Banking 1
266: Financial Markets and Institutions

Jon Faust

http://e105.org/e266

March 6, 2018

▶ Banking

- We now turn to banks as the foundation of the financial system

  and as 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.

- I call this the 'brute force' solution because it overcomes asymmetric information by eliminating the asymmetry.
- Brute force solution involves a lot of learning, which is costly, slow, and (at times) painful.
- Note also that some of the asymmetric information is about the motivations, abilities, and intentions of the other party.
- Even studying really hard will not let you understand someone's motivations and intentions in the same way that they do.
- Where motivations, intentions, and future actions are concerned, the nearest thing we have to eliminating asymmetry is forming a relationship.

- Relationships are all about coming to understand the motivations, abilities and intentions of another party
- And, as you may have discovered in life, building and maintaining relationships is even harder than learning.

  See, e.g., about any country music song go

  https://www.youtube.com/watch?v=1GVr1l7Xbko

▶ **A fundamental problem in finance**

- We want widespread participation of savers
- But most of the savers have lives and pursuits other than managing their savings.

  Careers, spouses, children, aging parents, hobbies,...
- The brute force solutions to asymmetric information are grossly impractical for most savers.

▶ **Thus,**

- We need to get folks involved in financial markets *without* them ever becoming very well informed about all counterparties they may be directly or indirectly dealing with.

▶ **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, shadow banking)
- Commercial bank: the defining features
  - Takes deposits

    especially 'checkable' deposits
  - Makes loans

▶ **Aside:: Usage**

- I'll just say 'banks' for the rest of the lecture,
- But we are focusing on what in the U.S. is called commercial banks.
- Or on the commercial banking functions of broader banks.

▶ **Banks and asymmetric information**

- Banks are an intermediary between savers and borrowers.
- We replace one asymmetric relationship with two.
- We had savers-to-borrowers and now have savers-to-bank and bank-to-borrowers.

  Banks provide a partial fix to asymmetry problems in both relations

▶ Depositor-to-bank asymmetry

- The information problem for depositors is 'Why should I trust the bank?'

  And remember, it is impractical for depositors to carefully examine the soundness of the bank.

- Historically, banking mainly relied on faith/reputation/etc.

  You have a marble palace for a building and have been around a long time...

▶ The problem with faith-based economics

▶ Classic bank run

- Say Joe is headed to the bank. He is a marathoner and decides to do sprint intervals on the way.
- Random passerby: How come that person is 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:: Life lesson: arbitrary deadlines matter**

- The copyright owners of 'Its a Wonderful Life' forgot to renew the copyright when it expired

  and the film entered the public domain.

- Since then, it was shown endlessly (for free) on TV.
- 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

▶ **Deposit insurance**

- There is no good solution for getting people to trust banks without the people learning a lot about the bank.
- Thus, in most countries, the government steps in to guarantee that depositors will not lose their money.

  Most jurisdictions have some sort of deposit insurance go

  http://www.iadi.org/

- So long as the government is stable, this obviously solves the problem for the depositors

▶ **Deposit insurance is a mixed blessing**

- Banks+ deposit insurance solves one problem but creates another

  Every solution in this area tends to raise some problems

- With the government picking up the tab for failure, banks will tend to behave in a manner that is too risky
- Thus, we respond with regulation—another imperfect fix.

  We'll talk about regulation more later

▶ **Banker-to-borrower asymmetry**

- How do banks overcome the asymmetry between themselves and the folks they lend using the brute force approach: build a relationship.
- Learn a lot about the counterparty ex ante, stay heavily involved ex post.

Same way sensible people proceed before getting married.

- In all realms of life relationships are important, but an imperfect fix for information asymmetries.
- One additional protection comes in clever contracting.

▶ Aside:: Clever contracting: Prenups

- 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

- I personally am not so sure how clever this contracting is, but ...

▶ Clever contracting

- The most important contractual element often is collateral

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

- Definitive guide on this topic is...

▶ Repo Man

▶ Collateral

- The vast majority of household credit is collateralized

Home mortgages and auto loans.

- (Student loans are also a large part of household credit. Not collateralized, but most are backed by some government program.)

▶ **Other contract features: covenants**

- In banking, lenders put covenants in loan agreements restricting borrower behavior

  analogous to bond covenants.

- The lender can demand repayment (or force other actions) if the borrower takes certain actions forbidden in the covenant.

▶ **Aside:: Real world note: Cov-lite loans**

- Loan covenants have been a big topic in the news for a few years

  Google `cov-lite loans`

- Risky loans with few covenants are called cov-lite loans

  many of which are called leveraged loans, meaning (roughly) loans to farily heavily indebted borrowers.

- Cov-lite loans played a role in the crisis, then the market fell away
- But this market has boomed over the last few years.

  e.g.,from Forbes, Feb. 8 2018, go

  https://www.forbes.com/sites/spleverage/2018/02/08/ldots

  covenant-lite-credits-continue-to-dominate-u-s-leveraged-loan-market/

- Lots of folks are worried about the stability implications.

  For example, the Fed. discussed this in its recent Monetary Policy Report (Feb. 23, 2018) go

  https://www.federalreserve.gov/monetarypolicy/files/20180223%5Fmprfullreport.pdf

- Note that many of these loans are issued and/or held by nonbank institutions.
- The American Bankers Association has a nice article about why banks *should* get into this market
- And about how to do so prudently.

  American Banker, Apr. 26, 2017 go

  https://www.americanbanker.com/opinion/leveraged-loans-deserve-another-look-from-banks

- from the article:

> The focus should be on originating transactions with relationship-orientated clients, not passive participations in syndicated credits. Banks should... acquire the requisite skills... This requires an investment in infrastructure, especially experienced professionals, for underwriting, origination, due diligence and portfolio monitoring.

▶ **Aside::**

- End cov-lite aside

▶ **Commercial banks**

- The depositor-to-bank asymmetry is overcome by a government institution: deposit insurance.
- The bank-to-borrower asymmetry is moderated or minimized by:
  - Relationship: due diligence *ex ante*, monitoring *ex post*
  - Clever contracting (including collateral and covenants)

▶ **To test if you are getting it...**

- 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?
- Short answer: the fund providers don't have the time and energy to have a life and also do this.
- Longer answer involves some key microeconomic ideas: scale, diversification, specialization

▶ **Benefits: Scale and diversification**

- 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 form a relation with each borrower.

- Diversification. Having large scale allows banks to make a diversified portfolio of loans, decreasing overall risk of loss.

  > The bank can manage risk by diversifying its loans across a lot of borrowers/sectors/geographic areas/etc.

▶ **Benefits: specialization**

- Specialization. Banks can specialize in 'lending relationships'

  They get really good at appraising and monitoring borrowers.

- Specialization generally allows the specialist to do something better and cheaper than others could.

  This is a main factor in lots of economic analysis

▶ **One more topic: liquidity**

- At some point, every discussion turns to liquidity.
- While liquidity plays a vital role in asset valuation, we find it difficult to integrate fully in our discussions
- e.g. we carefully derive formulae and then add an arbitrary $+\ell$ at the end.

▶ **Liquidity: one thing we know**

- One thing we know is that banks play an essential role in the liquidity of any asset
- Sometimes this role is indirect or background.
- I like to say that banks are the backstop liquidity provider to all other private sector entities in the economy.

▶ **Remember**

- An asset is liquid if it can reliably provide a basis for making a given payment on short notice.
- This is a slightly different way of saying the same thing we've said before.

▶ **Liquidity**

- T-bill: liquid; your house: illiquid; your car: illiquid, but more liquid than your house.
- But without the banking system, all these are illiquid.

  Commercial banks play a key role (perhaps a backstop role) in allowing you to reliably convert assets into payments.

▶ **Liquidity and solvency**

- Firms and households must focus on solvency

  don't go bankrupt

- But separately, they must focus on liquidity

  Even if my assets are worth more than my liabilities, I may not be able to make some contractual payment due to the illiquidity of assets.

▶ **Liquidity crisis**

- 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**

- 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

▶ **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.
- If a payment obligation arises that you can't cover, you can be forced to sell assets at a loss, or borrow funds at a very high cost, or perhaps pay some large penalty.
- Or you might have to default on the payment, which could ultimately trigger bankruptcy

▶ **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.

▶ **Backstop liquidity provider for banks?**

- Hmmm., 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 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 textbook 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 firms 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**

- Net Worth = Assets - 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 money 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 notions of and measures of capital

  especially in banking

- Further, bankruptcy law specifies conditions for declaring bankruptcy that do not turn only on any simple notion of net worth.
- But the simplified notions we are discussing form a good baseline of understanding.

▶ **A first balance sheet:**

- A bank that mainly sells 1-month certificates of deposit and makes 7-year loans
- Both the deposits and loans have a present value of $1000.
- Firm has physical assets (e.g., computers, etc.) of $30

▶ **(Incomplete) Balance sheet**

First Bank

Assets		Liabilities & NW	
loans	1000	deposits	1000
other	30		
	1030	total:	1000

Net worth is $NW = 30$.

▶ **Balance sheet**

First Bank

Assets		Liabilities	
loans	1000	deposits	1000
other	30		
		net worth	30
total	1030	total:	1030

▶ **Definition: Leverage**

- While leverage has many definitions, all of the financial uses involve something like the magnitude of assets or liabilities relative to net worth or capital.
- The leverage of our bank, as measured by assets divided by net worth, is about 34

  That is, 1030/30

▶ **Leverage is a key concept**

- In any business, leverage is a key concept
- All else equal, higher leverage ...
  - allows the firm to earn a higher rate of return on equity for the owners

    on average
  - but makes the firm more likely to go bankrupt

    (as we said, that higher rate of return is on average)

▶ **Let's explore bankruptcy first.**

▶ **Leverage, net worth, and bankruptcy**

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

  34 in our example.
- As a thought experiment, consider a decline in the bank's assets by $100X\%$
- Ask: What is the smallest proportional decline, X, that would lead to bankruptcy?
- The decline will entirely wipe out net worth if:

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

- The larger is leverage the smaller the loss it takes to bankrupt the firm.
- With leverage of 10, a $1/10^{th}$, or 10%, fall in value will bankrupt the firm.
- In our example, $X = -1/34 \approx -0.03$, so a 3% fall in the value of assets will bankrupt the 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 present 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 for all horizons rises from 3% to 3.5%

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

▶ **Consider loans**

- Initially, we have:

$$\begin{aligned} PV_0 &= \frac{FV}{(1+i_0)^7} \\ PV_0 &= \frac{FV}{1.03^7} \\ 1000 &= \frac{FV}{1.03^7} \end{aligned}$$

  so $FV = 1229.87$.

- After the change,

$$PV_1 = \frac{1229.87}{1.035^7}$$

  or \$966.67

- The value of assets fell by about \$33
- We can do the same computation for liabilities:

$$999.60 = 1000\frac{(1+i_0)^{1/12}}{(1+i_1)^{1/12}}$$

  remember the deposits are 1-month deposits

- The value of liabilities fell by about 40 cents.

▶ **Why maturity and the yield curve matter**

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

  $33 vs. 40 cents.

▶ **Our bank is bankrupt**

- That change in net worth wiped out the $30 in equity.

▶ **Two elements at work here**

- 1. The firm has high leverage.

  With leverage of 34, a modest proportional change in the value of assets can bankrupt the firm.

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

  Large maturity mismatch makes the net worth of the firm very sensitive to changes in market interest rates.

▶ **Oh, and by the way. . .**

- The firm we have depicted is a rough caricature of Lehman Brothers just before it's collapse in the financial crisis

  Note: the collapse of Lehman Brothers in Oct. 2008 signalled the beginning of the critical phase of the crisis.

▶ **Note also**

- Savings and loan institutions are 'bank-like' entities that take deposits and make mortgage loans.

  Deposits are short-term; mortgages are mostly 30-year fixed rate mortgages in the U.S.

- With this big maturity mismatch, they too can be pushed toward bankruptcy by rises in interest rates.

▶ **Aside:: S&L Crisis**

- In 1980, S&Ls did not have such crazy leverage as Lehman Brothers.
- But interest rates did not just go from 3.0 to 3.5 percent as in our example.

  Short-term rates went from 3% peaked near 20 %.

- The value of assets fell sharply relative to liabilities, ultimately bankrupting the lots of S&Ls

▶ **Aside::**

- 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.
- Let's show this using some basic 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 of the firm

▶ **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:**

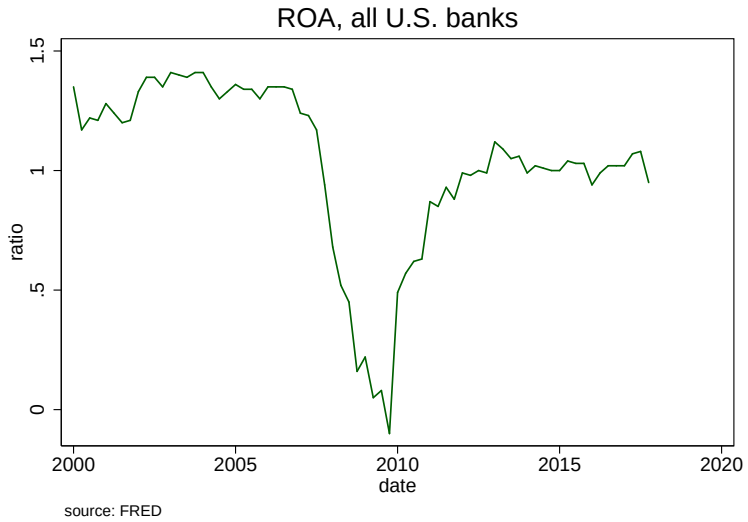
-

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

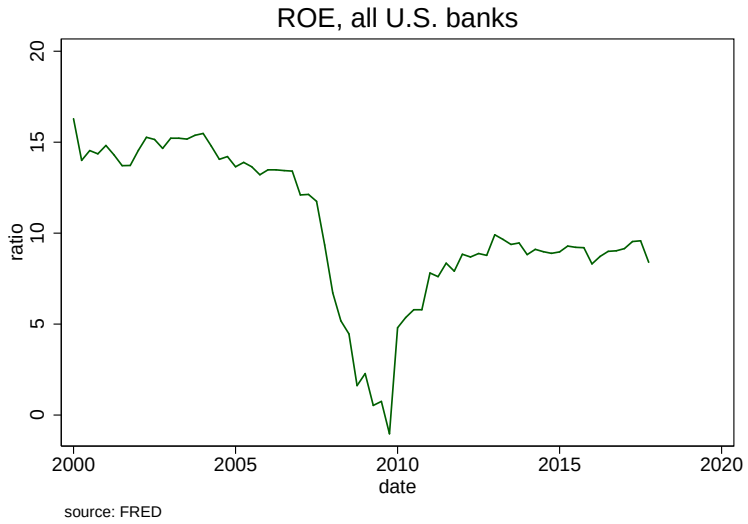
  where $EM = A/E$ is called the 'equity multiplier'

- 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**

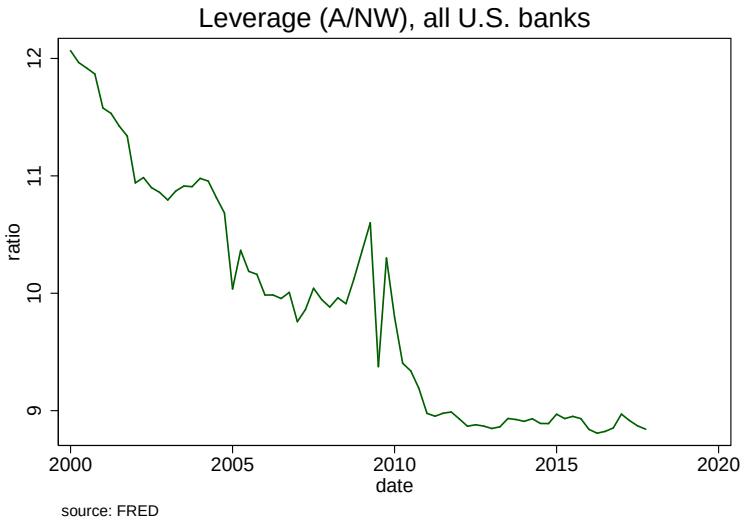


- ROE has fallen roughly from 15% to 10%

  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 the government has tightened regulation forcing them hold more capital relative to assets.

  that is, required banks to lower leverage.

▶ **Dodd-Frank**

- Dodd-Frank a large post crisis regulatory bill
- It was written by Congress in a big hurry.
- It has some good stuff, some crazy stuff, and a whole lot of stuff about which reasonable people disagree on the merits.
- In my view: causing large 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.

▶ **That debate is happening**

- From today's New York Times: Why Are Democrats Helping Trump Dismantle Dodd-Frank?

  go

  https://www.nytimes.com/2018/03/06/opinion/democrats-trump-dodd-frank.html

- As with much of politics these days, a lot of the debate is polarized nonsense.

▶ **Next time**

- deeper into management and risk management at banks