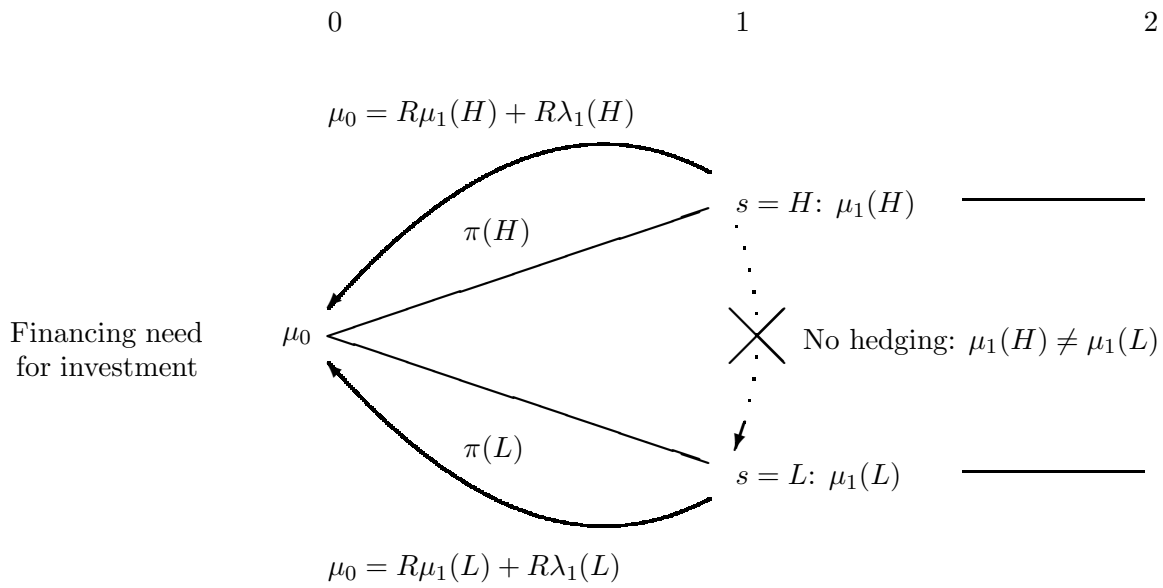


Reconsidering Risk Management (Cont'd)

Financing and risk management subject to collateral constraints

- Our model assumes
  - ... complete markets subject to collateral constraints and financing need at $t = 0$

  and implies that
  - ... **financing need can override hedging concern**



Distribution of Debt Capacity

Synopsis

- **Productive borrowers exhaust debt capacity**
  - ... because the opportunity cost of conserving debt capacity is foregone investment
  - Ditto for constrained firms!
- Such firms may be **forced to downsize**
  - ... exactly in times when cash flows are low but investment opportunities arise
- **Financial innovation** may aggravate these effects
  - ... as higher θ means firms can pledge more (leaving them with less net worth ex post)
- Infinite horizon model: Rampini/Viswanathan (2010) *Collateral and capital structure*

Conclusion

Financing and risk management are fundamentally linked

- Firms' promises to pay are limited by collateral constraints
- New perspective on dynamic risk management
  - ... **more constrained borrowers hedge less**
- Productive/less well capitalized borrowers likely exhaust debt capacity
  - ... and may be forced to downsize