

# International Money and Banking: 10. Incentive Problems in Banking

Karl Whelan

School of Economics, UCD

Spring 2017

# Why Do Banks Get Into Trouble?

- Why do banks get into trouble sometimes?
- Our traditional image of a banker is of someone who is very conservative and risk-averse. Can't we rely on the self-interest of conservative bankers to ensure that most banks maintain sufficient equity capital and that bank failure will be a rare event?
- The answer is no. It turns out that the **incentives** of bank management can lead them to take risks that sometimes end up getting their banks into trouble.
- In these notes, I will discuss how the personal financial incentives of bank executives can lead them to run banks that
  - 1 Are too leveraged (i.e. too little equity capital relative to assets).
  - 2 Have too many risky investments.
  - 3 Are too big.
  - 4 Have too much short-term non-deposit funding.

# Part I

## Incentives For Excessive Leverage

# Imagine You're a Bank CEO

- We've discussed how banking works via a simple balance sheet listing assets and liabilities.
- To better understand how banks work, we're going to go through a little exercise in which we imagine setting up a bank and figuring out what a bank CEO gets up to.
- Let's start with the assumption that the bank is founded by a bunch of investors who have €10 million.
- Then they hire you to run the bank for them.
- They expect you to make as much money for them on their investment as you can.
- Let's see how it goes.

# Getting Started

- First thing you do is spend €1 million of your investors' money on a retail branch network which can start to take in deposits.
- To attract depositors, you offer to pay 1% interest on deposits. Customers appear at the branches and next thing you know, you've got €50 million in deposits.
- Flush with €59 million in non-property assets, you decide to use €50 million to make loans with an interest rate of 5% and you keep €9 million in cash and reserves (i.e. your account at the central bank).
- Here's how your balance sheet looks now (all figures in millions):

Assets (Uses of Funds)		Liabilities (Sources of Funds)	
Cash and Reserves	€9	Deposits	€50
Loans	€50	Equity Capital	€10
Branch Network Buildings	€1		
Total	€60	Total	€60

# Getting Started

- First thing you do is spend €1 million of your investors' money on a retail branch network which can start to take in deposits.
- To attract depositors, you offer to pay 1% interest on deposits. Customers appear at the branches and next thing you know, you've got €50 million in deposits.
- Flush with €59 million in non-property assets, you decide to use €50 million to make loans with an interest rate of 5% and you keep €9 million in cash and reserves (i.e. your account at the central bank).
- Here's how your balance sheet looks now (all figures in millions):

Assets (Uses of Funds)		Liabilities (Sources of Funds)	
Cash and Reserves	€9	Deposits	€50
Loans	€50	Equity Capital	€10
Branch Network Buildings	€1		
Total	€60	Total	€60

# The Income Statement

- Now you're in business. And like any other business, you have revenues and you have costs.
- You have two types of revenues. Interest income of €2.5 million—5% of your €50 million in loans—and €1 million in fees from services offered by your branches.
- However, you had to pay out interest of €0.5 million and the branch network costs €1.5 million to run.
- Now you issue an “Income Statement” to your investors.

Revenues		Costs	
Interest Income	€2.5	Interest Paid	€0.5
Fees	€1.0	Branch Network	€1.5
Total	€3.5	Total	€2.0

- So, you've made profit of €1.5 million. Congratulations!
- Your investors gave you €10 million and you made €1.5 million profit. Thus, you delivered a **Return on Equity (ROE)** of 15%. This is the key performance measure your investors will be watching.

# The Income Statement

- Now you're in business. And like any other business, you have revenues and you have costs.
- You have two types of revenues. Interest income of €2.5 million—5% of your €50 million in loans—and €1 million in fees from services offered by your branches.
- However, you had to pay out interest of €0.5 million and the branch network costs €1.5 million to run.
- Now you issue an “Income Statement” to your investors.

Revenues		Costs	
Interest Income	€2.5	Interest Paid	€0.5
Fees	€1.0	Branch Network	€1.5
Total	€3.5	Total	€2.0

- So, you've made profit of €1.5 million. Congratulations!
- Your investors gave you €10 million and you made €1.5 million profit. Thus, you delivered a **Return on Equity (ROE)** of 15%. This is the key performance measure your investors will be watching.



## Expanding the Business

- What do you do with your €1.5 million of profit income?
- You decide to pay €0.5 million back to your investors in dividends and use the other €1 million (retained earnings) to make more loans.
- You also observe that there are opportunities to make more loans than your deposits and equity capital would allow, so you decide to issue €20 million in debt securities to raise funds to make these loans.
- Now your balance sheet looks like this

Assets (Uses of Funds)		Liabilities (Sources of Funds)	
Cash and Reserves	€9	Deposits	€50
Loans	€71	Debt Securities	€20
Branch Network Buildings	€1	Equity Capital	€11
Total	€81	Total	€81

- From here on, your goal is to expand the business and deliver a steady supply of dividends.

## Expanding the Business

- What do you do with your €1.5 million of profit income?
- You decide to pay €0.5 million back to your investors in dividends and use the other €1 million (retained earnings) to make more loans.
- You also observe that there are opportunities to make more loans than your deposits and equity capital would allow, so you decide to issue €20 million in debt securities to raise funds to make these loans.
- Now your balance sheet looks like this

Assets (Uses of Funds)		Liabilities (Sources of Funds)	
Cash and Reserves	€9	Deposits	€50
Loans	€71	Debt Securities	€20
Branch Network Buildings	€1	Equity Capital	€11
Total	€81	Total	€81

- From here on, your goal is to expand the business and deliver a steady supply of dividends.

# Credit Risk

- But there's a problem. Sometimes people don't pay you back!
- Suppose, for instance, that €5 million of your new loans of €21 million went to a dodgy property developer who went bankrupt and couldn't pay you back. Now your balance sheet looks like this:

Assets (Uses of Funds)		Liabilities (Sources of Funds)	
Cash and Reserves	€9	Deposits	€50
Loans	€66	Debt Securities	€20
Branch Network Buildings	€1	Equity Capital	€6
Total	€76	Total	€76

- Your assets only exceed deposits and debts by €6 million now.
- Note the risky nature of equity capital.
- Your investors get dividends when you make profits but they are the first to lose their money if you make bad loans. Depositors and debt-holders have first claim for getting their money back. So you need to be very careful in assessing the credit risk on your loans.

# Credit Risk

- But there's a problem. Sometimes people don't pay you back!
- Suppose, for instance, that €5 million of your new loans of €21 million went to a dodgy property developer who went bankrupt and couldn't pay you back. Now your balance sheet looks like this:

Assets (Uses of Funds)		Liabilities (Sources of Funds)	
Cash and Reserves	€9	Deposits	€50
Loans	€66	Debt Securities	€20
Branch Network Buildings	€1	Equity Capital	€6
Total	€76	Total	€76

- Your assets only exceed deposits and debts by €6 million now.
- Note the risky nature of equity capital.
- Your investors get dividends when you make profits but they are the first to lose their money if you make bad loans. Depositors and debt-holders have first claim for getting their money back. So you need to be very careful in assessing the credit risk on your loans.

# Credit Risk

- But there's a problem. Sometimes people don't pay you back!
- Suppose, for instance, that €5 million of your new loans of €21 million went to a dodgy property developer who went bankrupt and couldn't pay you back. Now your balance sheet looks like this:

Assets (Uses of Funds)		Liabilities (Sources of Funds)	
Cash and Reserves	€9	Deposits	€50
Loans	€66	Debt Securities	€20
Branch Network Buildings	€1	Equity Capital	€6
Total	€76	Total	€76

- Your assets only exceed deposits and debts by €6 million now.
- Note the risky nature of equity capital.
- Your investors get dividends when you make profits but they are the first to lose their money if you make bad loans. Depositors and debt-holders have first claim for getting their money back. So you need to be very careful in assessing the credit risk on your loans.

## Two Banks: Big and Small

- Suppose you start up a bank with €10 million in equity capital. You pay 2% on deposits, charge 3% on your loans, and reserve requirements are 10% of deposits.
- Consider now the following two cases. In the first case, you raise €90 million in deposits giving you the following balance sheet:

Assets (Uses of Funds)		Liabilities (Sources of Funds)	
Cash and Reserves	€9	Deposits	€90
Loans	€91	Equity Capital	€10
Total	€100	Total	€100

- In the second case, you are more aggressive raising funds. You also borrow €100 million from international money markets, again at 2% interest, giving you the following balance sheet:

Assets (Uses of Funds)		Liabilities (Sources of Funds)	
Cash and Reserves	€9	Deposits	€90
Loans	€191	Borrowings	€100
		Equity Capital	€10
Total	€200	Total	€200

## Two Banks: Big and Small

- Suppose you start up a bank with €10 million in equity capital. You pay 2% on deposits, charge 3% on your loans, and reserve requirements are 10% of deposits.
- Consider now the following two cases. In the first case, you raise €90 million in deposits giving you the following balance sheet:

Assets (Uses of Funds)		Liabilities (Sources of Funds)	
Cash and Reserves	€9	Deposits	€90
Loans	€91	Equity Capital	€10
Total	€100	Total	€100

- In the second case, you are more aggressive raising funds. You also borrow €100 million from international money markets, again at 2% interest, giving you the following balance sheet:

Assets (Uses of Funds)		Liabilities (Sources of Funds)	
Cash and Reserves	€9	Deposits	€90
Loans	€191	Borrowings	€100
		Equity Capital	€10
Total	€200	Total	€200

## Two Banks: Big and Small

- Suppose you start up a bank with €10 million in equity capital. You pay 2% on deposits, charge 3% on your loans, and reserve requirements are 10% of deposits.
- Consider now the following two cases. In the first case, you raise €90 million in deposits giving you the following balance sheet:

Assets (Uses of Funds)		Liabilities (Sources of Funds)	
Cash and Reserves	€9	Deposits	€90
Loans	€91	Equity Capital	€10
Total	€100	Total	€100

- In the second case, you are more aggressive raising funds. You also borrow €100 million from international money markets, again at 2% interest, giving you the following balance sheet:

Assets (Uses of Funds)		Liabilities (Sources of Funds)	
Cash and Reserves	€9	Deposits	€90
Loans	€191	Borrowings	€100
		Equity Capital	€10
Total	€200	Total	€200



# Leverage and the Return on Equity

- What profits do you make in these two cases?
- Case 1: Profits =  $.03(91) - .02(90) = 2.73 - 1.8 = 0.93$ . Your Return on Equity is 9.3%.
- Case 2: Profits =  $.03(191) - .02(190) = 5.73 - 3.82 = 1.91$ . Your Return on Equity is 19.1%.
- The second case, with the lower capital-assets ratio, produces profits and thus a higher return on equity.
- The capital-assets ratio is often discussed in reverse terms, as the assets-capital ratio, which is called the *leverage ratio*.
- In Case 1, equity capital was 10% of total assets, so the leverage ratio was 10. In Case 2, equity capital was 5% of total assets, so the leverage ratio was 20.
- Clearly, the more highly-leveraged bank is taking on greater risk. It has more credit risk (more loans that could go bad) and more liquidity risk (funds from international money markets could dry up if things go wrong). But it also makes more profits.

# Leverage and the Return on Equity

- What profits do you make in these two cases?
- Case 1: Profits =  $.03(91) - .02(90) = 2.73 - 1.8 = 0.93$ . Your Return on Equity is 9.3%.
- Case 2: Profits =  $.03(191) - .02(190) = 5.73 - 3.82 = 1.91$ . Your Return on Equity is 19.1%.
- The second case, with the lower capital-assets ratio, produces profits and thus a higher return on equity.
- The capital-assets ratio is often discussed in reverse terms, as the assets-capital ratio, which is called the *leverage ratio*.
- In Case 1, equity capital was 10% of total assets, so the leverage ratio was 10. In Case 2, equity capital was 5% of total assets, so the leverage ratio was 20.
- Clearly, the more highly-leveraged bank is taking on greater risk. It has more credit risk (more loans that could go bad) and more liquidity risk (funds from international money markets could dry up if things go wrong). But it also makes more profits.

## Leverage and the Return on Equity

- What profits do you make in these two cases?
- Case 1: Profits =  $.03(91) - .02(90) = 2.73 - 1.8 = 0.93$ . Your Return on Equity is 9.3%.
- Case 2: Profits =  $.03(191) - .02(190) = 5.73 - 3.82 = 1.91$ . Your Return on Equity is 19.1%.
- The second case, with the lower capital-assets ratio, produces profits and thus a higher return on equity.
- The capital-assets ratio is often discussed in reverse terms, as the assets-capital ratio, which is called the *leverage ratio*.
- In Case 1, equity capital was 10% of total assets, so the leverage ratio was 10. In Case 2, equity capital was 5% of total assets, so the leverage ratio was 20.
- Clearly, the more highly-leveraged bank is taking on greater risk. It has more credit risk (more loans that could go bad) and more liquidity risk (funds from international money markets could dry up if things go wrong). But it also makes more profits.

# Incentives of Bank Shareholders and CEOs

- These calculations show why we can't rely on bankers self-interest to maintain sufficient capital to protect against losses. The higher credit and liquidity risk means higher bank profits.
- There are two different elements to consider here:
  - ① **Investor Incentives:** People differ in how much risk they are willing to take. Shareholders of a highly-leveraged bank may be willing to accept a risk of losing all their money in return for a high return most of the time. Maybe by the time the bank blows up, they will have made a nice return from all the dividends the bank has paid back.
  - ② **Bank CEO Incentives:** Even if the bank's shareholders don't want to take on a lot of risk, there are strong incentives for bank CEOs to operate with high leverage. Profit-linked bonuses are very important for senior bank management, so they want to maximize profits *today*. If the bank blows up next year, they don't have to pay the bonuses back. So they have an incentive to take big risks while pretending to shareholders that they are being prudent.

# Part II

## Other Incentive Problems

# Excessive Risk Taking in Lending or Investment

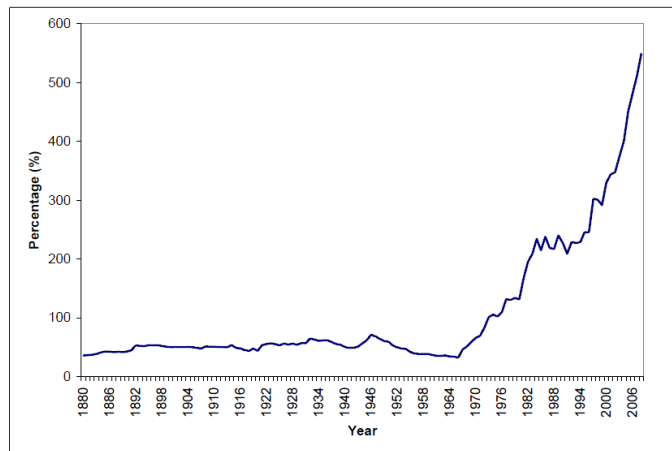
- We have seen how banks may be incentivized to have too much leverage. For a given amount of equity, a bank with more assets will generally deliver a higher return on equity. For bank CEOs, the higher returns from more leverage may matter more than the smaller probability that credit or liquidity risks bring down the bank.
- Similar arguments apply to risky lending or investments. Consider an investment that has a ninety percent probability of delivering a 50% return and a 10% probability of losing all your money. A banker who takes on this risk will generally do well and may earn good bonuses. Occasionally, however, his bank will become insolvent. He may decide it's worth the gamble.
- Sometimes bankers get into trouble because everyone believes a certain type of investment (technology stocks, housing) is a “one-way bet” and only realise too late that they are wrong. We will discuss the idea of asset price “bubbles” later.
- Why don't the bankers question the prevailing wisdom? Often, the money being made is just too good.

# Incentives to be Too Big

- We have discussed the idea of systemic risk, i.e. how a bank may be perceived as “too big to fail” because its failure can bring down the whole financial system.
- This provides an incentive for banks to grow bigger in size over time: The bigger they are, the more likely the state will intervene to save them if things go wrong. In addition to being highly leveraged (high ratio of assets to equity) this can also be achieved by taking over other banks or seeking new equity investments.
- The website features a link to an excellent paper from November 2009 titled “Banking on the State” by Piergiorgio Alessandri and Andrew Haldane of the Bank of England.
- Alessandri and Haldane document how banking sectors have grown in size relative to the economy, have become more leveraged and less liquid, and have engaged in more risky trading activities.
- The next few pages repeat some graphs from the Alessandri-Haldane paper.

# The Banking Sector Has Increased In Size

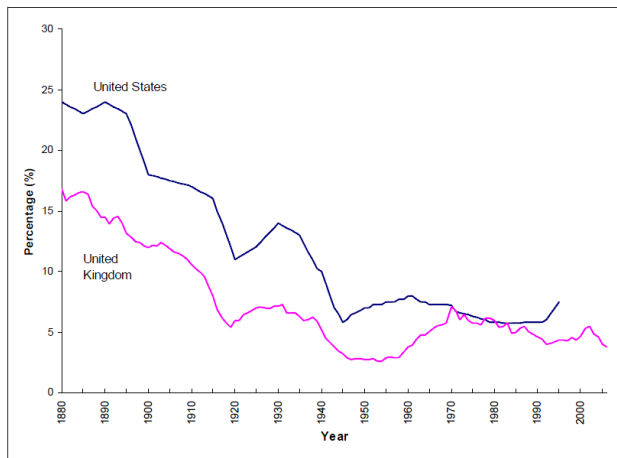
**Chart 1: UK banking sector assets as % of GDP**





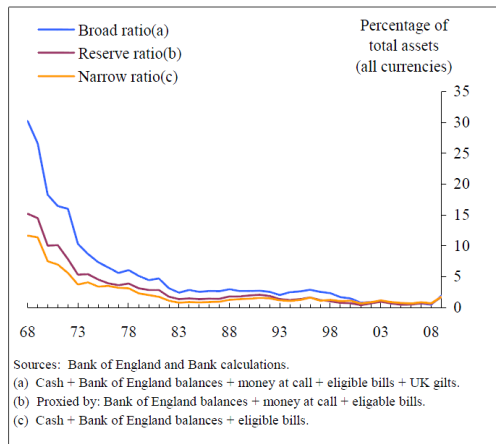
# And Has Lower Capital Ratios

Chart 2: Capital ratios for UK and US banks



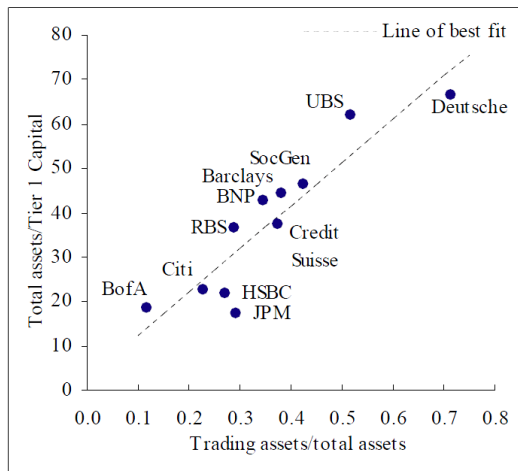
# And Has Less Liquid Assets

Chart 3: Sterling liquid assets relative to total assets



# With Big Banks Doing a Lot of Financial Trading

Chart 8: LCFIs' trading portfolios and financial leverage – 2007



## Alessandri and Haldane: Banking on the State

- “Gains to shareholders are potentially unlimited. But the same is not true in bad states of the world. The reason is limited liability. That constrains the losses of shareholders to around zero. Losses beyond that point are borne by other parts of banks’ capital structure - wholesale and retail depositors. Therein lies the problem. If protection of depositors is felt to be a public good, these losses instead risk being borne by the state, either in the form of equity injections from the government (capital insurance), payouts to retail depositors (deposit insurance) or liquidity support to wholesale funders (liquidity insurance). The gains risk being privatised and the losses socialised. Evidence suggests this is a repeated historical pattern.”
- “Socialised losses are doubly bad for society. Taxes may not only be higher on average. They may also need to rise when they are likely to be most painful to taxpayers, namely in the aftermath of crisis. So taxes profiles will be spiky rather than smooth and will spike when the chips are down.”
- “So far, so bad. But it is about to get worse, for this tells only half the story. This is a repeated game. State support stokes future risk-taking incentives, as owners of banks adapt their strategies to maximise expected profits. So it was in the run-up to the present crisis.”

# The Doom Loop

- Alessandri and Haldane: “These strategies are the latest incarnation of efforts by the banking system to boost shareholder returns and, whether by accident or design, game the state. For the authorities, it poses a dilemma. Ex-ante, they may well say “never again”. But the ex-post costs of crisis mean such a statement lacks credibility. Knowing this, the rational response by market participants is to double their bets. This adds to the cost of future crises. And the larger these costs, the lower the credibility of “never again” announcements. This is a doom loop.”
- Another vocal proponent of the dangers of “too big to fail” is Simon Johnson (MIT and former chief economist of the IMF). I have linked to a presentation of his titled “Economic Recovery And The Coming Financial Crisis.”
- Johnson is a strong believer in the need to break up the world’s biggest financial institutions so that bank failures can be handled by standard bank resolution techniques. He may be wrong about “the coming crisis” but there is plenty to worry about.

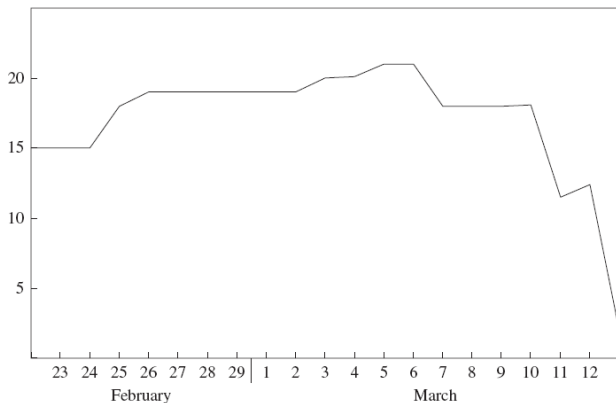
## Incentives to Rely on Short-Term Debt

- By September 2007, it was clear that some major banks were going to incur large losses that would threaten their solvency. Many of them had funded their operations with very short-term borrowing, which began to flow out.
- Why? See paper by Diamond and Rajan: “Given the complexity of bank risk-taking, and the potential breakdown in internal control processes, investors would have demanded a very high premium for financing the bank long term. By contrast, they would have been far more willing to hold short-term claims on the bank, since that would give them the option to exit – or get a higher premium – if the bank appeared to be getting into trouble.” In other words, they took this option because it was cheap.
- Vanity Fair article on Bear Stearns: “By midafternoon the dam was breaking. One by one, repo lenders began to jump ship. As word spread of the withdrawals, still more repo lenders turned tail .... A full \$30 billion or so of repo loans would not be rolled over the next morning. They might be able to replace maybe half that in the next day’s market, but that would still leave Bear \$15 billion short of what it needed to make it through the day ... By four o’clock the firm’s reserves, which had been \$18 billion that Monday, had dwindled to almost nothing.”

# The Demise of Bear Stearns

Figure 7. Bear Stearns' Cash Holdings, February 22–March 13, 2008

Billions of dollars



Source: Letter from SEC Chairman Christopher Cox to the Chairman of the Basel Committee on Banking Supervision, March 20, 2008.

# Part III

## Case Study: The Sub-Prime Mortgage Meltdown



# Securitization

- In the past, mortgages were the classic illiquid asset. Once a bank made the loan, the money came back very slowly over time.
- One could try to sell the rights to the stream of mortgage payments to another bank, perhaps to a big international investor.
- But buying individual loans requires paperwork and then having to service the loan. And perhaps you're being sold a loan that's going to default.
- *Securitization* dealt with these issue. If the mortgage was packaged together with lots of other mortgages, diversification would reduce the risk.
- Big international investors could thus purchase many loans together, getting them off the bank's balance sheet (freeing it to do more lending) and also paying the bank a fee for collecting and sending on the loan repayments.
- Usually, it's a bit more complicated. The bank usually has to agree to take the first  $x\%$  of any losses on a loan, to stop them just passing on their bad loans to international investors.

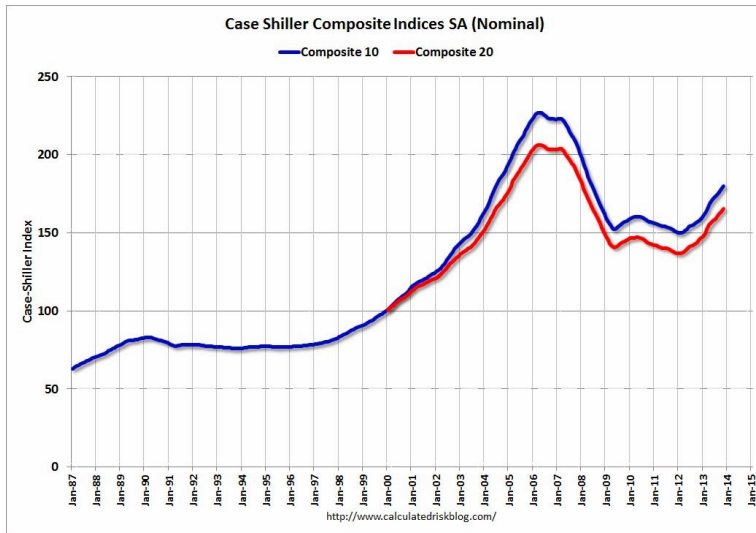
# The Securitization Boom

- With low interest rates and a booming housing market, the period after 2003 was a boom period for mortgage securitization.
- New types of mortgage-backed securities were invented. The money coming in from a large pool of mortgages could be used to create more than just one bond. Securitizers created different quality mortgage-backed securities.
  - ▶ For instance, one could create Security A, which paid the bond-holder out of all the repayments due back over the first five years of the various underlying mortgages. Safe enough, could be rated AAA.
  - ▶ And then use the money from rest of the mortgage repayments to pay back those who bought Security B. Less safe, could be rated AA.
  - ▶ Often, they also re-packaged these securities. For instance, you could create a security that was two-thirds of Security A and one-third Security B, and perhaps it might just about be rated AAA.
- Very large quantities of these mortgage-backed securities were produced and many US banks were making a lot of money from the fees they made from originating mortgage loans and then selling them to securitizers.

## Deteriorating Credit Quality: Bad Subprime Loans

- Many banks ended up making loans to people who could barely afford homes and then passing these loans on to securitisers.
- See again the paper on the website by Diamond and Rajan.
- Diamond and Rajan: “The “originate-to-securitize” process had unintended consequences. Because rating agencies were at a distance from the homeowner, they could process only hard information such as the credit score of the homeowner and the loan-to-value ratio, and per force had to ignore the detailed soft information that loan officers collected in assessing borrower creditworthiness. In turn, this meant originators stopped collecting this useful information, and focused instead only on ensuring borrowers had good credit scores and observable low loan-to-value ratios. Of course, originators could not completely ignore the true quality of borrowers since they would be responsible for initial defaults, but because house prices were rising steadily over this period, even this source of discipline weakened; the house price rise would give the homeowner the equity with which he could finance loan repayment.”

# The US House Price Boom and Bust



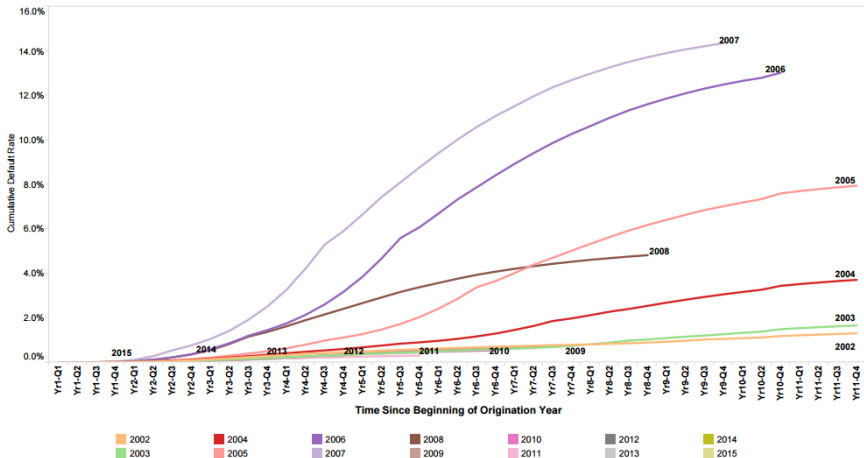
# Things Start to Go Wrong

- By 2006, the Fed had started to steadily increase interest rates and this was starting to affect the ability of people to pay high prices for houses. Many of the poorer quality (subprime) borrowers were on variable-rate mortgages which rose when the Fed increased rates (most US mortgages are fixed rate). Even those that could actually afford to pay to start with started to have trouble.
- Suddenly, the US economy saw a jump in defaults on mortgages.
- And house prices started to fall, so when the banks repossessed houses, they couldn't recover the values of the loans by selling the homes.
- By mid-2007, the full scale of the bad loans started to become clear. People started to seriously worry about the mortgage-backed securities that these loans were supposed to be paying for.
- Diamond and Rajan: “the slicing and dicing through repeated securitization of the original package of mortgages created very complicated securities. The problems in valuing these securities were not obvious when house prices were rising and defaults were few. But as the house prices stopped rising and defaults started increasing, the valuation of these securities became very complicated.”

# Why Valuation of MBS Was So Difficult

- After 2007, investors found it very difficult to figure out a good valuation for the mortgage-backed securities (MBS) originated in 2005-2007.
- One reason for this is the incredible complexity of some of the securities, so that once defaults and house price declines had to be factored in, people couldn't figure out the correct values.
- Another reason is that it is still very hard to figure out how many people will default on the mortgages originated in 2005-2007.
- Normally, few people default on a mortgage and very few default in the early years. See the next page for a chart of default rates for US mortgages issued in different years as they age over time.
- The 2002 vintage shows what a reasonably typical year looks like. Even after ten years, only a small proportion of mortgage-holders had defaulted.
- But the 2005-2007 vintages started defaulting in substantial numbers straight away and the vintages got worse. There is still uncertainty over how many of these people are going to end up paying their mortgages back.

# Default Rates on US Mortgage Loans by Origination Year



# The Global Banking Crisis of 2007-2009

- The global banking crisis saw lots of problems due to bad incentives combine together.
  - 1 Many banks (particularly European banks) had purchased large quantities of mortgage-backed securities. Poor loan standard meant that many may not have understood the risks they were taking.
  - 2 However, many bankers understood that MBS investments were higher risk than traditional AAA investments but were happy to take the additional returns.
  - 3 Lots of other proprietary trading activity also involved excessive risk-taking. e.g. credit default swaps that would incur big losses in a recession.
  - 4 Major banks were highly leveraged, with insufficient capital to absorb losses if the trading portfolios performed poorly.
  - 5 Short-term non-deposit funding often withdrew quickly, creating liquidity crises.
  - 6 With major banks considered too big to fail, governments intervened.
- Next, we will look at regulation to deal with these incentive problems.



## Recap: Key Points from Part 10

Things you need to understand and remember from these notes:

- 1 Income statements and how banks make profits.
- 2 Leverage and its role in determining the return on equity.
- 3 Why shareholders and CEOs may prefer high leverage ratios.
- 4 Incentives for excessive bank size and risk-taking.
- 5 Evidence presented by Alessandri and Haldane.
- 6 Incentives for short-term funding.
- 7 Securitisation and the problems with sub-prime mortgage-backed securities.