Financial Intermediation and Financial Crises

Nobel Lecture, December 8, 2022

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How I became interested in understanding the role of banking in the economy

- Milton Friedman and Anna Schwartz, *A Monetary History of US,* an entire course in college.

What is the role of financial intermediaries ("banks") in a modern financial system?

- What is special about the *contracts* that "banks" write and how do their contracts impact the economy?
- In modern systems, the role of "banks" may be other financial intermediaries, such as Lehman Brothers.

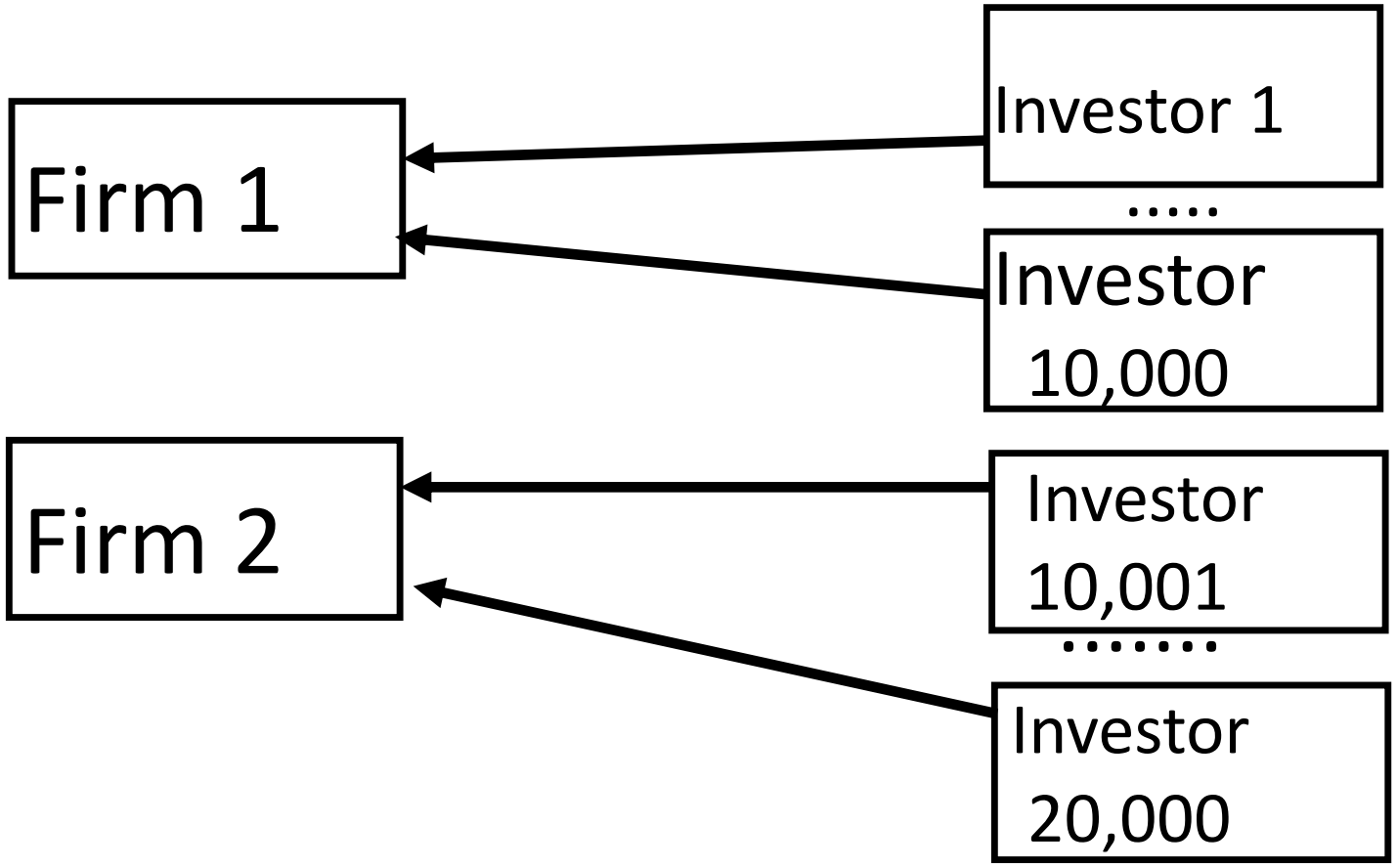
Diamond [1984]: Financial Intermediation and Delegated Monitoring

- What is the best way to deal with financial conflicts of interest in lending:
- ***Without banks:*** Between borrowers and investors (Direct Finance from small investors)
- ***With banks:*** Between borrowers and investors and bankers? (Financial Intermediation)

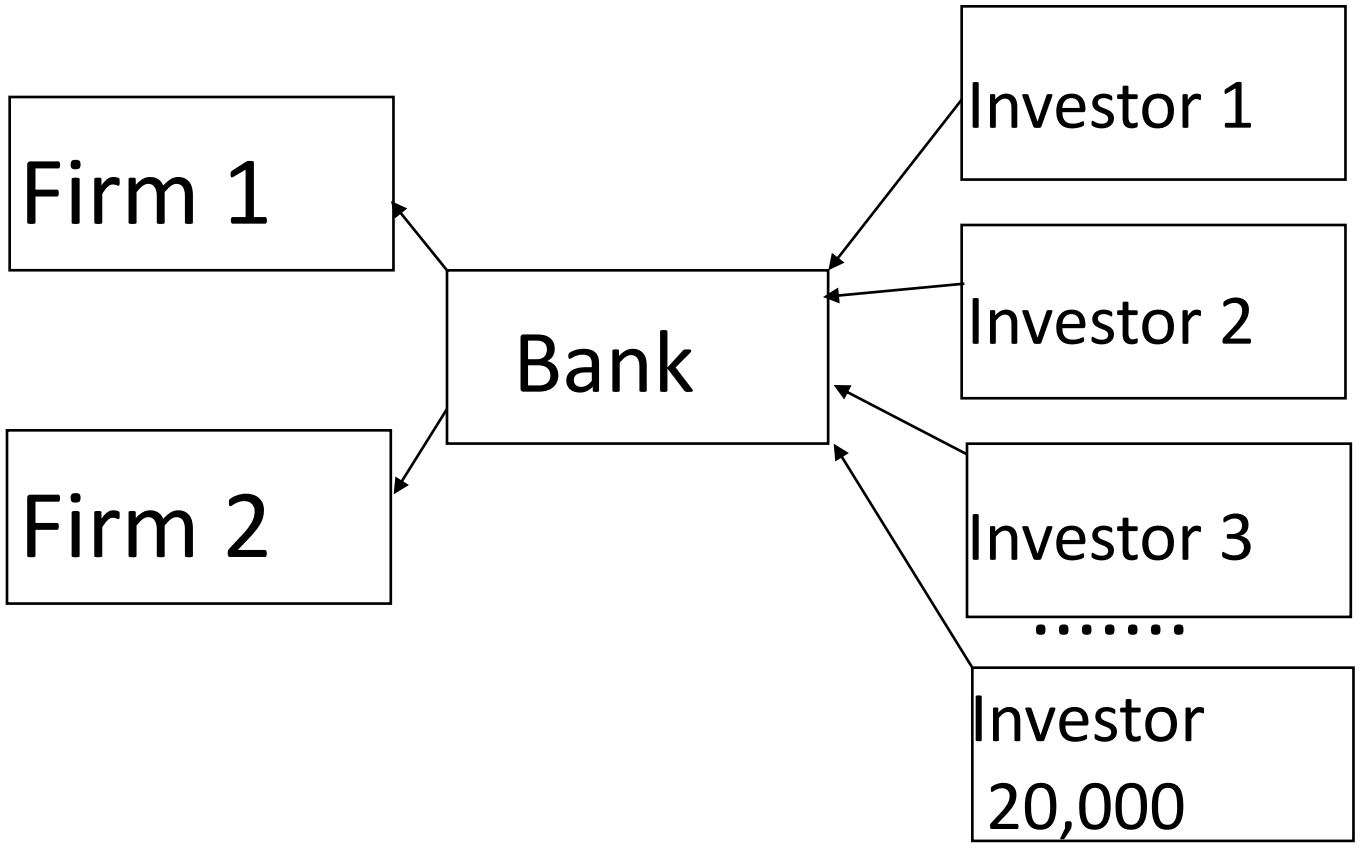
Diamond [1984]: Financial Intermediation and Delegated Monitoring

- What is the best way to deal with financial conflicts of interest in lending:
- *Without banks: Between borrowers and investors (Direct Finance from small investors)*
- ***With banks:*** **Between borrowers and investors and bankers? (Financial Intermediation from small investors)**

Direct Finance (no banks):



Financial Intermediation



The primary conflict of interest between borrower and investors:

- Getting the borrower to repay.
- How do we resolve this conflict of interest?

Two ways to get a borrower to repay

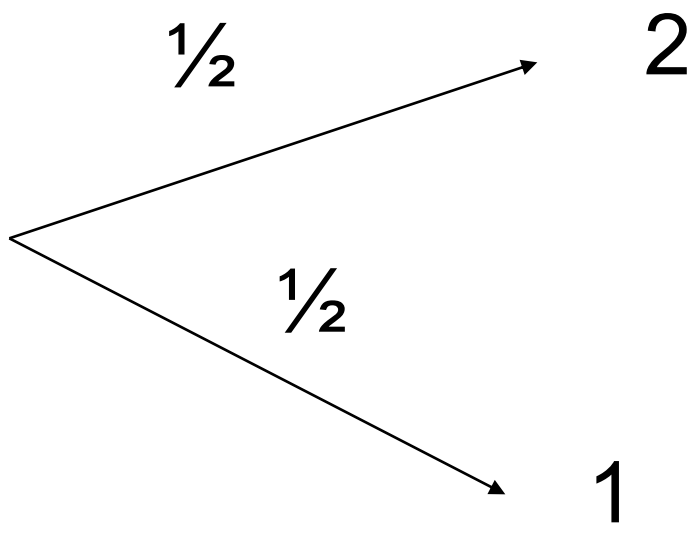
- Foreclose or *impose a penalty* if not repaid. Makes the borrower pay but it is *inefficient to foreclose*.
- Lender can Continuously Monitor the borrower to make sure the borrower pays when possible. *No need to foreclose*.

Costly.

The best financial contract without monitoring is debt.

- Ask a borrower to make a fixed payment, and foreclose for all smaller payments.
- Borrower will pay when possible, but there will be foreclosure when payment is impossible.
- No problem if borrower always has enough to repay. In that case, a threat only.

Borrower (Firm) Cash Flows Known only to the borrower: Example



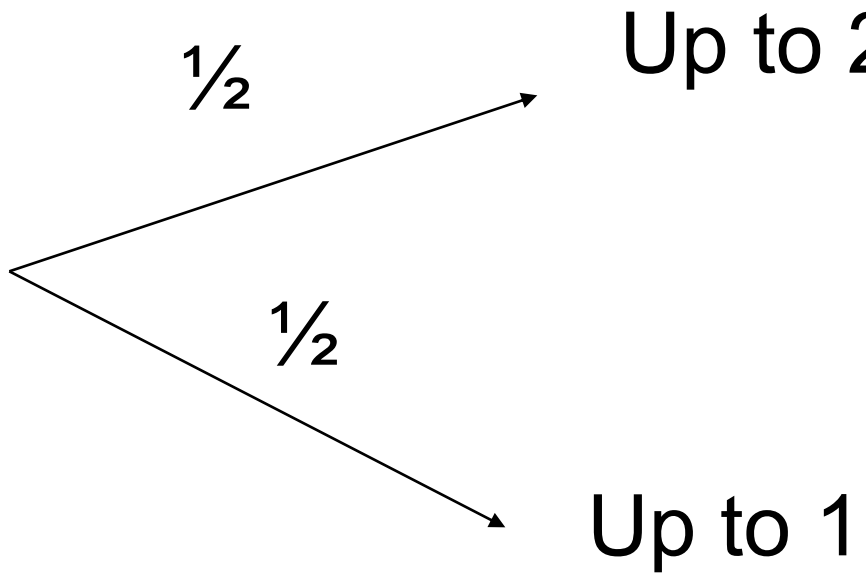
Expected value =
½ (2) + ½ (1)= 1.5

How to get the borrower to pay without monitoring: debt with foreclosure.

- The borrower must pay more than 1: we must foreclose inefficiently with probability ½! Investor gets ***much*** less than 1 when cash is 1.

Example: get 0!

Repayments received by lender with monitoring: Costly, but no need to foreclose.



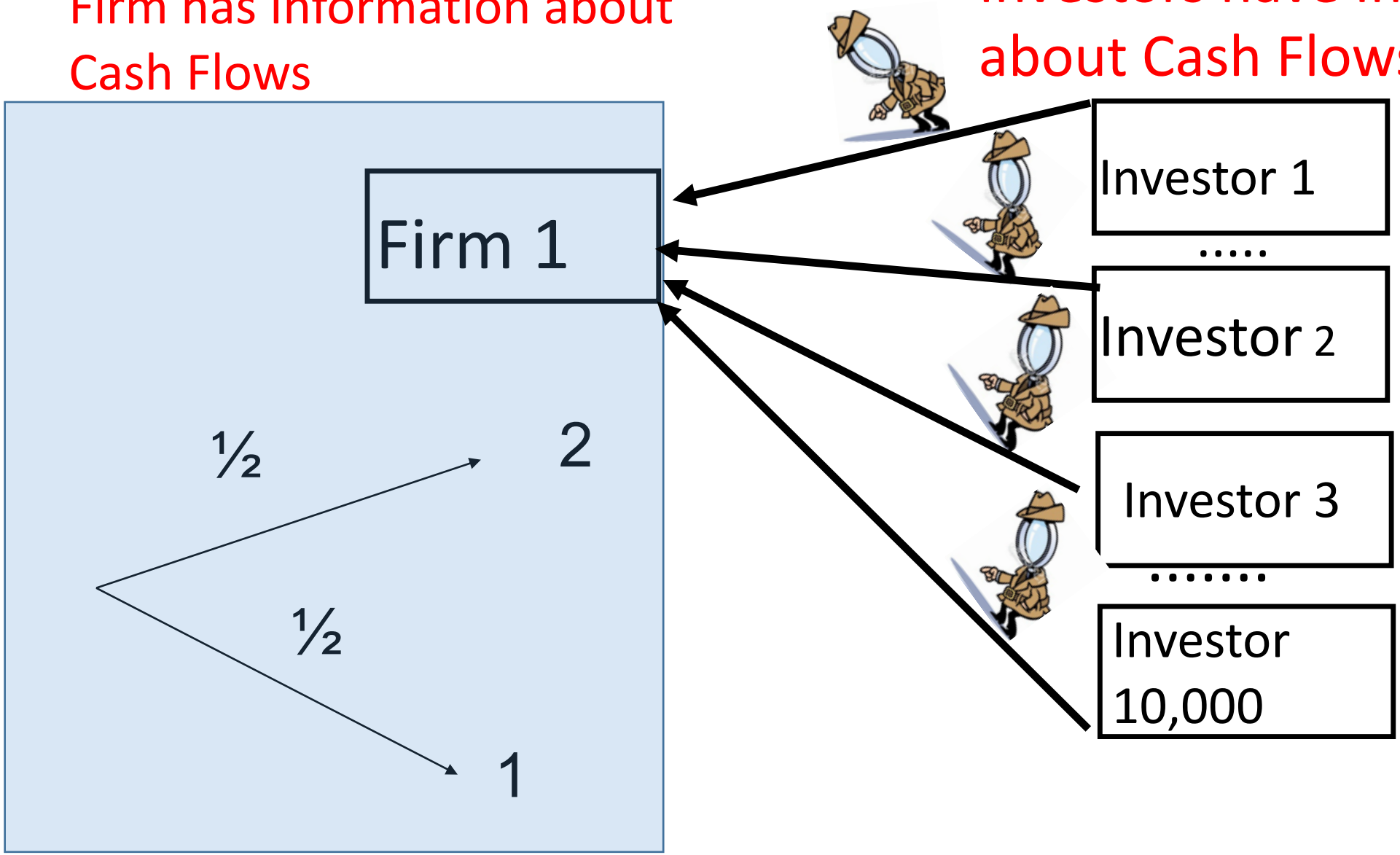
Expected value ≤

½ (2) + ½ (1)= 1.5

Direct Finance with monitoring (too expensive):

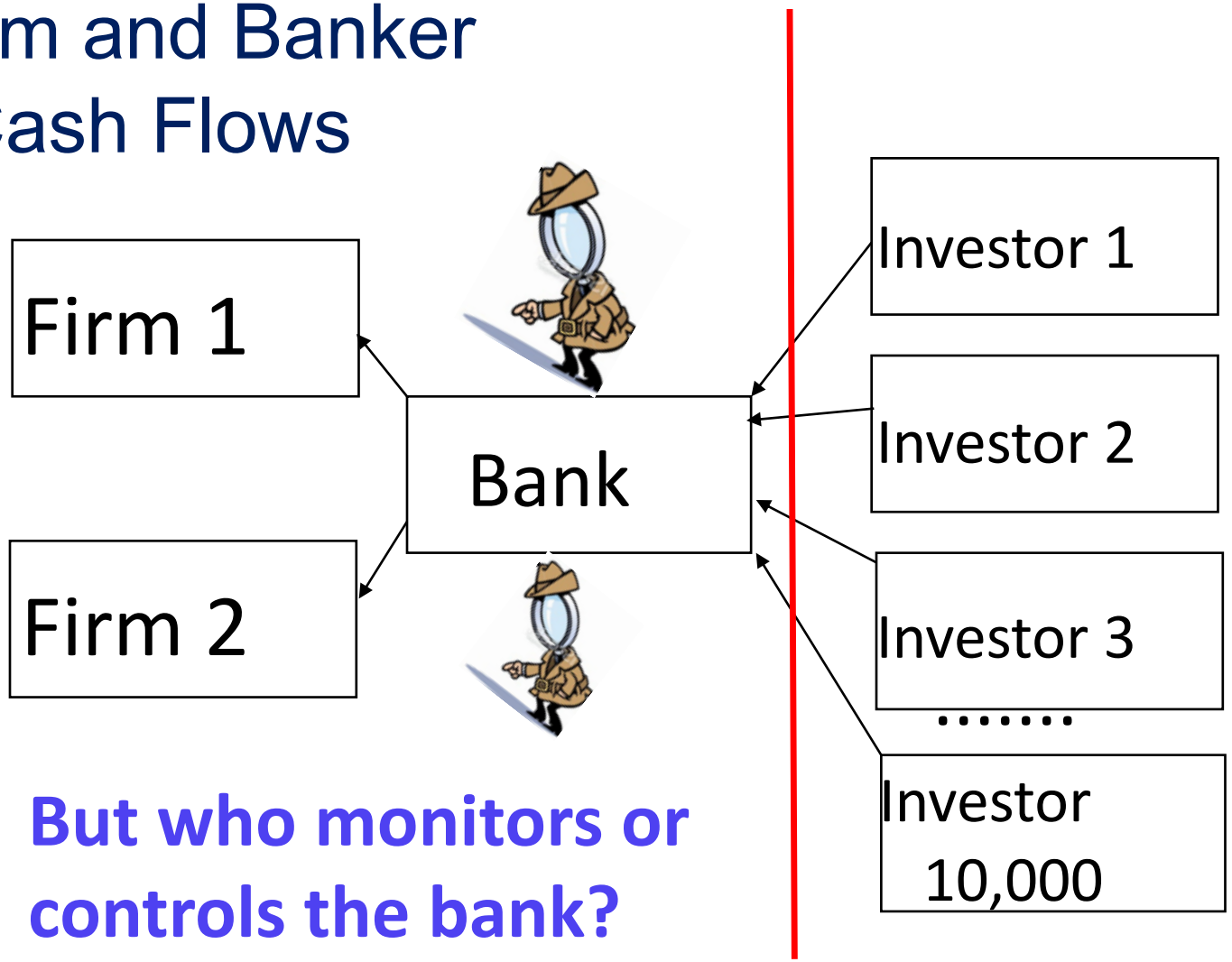
Firm has Information about Cash Flows

Investors have Information about Cash Flows



Delegated Monitoring by a Banker

Only Firm and Banker know Cash Flows



But who monitors or controls the bank?

Investors know only the Bank's Repayment (can foreclose based on low payment)

How to Provide Delegated Monitoring.

- Bank uses debt contracts to pay investors.
- Bank fails if its repayment to investors is too low (foreclosure if bank defaults on debt).
- Provides incentives for banker to monitor and to pay investors based on this monitoring.
- ***It turns out that for this to work, the bank must be large and diversified.***

Perfect Diversification (assumed perfect here, imperfect in the model and in practice).

- Bank monitors and diversifies across many borrowers, removing all uncertainty. Half of borrowers have 2, half 1, exactly.
- Bank Can Always pay up to 1.5.
- Threat of bank failure provides incentives.
- But the deposits are safe (no failure).
- Diversify away bank's private information.

Realistic Diversification (banks fail sometimes):

- "Bank" still fails sometimes, if:
  - Small or less diversified
  - Large exposure to economy-wide risks (now measured with stress tests).
- Substantial diversification within large bank is essential for banking to work well.

A more modern name:
This is Pooling and Tranching

- Pooling (diversification) and
- Tranching: issue senior debt claims to investors, while bankers retain some junior “bonus” claims.
- This structure also helps resolve many other conflicts of interest in finance, (DeMarzo [2005]).
- It is not perfect, especially if correlation increases:
  - 2008 problems with Mortgage Backed Bonds

The second model of "banks" (that need not be traditional commercial banks)

- Diamond-Dybvig (1983). Bank Runs, Deposit Insurance and Liquidity.

Diamond-Dybvig (1983) “DD”: Beneficial creation of liquidity may lead to failure of healthy “banks”

DD (1983): Solvent "banks" may fail if they Create Liquidity

- To be simple, DD assumes that bank loans are long-term and safe but illiquid and shows why deposits are more liquid and short-term.
- No solvency reason for bank to fail: this highlights how bank runs can cause unneeded bank failures.

Banks deposits are more “liquid” than loans that they hold.

- More liquid means a higher return from early withdrawal of a deposit than from early liquidation of a bank loan.
- Investors like liquid assets because they don’t know when they will need their funds back.
- Liquidity is a form of insurance against early need for funds.

Bank Assets: Illiquid But Safe Asset

Date 0		Date 1	Date 2	
Invest		1		(liquidate early)
1	or		2	(hold to maturity)

Bank issues short-term debt (Deposits)

Date 0		Date 1	Date 2	
Invest		1.28>1		(liquidate early)
1	or		1.81	(hold to maturity)

Bank Assets: Holds Illiquid Safe Asset

Date 0		Date 1	Date 2	
Invest		1		(liquidate early)
1	or		2	(hold to maturity)

Issues short-term debt (Deposits)

		Date 1	Date 2	
Invest		1.28>1		(liquidate early)
1	or		1.81	(hold to maturity)

100 investors can invest in a bank

- To be concrete, suppose there are 100 investors, 25 will be early (need funds at date 1), and 75 late (can wait until date 2). Each invests one unit in the bank at date 0.
- It is not known which investors will be early or late. Each investor is uncertain as of date 0.

Deposits: If No run (25 withdraw)

Date 0		Date 1	Date 2	
Invest		1.28		(liquidate early)
1	or		1.81	(hold to maturity)

The “Bank” can create liquid deposits out of an illiquid loan!

If bank creates liquidity (pays more than 1 at date 1), a run is also a Self-fulfilling prophecy

- Bank fails due to a run if too many are expected to withdraw (can't liquidate more than 100% of assets!).
- Can't give all 100 borrowers 1.28 at date 1.
- Can't even afford to give 79 1.28 each at date 1,

$$79 \times 1.28 > 100!$$

The bank would fail!

Deposits (if a run is expected) (Bank will fail)

Date 0		Date 1	Date 2	
Invest		1.28		(liquidate early)
1	or		0	(hold to maturity)

Short-term debt runs can bring down a solvent financial intermediary

- If you expect a run, you will do want to withdraw early to get there first.
- *Multiple Self-fulfilling prophecies (run, no run)*
- Multiple Nash equilibria.

Private Financial Crises are everywhere and always due to the problems of *short-term debt*

- "Bank" runs are not limited to banks:

Money market mutual funds, Lehman Brothers, Stable Coins, Short-term securitizations.

It is due to the ***contracts*** (borrow short-term to lend long-term illiquid). Not just about fractional reserves of currency in the bank vault.

How to stop or prevent runs

- A very solvent government can insure depositors against loss (or *commit* to lend to help them survive a run).

Two key optimal contracts of the Financial System

1. Pooling (diversification) and tranching (issue senior claims). Resolves conflicts of interest.

2. Create liquid assets by issuing short-term debt to fund long-term illiquid assets.

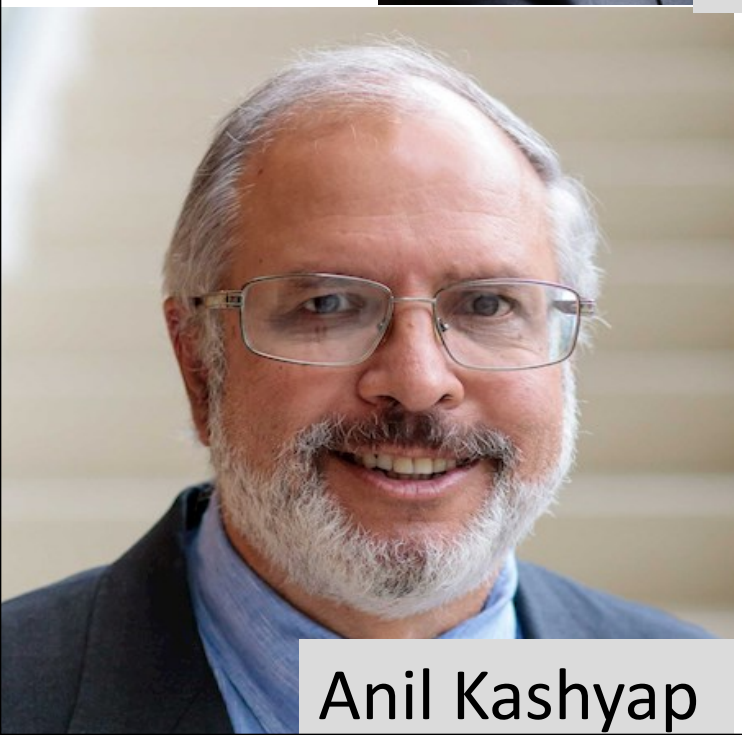
- Each must be understood to interpret new institutions in finance and to respond to a financial crisis.
- Diamond-Dybvig (1986) discusses implications for regulation.

Subsequent work on short-term debt: Financial intermediaries and short-term debt.

- Work with Raghuram Rajan continues to try to understand the financial system as mechanisms to resolve conflicts of interest.
- We use one additional idea showing that: Short-term debt is a stronger commitment to repay than long-term (especially for “banks”).

Raghu Rajan

Yunzhi Hu



Anil Kashyap

Zhiguo He

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Thanks to my (late) thesis advisors at Yale Economics:

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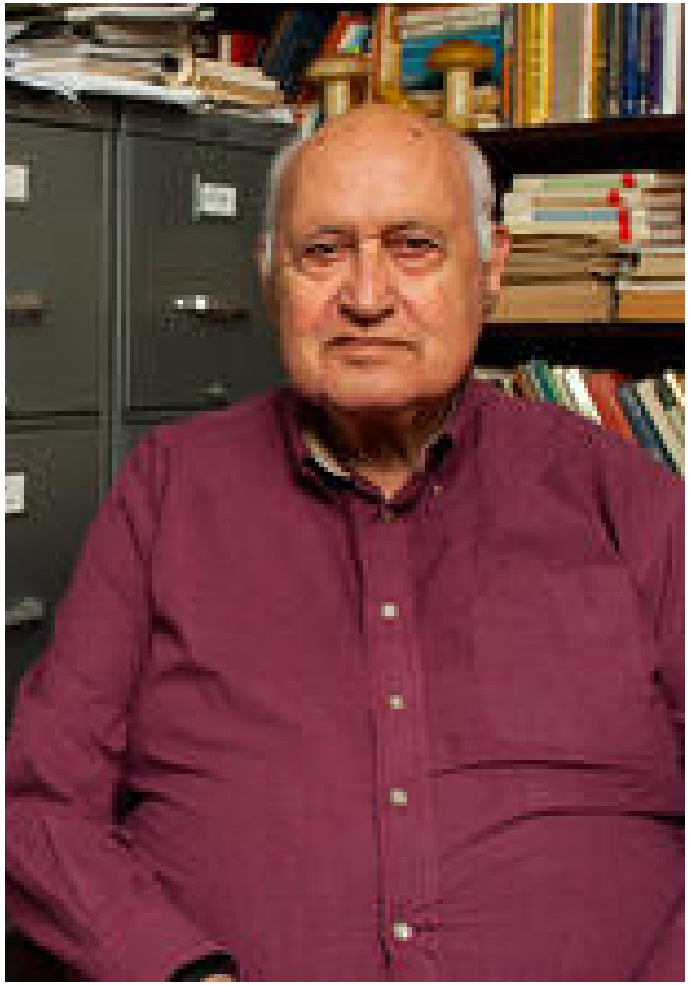

James Tobin