

# Chapter 6: Capital Structure and Moral Hazard

Albert Banal-Estanol

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## Credit Rationing Puzzle

- Why are lenders not willing to raise interest rates if the demand for loans exceeds their supply at the prevailing rates?
  - Why loan markets are personalised?
  - Explanation: asymmetric information between borrowers and lenders
  - Problems of moral hazard (this lecture) and adverse selection (next lecture)
  - In both cases higher interest rates reduces the stake of the borrower
  - Reduced stake may demotivate the borrower and may lower the probability of repayment (moral hazard)
  - If lenders cannot distinguish good from bad borrowers, higher interest rates may attract worse borrowers (adverse selection)
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## A Simple Model of Credit Rationing

- Agent has a project that requires investment  $I$  but has assets  $A < I$  (needs to borrow  $I - A$ )
  - Project may be successful (probability  $p$ ) and yield  $R > 0$  or fail (probability  $1 - p$ ) and yield 0
  - Agent may exert effort ( $p = p_H$ ) or shirk ( $p = p_L$ ), with  $\Delta p = p_H - p_L > 0$
  - If she shirks she obtains private benefits  $B > 0$
  - Both borrower and potential investors are risk neutral
  - Borrower has limited liability (no punishment for failure)
  - Lenders are competitive (make zero profit)
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## Loan Contract

- A loan contract specifies how the profit is shared between lenders and borrower:  
Both should get 0 in case of failure (limited liability)  
In case of success, sharing rule  $R_b + R_l = R$
  - Competitive lending implies (assuming effort is exerted):  $p_H R_l = I - A$
  - The rate of interest is given by  $(1 + i)(I - A) = R_l$  or  $1 + i = 1/p_H$
  - Hence, unless  $p_H = 1$ , we have  $i > 0$  (default premium)
  - Assume that project has positive NPV if the manager exerts effort,  $p_H R - I > 0$
  - But negative NPV if not,  $p_L R - I + B < 0$  (even adding  $B$ )
  - Hence, rewriting,  $p_L R_l - (I - A) + p_L R_b + B - A < 0$  (effort is necessary)
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## Summary: Timing

1. Loan agreement (sharing rule in the case of success)
  2. Investment
  3. Moral hazard (effort or shirk?)
  4. Outcome (and payments)
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## Credit Analysis

- Need to ensure that borrower exerts effort
- Borrower's trade-off: private benefits vs. higher probability of success
- Incentive compatibility constraint:

$$p_H R_b \geq p_L R_b + B$$

or

$$R_b \geq \frac{B}{\Delta p}$$

- This is the minimum the agent must keep
- Maximum that can be pledged (promised to the bank) is

$$R - R_b = R - \frac{B}{\Delta p}$$

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- Since this is paid only in the case of success, agent is financed only if

$$p_H \left( R - \frac{B}{\Delta p} \right) \geq I - A$$

or

$$A \geq I - p_H \left( R - \frac{B}{\Delta p} \right) = p_H \frac{B}{\Delta p} - (p_H R - I) = \bar{A}$$

- To make things interesting assume that  $\bar{A} > 0$  or

$$p_H \frac{B}{\Delta p} > p_H R - I$$

i.e. the NPV is smaller than the necessary rent

- Thus financing is possible only when  $A \geq \bar{A}$ , even if, when  $A < \bar{A}$ , the project also has positive NPV (credit rationing)
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- Lenders may not grant a loan even if borrower is willing to give a high fraction of the return
- The borrower needs to have enough assets to be financed ( $A \geq \bar{A}$ )
- In this case, borrower's stake is given by

$$R - R_l = R - \frac{I - A}{p_H} \geq R - \frac{I - \bar{A}}{p_H} = \frac{B}{\Delta p}$$

- Borrowers' net payoff (subtracting  $A$ ) is given by

$$\begin{cases} 0 & \text{if } A < \bar{A} \\ p_H R_b - A = p_H(R - R_l) - A = p_H R - I & \text{if } A \geq \bar{A} \end{cases}$$

- Borrower receives entire surplus if project is funded (lender breaks even)
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## Conclusions

- Because of moral hazard there is a limit to pledgeable income
  - There is credit rationing and projects with positive NPV may not be funded
  - The borrower needs to have enough assets to be financed
  - Higher private benefits, higher threshold for financing
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