Collateral, Rehypothecation, and Efficiency

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Liquidity enhancing mechanisms

- Securitization
- Loan commitments
- Correspondent banking

Rehypothecation: the repledging of collateral

For example, prime broker re-uses clients' collateral to back up its own trading and borrowing (provided that the clients permit this).

Rehypothecation economizes on scarce collateral.

- Without rehypothecation, the lender keeps collateral idle until he returns it to the borrower.
- Rehypothecation enables the lender to raise additional funds,
  - Decreasing the lender's opportunity cost of holding collateral
  - Allowing borrower to obtain more funds against the same collateral

In short, rehypothecation provides more funding liquidity to the economy

Rehypothecation and counterparty risk

- However rehypothecation comes at a cost

I can’t promise you tomorrow
what I can't buy back yesterday

-Jon Bon Jovi, “I’ll Be There for You” (slightly modified)

Rehypothecation and counterparty risk

- The receiver of collateral may go bankrupt having re-pledged his borrower's collateral to the third party:
  - Collapse of Lehman Brothers in 2008
- Rehypothecation failure leads to misallocation of the assets
  - The collateral cannot be returned to the borrower who is likely to put the highest value on it.

- Rehypothecation and the Financial crisis

- In 2007, $4.5 trillion in rehypothecatable collateral held by the six largest U.S. investment banks.
- In the wake of the Lehman Brothers collapse in 2008, hedge funds limited the amount of their assets to be rehypothecated.
- In 2009, the total value of rehypothecatable collateral held by these investment banks dropped to $2 trillion
- Debates about regulating rehypothecation continue

- Main questions in this paper

- What benefits and costs does rehypothecation produce?
  - Is rehypothecation socially beneficial?
- Are individuals' preferences between rehypothecation and non-rehypothecation aligned with social efficiency?
- When can we expect that rehypothecation is more (or less) likely to occur?

- Key assumptions in the model

A borrower is subject to the moral hazard problem.

Posting collateral induces the borrower to make effort to avoid default.

This increases the borrower's credibility and ability to raise funding for his productive investment.

- Key assumptions in the model

Collateral is transferred from the borrower to the lender at the time the contract begins.

As in a repurchase agreement, the borrower exchanges the asset for cash, and effectively buys it back later on.

However, financial distress in the lender can tie up the collateral

- Key assumptions in the model

Collateral is more valuable to the initial owner than to the others.

- Portfolio considerations
- Costs of resale
- Certainty of title
- Differences in beliefs
- Differences in liquidity needs

Benchmark Model with Two Parties

Bolton and Oehmke (2014),
Tirole (2010), Boot, Thakor, Udell (1991)

Two periods, risk neutrality, no discounting

- Firm A wants to borrow to finance an investment project, but lenders face *limited commitment to repay*
- If the lenders can, after the fact, only attach a fraction of the cost of the investment, they will be unwilling to lend

Source of limited commitment:

Moral hazard

- *Suppose the success of the investment depends on A's unobserved actions*
- *Then the ability of creditors to extract value is limited by the need to induce effort from A*
- *In this case, borrowing backed only by future gains may not be feasible*

- Example

- Investment takes input and effort. Return is R_A per unit input if successful, 0 otherwise.
- With effort success with probability 1, otherwise success with probability $P_A < 1$.
- Private benefit from avoiding effort: b per unit input

A's payoff per unit investment is therefore

$$a\, R_A + (1 - a)\,(P_A\, R_A + b)$$

(where a is the indicator variable for effort)

- Assumption #1

$$\min \{R_A ,\ P_A R_A + b\} > 1 > P_A R_A$$

(left side: project is worth carrying out either way)

(right side: project will not be profitable for lenders without investor effort)

- The loan

- A lacks input. B will lend **I** units of input in return for a promised repayment of X (which only occurs if the project is successful.
- B requires a profit of J $\geq$ 0 to participate.

Assumption #2:

$$R_A - 1 < P_A (R_A - 1) + b$$

This means A prefers no effort if X = **I**

(and so *a fortiori* if X > **I** .)

With these assumptions, simple debt not feasible.

Collateral relaxes the constraint

- If A has another asset that is of value to him at a later date, he can offer the asset in pledge, for redemption at the repayment date.
- The greater the value of the asset to A, the greater an amount he can credibly borrow—even if the asset is of little value to the lender.

- Example, continued

- Assume A possesses an indivisible asset yielding consumption at end of model.
- Consumption value is Z if held by A
- Consumption value is Z_0 if held by anyone else
- Assume A makes a take-it-or-leave-it offer to B of a contract (**I**, X), using his asset as collateral.
- If the contract is accepted A's utility is

$$U(\mathbf{I}, X, a) = a\,[R_A\,\mathbf{I} - X] + (1 - a)\,[P_A\,(R_A\,\mathbf{I} - X) + b\mathbf{I} - (1 - P_A)Z]$$

- Optimal contracting problem:

$\text{Max}_{\mathbf{I},X,a}\ U(\mathbf{I}, X, a)$ subject to

(IC) a belongs to argmax $U(\mathbf{I}, X, a)$

(P) $a X + (1 - a)\,[P_A X + (1 - P_A)\, Z_0\,] - \mathbf{I} \geq J$

(LL) $R_A\, \mathbf{I} \geq X$

(NN) $\mathbf{I}, X \geq 0$

Result: For Z_0 and J sufficiently small,

(IC) and (P) bind and investor exerts effort.

- Optimal arrangement

- We describe the loan as “over collateralized” or “under collateralized” depending on whether the total amount to be repaid by A is greater or less than the value of the collateral to A.
- In general depends on both the amount extractable from the project, and the details of the incentive problem.

- Define $\mathscr{B} = R_A - b\,(1 - P_A)^{-1}$

If positive, corresponds to pledgeable income of borrower; < 1 by assumption 2

But could be negative as well.

For small J, negative $\mathscr{B}$ means Z > X: overcollateralization.

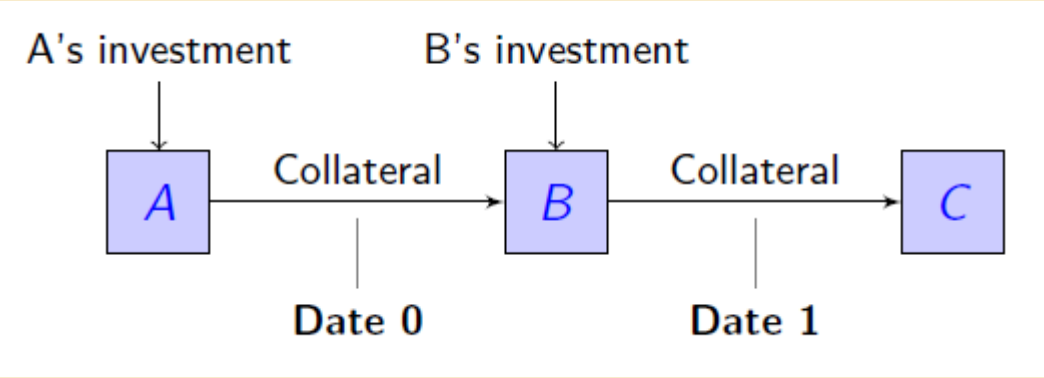
(and positive $\mathscr{B}$ means undercollateralization)

- Risk of loss of collateral by lender

- Provided the possibility of lender's failure is sufficiently small, it can still be desirable to engage in collateralized borrowing.
- The lender compensates for the risk by lending at better terms for the same collateral.

- Rehypothecation Model

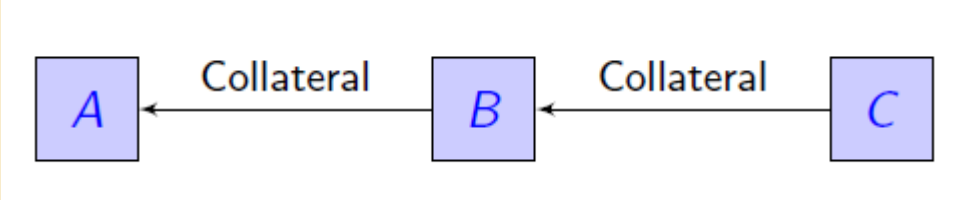
Three periods: Date 0, 1, and 2. Three players: Initial borrower A, A's lender B, and B's lender C.



- Timing:
- Date 0: A borrows funds from B for his investment by pledging his asset as collateral.
- Date 1: B borrows funds from C for investment by re-pledging A's asset.

- Rehypothecation Model (continued)

- Date 2: Both A's and B's investments mature, and B recovers A's collateral from C by making the payment and then B returns it to A in exchange for receiving the payment.



- If B defaults, collateral is seized by C; collateral remains in the wrong hands since it is worth less to C than to A.

Simplifying assumption

- For simplicity, authors assume no hidden choice of effort for B's investment
- Instead collateral is simply used to guarantee B repays.

- Optimization Problem with Rehypothecation

- A sequence of two contracts:
  - Contract between A and B at date 0
  - Contract between B and C at date 1

- Solve the model by backward induction
- Compare with optimal contract without rehypothecation (contract between A and B alone)

- Contract between B and C

- Straightforward: If B defaults C retains the collateral; if B does not default the maximum he can pay C is the amount he will receive from A.
- B borrows the maximum consistent with these constraints.

- Welfare Tradeoff

- Rehypothecation supplies more funding liquidity to the economy, so that additional productive investment are undertaken.
- Rehypothecation failure may incur costs by misallocating assets.

- Results: inefficiency of rehypothecation decision

- The wedge between the value of the collateral to the borrower and the value of the repayment is determined by the incentive problem that the collateral is solving.
- But this means that the shadow value of collateral to the middleman is not the same as to the borrower

- Results: inefficiency of rehypothecation decision
- If the loan is undercollateralized; there tends to be an insufficient use of efficient rehypothecation:
  - B values the payment he receives from A more than A values receiving his collateral back, and thus B tends to prefer not to rehypothecate
- Result is reversed for overcollateralization

- Permission to rehypothecate

If the initial borrower A has the right to permit rehypothecation or not,

- A will tend to be more reluctant to permit rehypothecation as the when the optimal contract between A and B involves increasingly over-collateralized lending.

- Summary

- Analysis of the economics underlying rehypothecation
- Model highlights the trade-off determining the costs and benefits of rehypothecation:
  - It supplies more funding liquidity to the economy, but it incurs deadweight costs by misallocating the asset when it fails.
- The spread between value of collateral and promised repayment leads to incentive conflicts between the parties

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