

Banking 1

266: Financial Markets and Institutions

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► Banking

- We'll now turn to banks as the foundation of the financial system and the key way societies overcome the Shakespeare problems

► Review

- Bagehot taught us that mobilizing the savings of a broad range of society was key to the finance and, hence, industrial revolutions.
- Key to mobilizing savings was overcoming the asymmetric information problems—Shakespeare problems, I call them—in financial markets.

► Brute force solutions

- One way to overcome asymmetric information between two parties is for both parties to study each other really hard

Get to know as much of what the other person knows as possible.

- Brute force solution involves a lot of learning, which is costly, slow, and (at times) painful.

... think finals week.

- Some of the asymmetric information is about the motivations, abilities, and intentions of the other party.
- Thus, eliminating asymmetric information amounts to forming a relationship.
relationships are all about coming to understand the motivations, abilities and intentions of another party
- If you thought college education was slow, costly, and sometimes painful, give relationships a try.

► **Fundamental problem in finance**

- We want widespread participation of savers
- Most of these savers have lives

Careers outside finance, spouses, children, aging parents, hobbies,...

- The brute force solution to asymmetric information is grossly impractical for most folks.
- We need to get folks involved in financial markets *without* them ever becoming fully informed about all counterparties they may be directly or indirectly invested in.

► **Main solution for much of modern history: banks**

► **Commercial bank**

- A ‘Commercial bank’ as traditionally defined in the U.S. captures the essence of what we mean by ‘bank’

(we’ll contrast later to, e.g., a universal bank, investment bank)

- Commercial bank: the defining features
 - Takes deposits
 - Makes loans

► **Aside:: Banks**

- I’ll just say ‘banks’ for the rest of the lecture, but we are focussing on commercial banks.

► **Question**

- Q: How do banks overcome the asymmetric information problems that would otherwise thwart broad participation of savers?

Put another way: why do depositors trust the bank with their money?

- A: They don’t necessarily trust the bank. They certainly don’t know much about the management (abilities, intentions, etc.) of the bank.

Historically, banking relied upon an important element of faith

► **The problem with faith-based economics**



► **Classic bank run**

- Person A decides to do sprint intervals on way to the bank.
- Person B: How come that person's in such a hurry to get to the bank?

OHMYGOD, I have no idea if the bank is sound, I better run to get my money out too.

- Details, see 'It's a wonderful life'

go

<http://www.youtube.com/watch?v=MJJN9qwhkkE>

- Or you can jump to the bank run scene:

go

<https://www.youtube.com/watch?v=iPkJH6BT7dM>

► **Aside:: Laws, arbitrary deadlines, and wonderful stuff**

- You may wonder why I penalize you for missing largely arbitrary deadlines.
- It is to illustrate concretely one wonderful aspect of real life: deadlines matter
- The copyright owners of 'Its a Wonderful Life' forgot to renew the copyright when it expired after 28, and the film entered the public domain.

And afterward, it was shown endlessly (for free) on TV.

► **Aside::**

- In a weird twist of fate, what had been a box office flop became a cult classic.

e.g. Slate's Explainer piece: go

<http://www.slate.com/articles/news%5Fand%5Fpolitics/explainer/1999/12/why%5Fwonderful%5Flife%5Fcomes%5Fbut%5Fonce%5Fa%5Fyear.html>

► **Aside:: Back to short-circuiting the asymmetric info. prob.**

► **Solution: deposit insurance**

- The government steps in to guarantee that depositors will not lose their money.
- Once there is credible insurance, depositors no longer need to know about the bank.
- Note: the depositor remains uninformed about the bank, but it no longer matters.

► **Ok, but what about the information asymmetry between the bank and its borrowers?**

► **Banker-to-borrower asymmetry?**

- Q: How do banks overcome the asymmetry between themselves and the folks they lend to?
- Answer 1: Relationships. Learning/interacting. They form a relationship and learn a lot about the business.

Same way sensible people proceed before getting married.

- Get out there and learn as much as possible of what the other party knows, ex ante, and then monitor, ex post.
- This solution is always imperfect, in both marriage and banking, so we also get some additional mechanisms...

► **Clever contracting: Prenups and covenants**

- You protect yourself by how you structure the contractual relationship
- In marriage, you might sign a pre-nup laying out how any dissolution of the marriage might go.

In 2013, the WSJ was reporting that pre-nups were on the rise in the U.S. go

<http://www.wsj.com/articles/SB10001424052702303615304579157671554066120>

- In banking, lenders put covenants in loan agreements restricting borrower behavior
The lender can demand repayment (or force other actions) if the borrower takes certain actions forbidden in the covenant.
- Nice article on this from Bloomberg (quotes Wilbur Ross)

Bloomberg, Sept. 27, 2016 go

<https://www.bloomberg.com/news/articles/2016-09-27/lenders-can-only-watch-as-covenant-lite-debt-strips-influence>

- As you know, bonds often have covenants as well.

► **Another contractual protection: collateral**

- In banking, lender often requires collateral.

Collateral is stuff the lender can seize if borrower doesn't obey the terms of the loan.

- Definitive guide on this topic is . . .

► **Repo Man**



► **Aside:: Modern wrinkle**

- Modern wrinkle: remote disabling of the cars of deadbeat borrowers go

<http://www.nytimes.com/video/business/100000003095109/the-remote-repo-man.html>

- Isn't progress wonderful

Except when they accidentally disable the car when it is travelling at speed. Oh well, we'll get wrinkles worked out.

► **Collateral**

- The vast majority of household credit is collateralized

Home mortgages and auto loans.

- Actually, student loans are also a large part of household credit.

Not collateralized, but most are backed by some government program.

► **O.K. back to the main story**

► **Commercial banks**

- The asymmetry with the fund providers (depositors) is overcome by a government institution: deposit insurance.
- The asymmetry with the borrowers is moderated or minimized by:
 - Relationship: due diligence *ex ante*, monitoring *ex post*
 - Clever contracting (including collateral)

► **A puzzle**

- Banks overcome asymmetric information with borrowers by getting to know the borrower and writing a clever contract.
- Why can't the households just do this directly?

Cut out the middle-person

- Put another way, what is the benefit of having an 'intermediary' deal with borrowers rather than fund providers dealing with borrowers directly?

► **Benefits: Scale and specialization**

- 1. Scale. Banks can pool the funds of lots of depositors.
- Only one entity needs to do the costly relationship-building
 - otherwise each of the individual depositors would have to do this.
- And there is another major benefit of scale, that is, pooling a large quantity of funds in one institution
 - The bank can manage risk by diversifying its loans across a lot of borrowers/sectors/geographic areas/etc.
- 2. Specialization. Banks can specialize in 'lending relationships'
 - They get really good at appraising and monitoring borrowers. Thus, they do this better and cheaper than others could. Standard economic argument in favor of specialization.

► **Bagehot and Shakespeare again**

- Bagehot stressed that the industrial revolution required mobilizing the savings of lots and lots of folks

- Inevitably, the vast majority of these fund providers cannot themselves know deeply about a large, diversified collection of borrowers they fund.
- Banks with government-backed deposit insurance is the main (imperfect)solution.

(we'll get back to imperfections, but need to lay out one more topic: liquidity)

► **Banks and everybody else's liquidity**

► **Liquidity**

- Everyone in the economy—households, firms, etc.— must worry about liquidity

► **Liquidity**

- An asset is 'liquid' if it can be used directly in a wide range of transactions or if it can be converted cheaply, quickly, and at a reliably known value into something that can be used in a wide range of transactions
- Liquid: funds in your checking account
- Illiquid: your house
- Liquid: a short-term Treasury security (a T-Bill)

easily converted to cash at a well-known and relatively stable price

- Illiquid: your antique tooth collection

► **Emphasize**

- No matter how wealthy you are as an individual or firm, you need to be sure that enough of your wealth is in a liquid form to enable you to meet expected and unexpected payment obligations.
- It's called a liquidity crisis when some party that is wealthy enough to afford to make a payment cannot convert that wealth to a form enabling timely payment.

► **One more movie: liquidity crisis**



► **Liquidity crisis in Rocky I**

- Borrower: I'm good for it, really, I just need couple more days to get the cash together.
- Rocky: I'm sorry to have to do this to you.
- Rocky was (according to his trainer) 'a leg-breaker' for a 'second-rate loan shark'

key scene: go

<https://www.youtube.com/watch?v=g6mF%5FyokyiA>

► **Role of commercial banks**

- Commercial banks are the backstop liquidity provider to essentially all other entities in the economy.

Banks provide ATMs, checking accounts, credit lines, overdraft protection, etc.

- In the modern economy, most of your liquidity might be in the form of non-bank assets such as some sort of mutual fund
- And you meet payment obligations lots of ways (credit card, paypal, ...)
- But a bank is the backstop liquidity provider at the end of the chain.

► **Aside:: Central bank**

- Hmm., you should be thinking, who is the backstop liquidity provider to banks?
- As we will see later, the central bank is the backstop liquidity provider to the banking system.
- Thus, the government plays a central role here too.

► **With those big picture issues in place, let's get more into the guts of how banks are run.**

► **Accounting:**

- To really understand any firm, you must understand accounting
- And this is particularly true for understanding financial firms.

► **This class**

- In this class we will just get our feet wet on this topic, using a very simplified set of accounting notions
- If you have had financial accounting, this should all be consistent with what you learned, but much simplified.
- We'll try to be clear about when murkier aspects of reality are important.

For example, you should read the box in the book on 'mark-to-market' accounting

► **Aside: ...**

- You should really consider taking the financial accounting course offered by the CLE
(one of the electives for the financial economics minor)

► **A simplified view of accounting**

► **Balance sheet:**

- A firm's balance sheet gives a snapshot at any point in time of the firm's assets and liabilities
- **Assets:**
stuff you own; stuff that provides future value either in terms of interest or capital gain income.
Sometimes assets are also called 'uses of funds'
- **Liabilities:**
Stuff you must repay, stuff that you must pay interest on. Liabilities are also called 'sources of funds'

► **Definition: net worth**

- $\text{Net Worth} = \text{Assets} - \text{Liabilities}$
- A firm with positive net worth is called 'solvent' and a firm with negative net worth is called 'insolvent.'

► **Net worth and solvency**

- Net worth is roughly how much you'd have left if dissolved the entity and sold off all the assets and paid off all the liabilities.

- Net worth is one measure of what people call ‘capital’
- When net worth goes negative, the firm has no capital, its obligations exceed its assets, and the firm goes bankrupt.

► **Aside:: Real world murkiness**

- In reality there are many different measures of capital
especially in banking
- And bankruptcy law specifies conditions for declaring bankruptcy that do not turn only on any simple notion of net worth.

► **A first balance sheet:**

- Firm mainly sells 1-month certificates of deposit and makes 7-year loans
- Both the deposits and loans have a present value of \$1000.

		First Bank	
		Assets	Liabilities & NW
► Balance sheet	loans	1000	deposits 1000
	other	30	
		1030	total: 1000

Net worth is $NW = 30$.

		First Bank	
		Assets	Liabilities
► Balance sheet	loans	1000	deposits 1000
	other	30	net worth 30
	total	1030	total: 1030

► **Balance sheet**

- Other assets? The bank building, etc.
specifics of other assets not crucial for this example.

► **Definition: Leverage**

- Leverage has many definitions and is often used in imprecise ways.
- But all of the financial uses involve something like the magnitude of assets or liabilities relative to net worth or capital.

- The leverage of this firm, as measured as assets divided by net worth is about 34

That is, $1030/30$

► **Leverage has 2 main effects**

- We will see that higher leverage ...
 - allows the firm to earn a higher rate of return (on average) for the owners
 - but (all else equal) makes the firm more likely to go bankrupt

► **Let's explore that bankruptcy problem first.**

► **Leverage, net worth, and bankruptcy**

- Call our leverage measure, assets divided by net worth, LEV

34 in our example.

- With this leverage, what proportional change in the value of assets will bankrupt the firm (holding liabilities constant)?
- Call the loss RL (for rate of loss):
- The firm goes bankrupt if the drop in asset value wipes out NW :

$$\begin{aligned}
 -RL \times A &= NW \\
 -RL &= NW/A \\
 RL &= -1/LEV
 \end{aligned}$$

- The larger is leverage the smaller the loss it takes to bankrupt the firm.
- Note: in our example, $RL = -1/34 \approx -0.03$.

A 3% fall in the value of assets will bankrupt this firm.

► **Let's explore how a change in interest rates might cause such a loss for our example firm**

► **Effect of interest rate changes**

- We know that both the value liabilities and assets will change when interest rates change.
- Will the value of the firm's assets (loans) rise or fall when interest rates rise?

fall. As we've been emphasizing, the value of fixed income securities falls when interest rates rise

- Will the value of the deposits rise or fall?

Same answer: the value of fixed income securities falls when interest rates rise.

- Thus, when interest rates go up, the value of what the firm is owed from borrowers falls, but the value of what it owes to depositors also falls

We need to know which falls more to determine the effect on net worth

- And the key here is that the maturity of the assets and liabilities is different

The loans are 7 year loans, the deposits are 1-month deposits.

► **Let's simplify**

- Assume that the yield curve is flat (constant interest rate for all horizons)
- And the interest rate rises from 3% to 3.5%

$$i_0 = 0.03, i_1 = 0.035.$$

► **Present value**

- Initially, at $i_0 = 0.03$, the present value of the loans and deposits are both \$1000.
- At $i_1 = 0.035$,

$$\begin{aligned} \text{deposits: } 999.60 &= 1000 \frac{(1 + i_0)^{1/12}}{(1 + i_1)^{1/12}} \\ \text{loans: } 966.67 &= 1000 \frac{(1 + i_0)^7}{(1 + i_1)^7} \end{aligned}$$

- The loans, which have the longer maturity, fall proportionally much more.

\$33 vs. 40 cents.

- And that change in net worth wiped out our \$30 in equity.

Our firm is now bankrupt.

► **Two elements at work here**

- The firm has high leverage.

With leverage of 33, a modest proportional change in the value of assets can bankrupt the firm.

- The firm has a large maturity mismatch between assets and liabilities.

Assets have 7 year maturity; liabilities 1 month.

- Larger maturity mismatch makes the value of the firm very sensitive to changes in market interest rates.

► **Aside:: Oh, and by the way...**

- The firm we have depicted is a rough caricature of Lehman Brothers just before it's collapse
Note: the collapse of Lehman Brothers in Oct. 2008 signalled the beginning of the critical phase of the crisis.

► **It's a wonderful life...**

- Savings and loans are 'bank-like' entities that take deposits and make mortgage loans.
- With this big maturity mismatch, they too can be pushed toward bankruptcy by rises in interest rates.

► **Aside:: S&L Crisis**

- In, say, 1980, S&Ls did not have such crazy leverage as Lehman Brothers.
- But you know that interest rates rose a lot around 1980
value of assets fell sharply, ultimately bankrupting the lots of S&Ls
- About 1000 S&Ls went bust costing the government about \$150 billion in direct expenses
This cost ignores spillovers to economic performance
- Nice web chronology and other info about the crisis go

<http://www.fdic.gov/bank/historical/s%26l/index.html>

► **Why do firms use leverage?**

► **Why use leverage**

- The upside to leverage is a higher return to the owners of the firm.
- Back to accounting

► **ROE, ROA, EM**

- Return on equity (ROE) in any period is

$$ROE = \frac{\text{net profit after tax}}{\text{equity}}$$

Remember that in our simple framework, equity is net worth.

- ROE is a measure of rate of return to the owners

► **Return on assets**

- Return on assets, ROA

$$ROA = \frac{\text{net profit after tax}}{\text{Assets}}$$

- This is a measure of the rate you are earning on your assets

► **Simple algebra:**

-

$$ROE = ROA \times \frac{A}{E} = ROA \times EM$$

where $EM = A/E$ is called the 'equity multiplier'

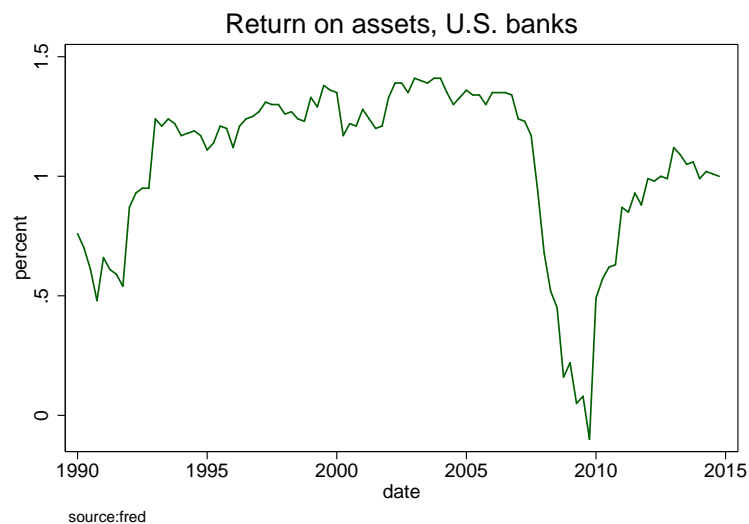
- For any given return on assets, a higher equity multiplier means a higher rate of return to the owners.
- But note that EM is one measure of leverage.
- Higher leverage converts a given ROA into a higher ROE.

► **Thus,**

- All firms balance the benefits of higher leverage (higher ROE) against the costs (higher risk of bankruptcy).

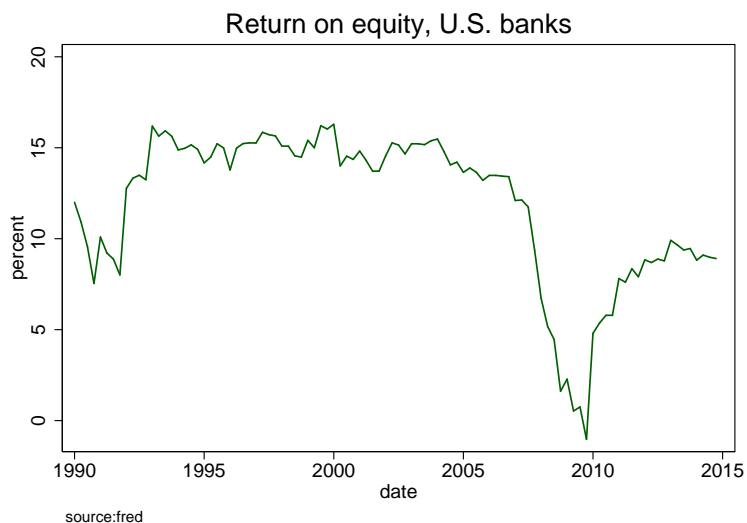
► **Some data**

► **ROA, U.S. banks**



- ROA is down since the crisis from a bit over 1% to about 1%

► ROE, U.S. banks ;

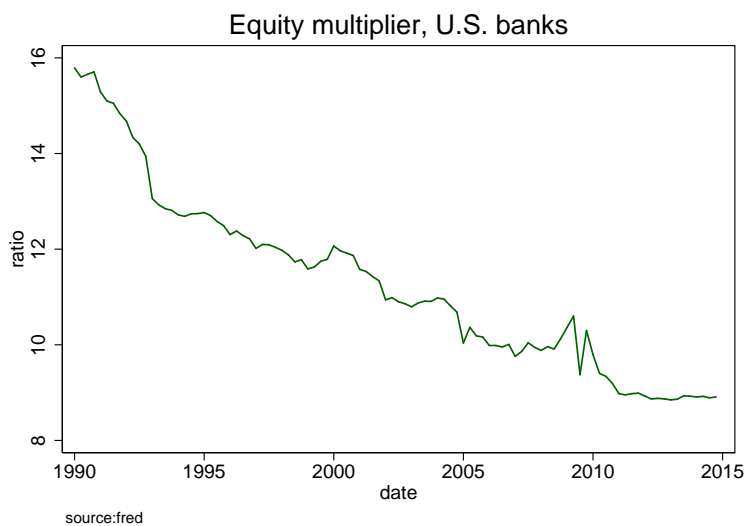


- ROE has fallen roughly from 15% to 10%

down by about 1/3

- Why?

► Leverage (EM) has fallen



► Why did they change?

- Banks were becoming increasingly risky (exposed to bankruptcy) in the period before the crisis
- Since the crisis, banks have to some extent taken on a more realistic view of risk
- And (probably more importantly) the government has tightened regulation forcing them hold more capital.

► **Dodd-Frank**

- Dodd-Frank, the big, post crisis regulatory bill, will be a political football in the coming year.
- It was written by Congress in a big hurry.
- It has some good stuff, some crazy stuff, and a whole lot of stuff that about which reasonable people disagree on the merits.
- In my view: causing banks to hold more high quality capital was very clearly justified and, in this regard, we are now in a better place than before.

(We can debate whether its gone a bit too far or not far enough, but a significant rise in capital was warranted.)

- As for the rest of Dodd-Frank: mixed blessing and we could have a long debate about the merits.

► **Next time**

- Deeper into management and risk management at banks