EC372 Bond and Derivatives Markets

Financial Intermediation, II

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University week 25

Outline

1. Financial Intermediation as Delegated Monitoring
   - Principal-Agent relationships
2. The Holmstrom & Tirole (HT) Model
3. Fixed Investment
   - Direct finance
   - Indirect finance
   - Interpretation
   - Credit Market Equilibrium
4. Variable Investment

Reading: Lecture notes (available online in the CMR)

Delegated Monitoring

- Investors delegate responsibility for monitoring borrowers to intermediaries.
- Aspects of delegated monitoring:
  1. Screening – assess borrower's creditworthiness
  2. Prevention – check borrower's behaviour
  3. Auditing – penalise borrower's misbehaviour

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Principal-Agent theory: a sketch

- The principal seeks to control the actions of an agent in the interests of the principal.
- Suppose principal has complete control over the agent:
  – treat as a single decision-making unit
- Suppose principal has incomplete control over the agent:
  – scope for genuine principal-agent relationship
- The principal designs rules to give incentives to the agent to act in the principal's interests
- Why does the principal have incomplete control over the agent?
  1. Hidden actions ⇒ Moral hazard
  2. Hidden information ⇒ Adverse selection

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Principal-Agent: Financial Intermediation

- Financial intermediation: principal $\Leftrightarrow$ bank; agent $\Leftrightarrow$ borrower
- Principals (banks) elicit information from or influence the behaviour of agents (borrowers)
- Key assumptions in the 'moral hazard' approach:
  1. Incomplete contracts: lender cannot specify borrower's action in every circumstance.
  2. Divergent objectives: lender cares only about cash payoff; borrower prefers to shirk.
- Alternative approach: depositors are principals that monitor banks (agents) (not studied in EC372)

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The Holmstrom & Tirole (HT) Model

- HT model is based on moral hazard
- Three groups of decision-makers (all risk-neutral):
  1. Firms – issue bonds or borrow from banks
  2. Investors – hold bonds issued by firms but cannot monitor them
  3. Financial intermediaries (banks) – lend to firms and monitor them
- Alternative asset has a fixed payoff equal to $\gamma > 0$
- HT model has two varieties:
  1. Fixed investment: scale of each firm's investment is exogenous
  2. Variable investment: firms choose scale of investment project

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Firms' investment payoffs

- Firms differ only in the amount of initial capital, A.
- Cost of project: I (from own funds, loans or bonds)
- Investment payoffs: $R^* =$ success; $0 =$ failure.
- Each firm chooses effort, H (no shirking) or L (shirking), with probabilities of success p_H and p_L: $\Delta p \equiv p_H - p_L > 0$.
- Private benefits: $H \Rightarrow$ Nil;
  $L \Rightarrow B^*$ if not monitored, b^* if monitored; with $B^* > b^*$

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Firms' investment opportunities

- Assumptions about expected payoffs:
  - $p_H R^* - \gamma I > 0$
  - $p_L R^* - \gamma I + B^* < 0$
- Note: $p_L R^* - \gamma I + b^* < 0$ because $b^* < B^*$
- Expected payoffs are split between firms, bond holders and banks
- 'Direct' finance obtained from issuing bonds;
  'Indirect finance' obtained from bank loans
- Firms borrow from banks only if bond finance is not available because banks will monitor them.

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Direct finance

- $R^* = R_f + R_u$: firm's payoff $= R_f$; investors' payoff $= R_u$
- Non-shirking (H) requires:

$$p_H R_f \geq p_L R_f + B^* \quad \text{or} \quad R_f \geq B^*/\Delta p$$

- Payoff to investors from an investment of I_u:

$$\gamma I_u = \gamma[I - A] \leq p_H \left[R^* - \frac{B^*}{\Delta p}\right]$$

- Minimum capital required to obain bond finance:

$$\overline{A}(\gamma) = I - \frac{p_H}{\gamma}\left[R^* - \frac{B^*}{\Delta p}\right]$$

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Indirect finance

- Even if $A < \overline{A}(\gamma)$, a firm may still be able obtain a bank loan
- But, because monitoring is costly, loan finance is costly: $\beta > \gamma$, where β is the required return on bank loans.
- Now: $R^* = R_f + R_u + R_m$, where R_m is the bank's payoff.
- As banks monitor loans, shirking is lower: $b^* < B^*$. Hence:

$$R_f \geq b^*/\Delta p$$

- Assume monitoring costs c^* per firm (project). Then:

$$p_H R_m - c^* \geq p_L R_m \quad \text{or} \quad R_m \geq c^*/\Delta p$$

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Outline

Indirect finance, continued

- Competition drives banks' payoff to: $R_m = c^*/\Delta p$
- If I_m is the bank's investment, $\beta I_m = p_H R_m$. Hence:

$$I_m(\beta) = \frac{p_H c^*}{\beta \Delta p}$$

- Only firms with capital, $A \geq \underline{A}(\gamma, \beta)$ will be able to obtain a loan.
- Indirect finance is possible only if c^* is low enough that:

$$c^* \Delta p < p_H[B^* - b^*] \quad \Longrightarrow \quad \underline{A}(\gamma, \beta) < \overline{A}(\gamma)$$

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Interpretation

- HT model shows how initial capital allows access to credit markets.
- Firms with enough capital can borrow without monitoring (but will still not shirk)
- Firms with too little capital will not be able to borrow at all.
- Firms with $\underline{A}(\gamma, \beta) \leq A < \overline{A}(\gamma)$ can obtain bank loans (and will be monitored)

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Outline

Interpretation

- HT model shows how initial capital allows access to credit markets.
- Firms with enough capital can borrow without monitoring (but will still not shirk)
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Credit Market Equilibrium

- HT assume that the aggregate supply of capital is given by:
  - Investors' capital: $K_u = S(\gamma)$, where $S'(\gamma) > 0$
  - Banks' capital: K_m is exogenously fixed
  - Firms' initial capital: K_f is exogenously fixed
- Beware: some ambiguities remain (see notes).
- Firms' aggregate demand for funds:

$$\text{Firms' demand for uninformed capital:} \quad \underset{-}{D_u}(\underset{-}{\gamma}, \underset{-}{\beta}; \underset{+}{K_f})$$

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- Results:
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- Allows firms to choose the size, I, of their investment projects
- Now all firms invest in a project proportional to initial capital.
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