The Credit Crunch

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Economic Crises

Holmstrom-Tirole (QJE 1997)

Holmstrom, B. and J.Tirole, "Financial Intermediation, Loanable Funds, and the Real Sector," *Quarterly Journal of Economics*, 112(3), 663-691, August 1997

- Main points:
  - Banks play a central role in financial intermediation and can be both a source of systemic shocks and an amplification mechanism
  - Bank capital constraint matters
  - Smaller, collateral poor firms are hit the hardest even if the problem stems from banks (flight to quality)
- Useful terminology: **Credit crunch** vs collateral squeeze (and savings squeeze)

Environment

- Three type of agents: firms, intermediaries, and (uninformed) investors
- Firms (a continuum) have the same technology but different amount of funds (cash), A, with distribution $G(A)$.
- They need external finance for investment I (fixed) if $A < I$
- Project has return R in good state, 0 in bad state
- Moral hazard: if entrepreneur (who runs the firm) shirks, gets private benefit B, but prob. of good state is only p_L. If not, no private benefit, but prob. of good state $p_H > p_L$
- Monitor (bank): can spend cost c to reduce private benefit from B to b
- Technical Assumption (TA): $\frac{p_H}{\Delta p}(B-b) > c > (B-b)$, for monitoring to be valuable and to rule out intermediation w/o capital
- Rate of return to private investors γ, to banks $\beta > \gamma$.

Trade-offs

Project	Good	Bad (low private benefit)	Bad (high private benefit)
Private benefit	0	b	B
Probability of success	p_H	p_L	p_L

- Assume parameters are such that only the good project is economically viable:

$$p_H R - \gamma I > 0 > p_L R - \gamma I + B$$

Firms fully financed by private investors (direct finance)

- Return in good state R is split between firm and investor:

$$R_f + R_u = R$$

- Since shirking is not profitable, a necessary condition for direct finance is that the firm prefers to be diligent:

$$p_H R_f \geq p_L R_f + B \quad \Rightarrow \quad R_f \geq \frac{B}{\Delta p}$$

- This means that the maximum expected income that can be promised to investors (pledgeable expected income) is:

$$p_H \left[R - \frac{B}{\Delta p} \right]$$

Firms fully financed by private investors (direct finance)

- In order to have access to direct funding, the firm has to satisfy:

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

- From which it follows that there is a minimum threshold $\overline{A}(\gamma)$ to be able to invest using direct funding:

$$A \geq \overline{A}(\gamma) = I - \frac{p^H}{\gamma} \left(R - \frac{B}{\Delta p} \right),$$

- If a firm cannot access direct financing, it may seek the help of an intermediary that reduces the opportunity cost of being diligent: $b < B$

Firms partially financed by banks (indirect finance)

- This allows more capital to be raised, but it is expensive for the firm (see below), so the firm will still want to use direct finance in addition to the minimum amount of intermediary funding needed to satisfy incentive constraints (a certificate of good behavior)

$$R_f + R_u + R_m = R$$

- Now we have two ICs:

$$\begin{aligned} R_f &\geq \frac{b}{\Delta p}; \\ R_m &\geq \frac{c}{\Delta p} \end{aligned}$$

- The maximum expected income that can be promised to uninformed investors is now:

$$p_H \left[R - \frac{b+c}{\Delta p} \right]$$

Firms partially financed by banks (indirect finance)

- If I_m is the amount financed by banks and R_m the return to the bank in the good state, the expected rate of return on intermediary capital is :

$$\beta = \frac{p_H R_m}{I_m} > \gamma$$

- The last inequality holds from the fact that monitoring is costly. This means firms prefer the smallest possible bank loan that preserves the banks incentives (skin in the game):

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

- Uninformed investors supply the balance:

$$I_u = I - A - I_m$$

- So now the condition for a firm to be financed is:

$$\gamma \left[I - A - I_m \right] \leq p_H \left[R - \frac{b + c}{\Delta p} \right]$$

Firms partially financed by banks (indirect finance)

- And we have new threshold:

$$A \geq \underline{A}(\gamma, \beta) = I - I_m(\beta) - \frac{p^H}{\gamma}\left(R - \frac{b+c}{\Delta p}\right),$$

- With $\underline{A}(\gamma, \beta)$ increasing in both of its arguments
- A firm with less than $\underline{A}(\gamma, \beta)$ cannot persuade uninformed investors to supply enough capital to the project
- Note that since monitoring is costly, the minimum acceptable rate $\underline{\beta}$ satisfies:

$$p_H \frac{c}{\Delta p} - c = \gamma I_m(\underline{\beta})$$

- To imply:

$$\underline{\beta} = \frac{p_H}{p_L}\gamma > \gamma$$

- TA ensures:

$$\underline{A}(\gamma, \underline{\beta}) < \overline{A}(\gamma)$$

Banks as Monitors (Certification)

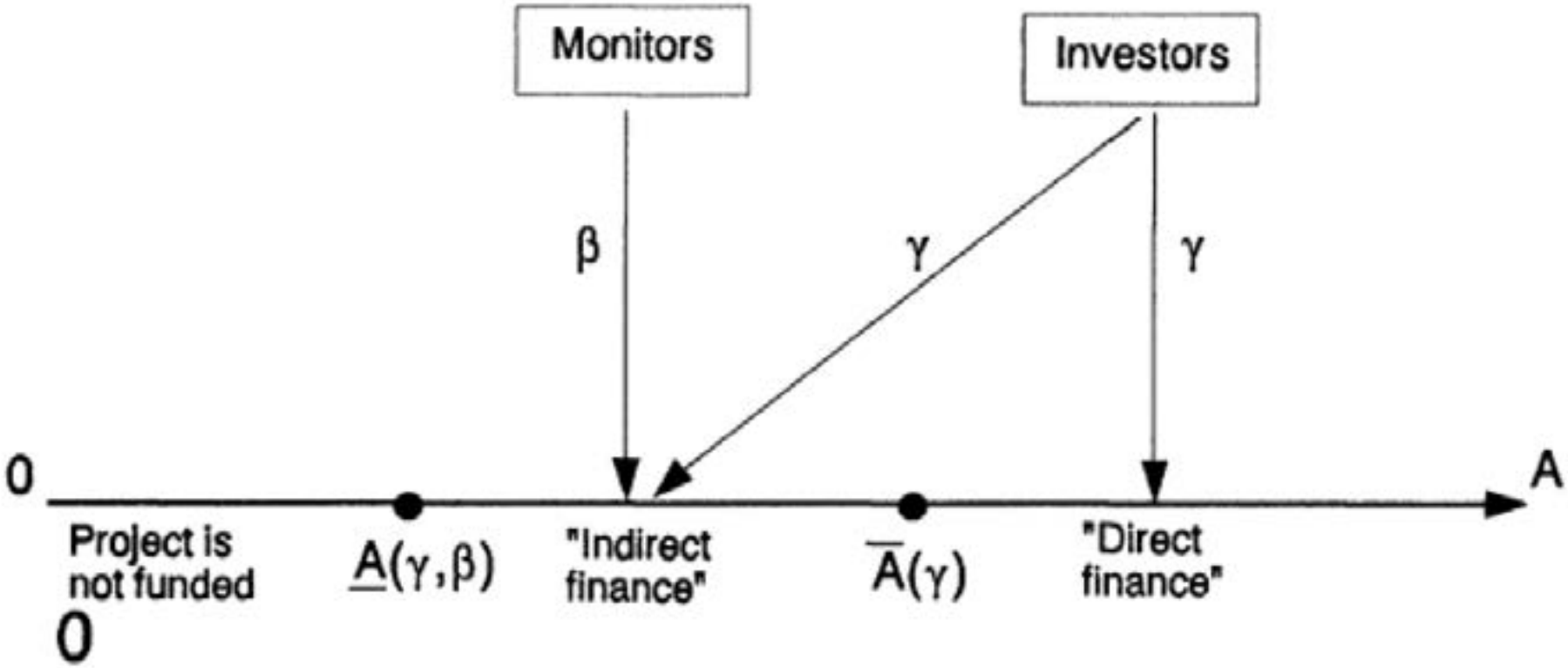


FIGURE II
Certification

Alternative interpretation: Banks as Intermediaries

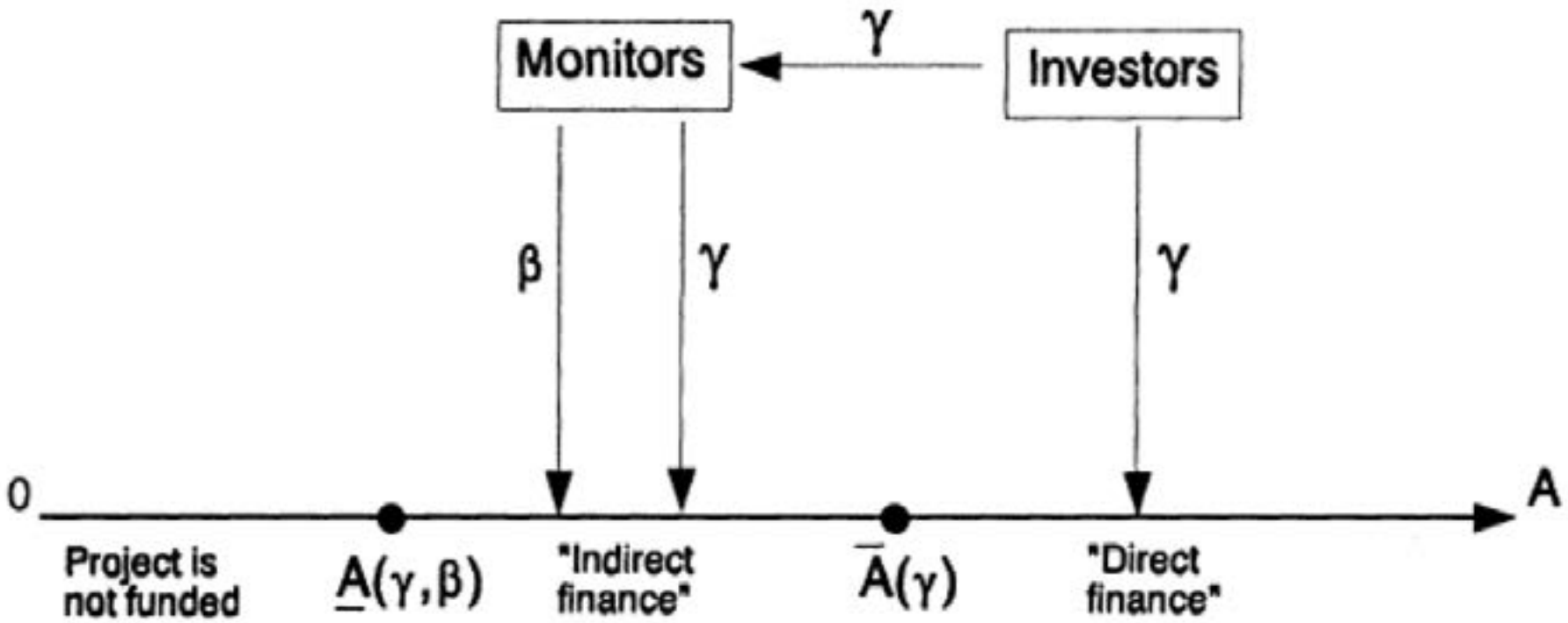


FIGURE III
Intermediation

Equilibrium

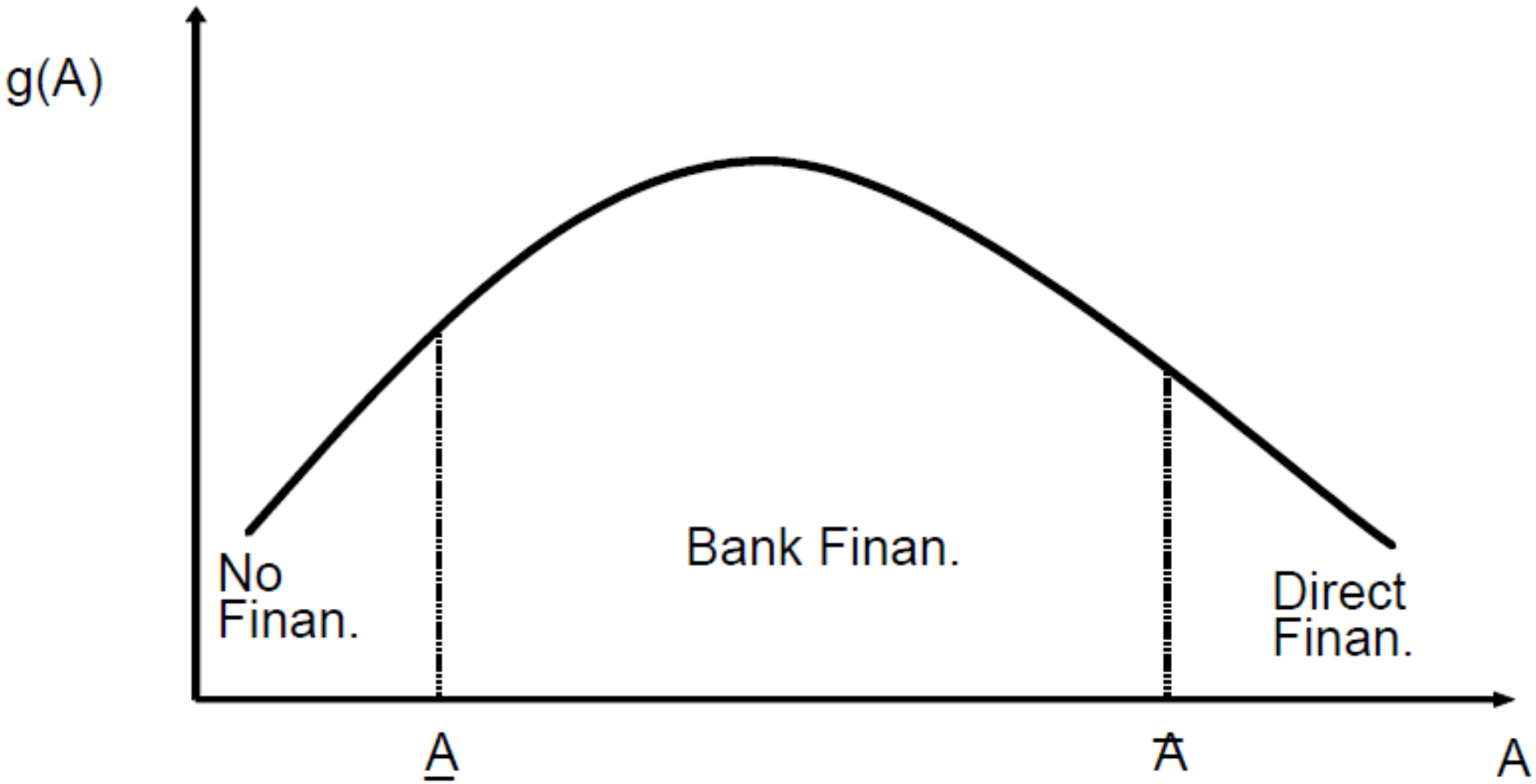
- If K_m is the supply of informed capital (owned by banks), market clearing implies

$$K_m = \left[G(\overline{A}(\gamma)) - G(\underline{A}(\gamma,\beta))\right] I_m(\beta).$$

- The supply of uninformed (private) capital must satisfy

$$S(\gamma) = \int_{\underline{A}(\gamma,\beta)}^{\overline{A}(\gamma)} (I - I_m(\beta) - A) g(A) dA + \int_{\overline{A}(\gamma)}^{I} (I - A) g(A) dA.$$

Equilibrium



Credit crunch

- Note: I will assume $G(A)$ is such that the most intuitive results hold (technicalities due to fixed I)
- **Credit crunch** (K_m falls)
  - β rises, so $\underline{A}(\gamma, \beta)$ rises
  - uninformed capital becomes less scarce, hence, γ and $\overline{A}(\gamma)$ fall. Flight to quality.
  - Spread $\beta - \gamma$ rises
  - Investment falls
- Insights extend beyond banks. Informed capital/investors (specialists) play a special role, which often gives them systemic importance. Very important for EMs (will return to it).
- Secondary results:
  - Collateral Squeeze ($g(A)$ shifts to the left): γ and β fall; Investment falls
  - Savings squeeze: $S(\gamma)$ shifts up: γ rises, β ambiguous but $\underline{A}(\gamma, \beta)$ rises

User Guide

- Research: Hard to publish this kind of papers today...
- However, very useful to get a quick sense/organize your thoughts about the implications of a distressed specialists/node
  - Example 1: Asian crisis – Russian default.... LTCM crisis!
  - Example 2: Brazil during the post-Asian crisis: $\underline{A}(\gamma, \beta)$
  - Example 3: SVB event and impact on CRE and small businesses

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