MA Advanced Macroeconomics: 13. Banking: Crises and Regulation

Karl Whelan

School of Economics, UCD

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Part I

Banking Basics

Some History: Early Banking

- Once coins and paper money replaced barter, the question arose of where people stored their money. You could keep it all at home (perhaps under the mattress) but this would not be very safe.
- Banks began as safe depositories for cash: You had your own separate locker in the bank's vaults for your cash.
- And you could go to the bank when you needed to get out your cash.
- But why waste your time going yourself? Why not pay your bills with a special piece of paper (clearly identifiable as coming from you) that says the bearer is entitled to payment of cash from your account?
- As we noted before, this was how the earliest bank notes came into existence. Cheques can also be used to make payment without using cash.
- Once many people had bank accounts, then they weren't taking money out of the bank after receiving a cheque. Instead, they were instructing the bank to move cash from someone else's locker to theirs.

Clearinghouse Banks

- Suppose Bank A's depositors look to have their accounts credited by €10 million by presenting cheques from Bank B's depositors.
- At the same time, Bank B's depositors look to be credited €9 million from Bank A depositors.
- We could send €19 million in cash around town to the various vaults.
- But the couriers could get held up by bandits!
- A better idea was the following: Settle accounts at a clearinghouse bank. At end of the day, the clearinghouse orders the transfer of €1 million from B's vaults to A's.
- Actually, you could mingle all the cash together and the clearinghouse just deducts €1 million from the ledger entry for Bank B's account and adds it Bank A's.
- But all deposits are still fully backed up by cash in the vaults.
- These clearinghouses were the forerunners of today's central banks.

Fractional-Reserve Banking

- Most of the time (most being an important qualifier!) only a small fraction of a bank's total deposits will be demanded on any given day.
- And new money also gets deposited every day. Consider the example on the previous slide: Despite €10 million in total claims against it, Bank B still only needed to hand over €1 million at the end of the day.
- Eureka moment: Why do we have to keep all this cash sitting around doing nothing to back up the deposits?
- Why not *lend* out some of these deposits and just keep enough cash reserves on hand to deal with day-to-day demands?
- And so, the modern practise of fractional-reserve banking was born: Banks don't keep all your money in a vault anymore. They lend it out to other people.
- This is called *fractional-reserve banking* because they only keep a fraction of the money you've deposited with them "on reserve" in case people come looking for their money.

Bank Balance Sheets

- A bank's balance sheet lists its assets and liabilities.
- The liabilities side shows the *sources* of the bank's funds (where it got them from) and the asset side shows the *uses* of funds (where they went).
- Here's a simple example of a balance sheet:

Assets (Uses of Funds)		**Liabilities and Equity (Sources of Funds)**	
Cash	€15	Deposits	€100
Loans	€95	Equity Capital	€10
Total	€110	Total	€110

- This bank took in €100 in deposits and added this to €10 in funds that belong to its owners (equity capital).
- It then took these €110 in funds and handed out €95 in loans and kept €15 in cash (in case some of the depositors come looking for money.)

Balance Sheet of US Banks, July 2012

Assets (Uses of Funds)		**Liabilities and Equity (Sources of Funds)**	
Reserves and Cash	14%	Deposits	67%
Securities	20%	Borrowings	12%
Business Loans	11%	Other Liabilities	8%
Real Estate Loans	27%	Equity Capital	13%
Consumer Loans	9%		
Other Loans	8%		
Other Assets	11%		
Total	100%	Total	100%

- Note that banks are keeping 14% of their deposits on hand in cash or reserves held at the central bank.
- The rest has been invested or loaned out.
- The next two pages show the balance sheet of Bank of Ireland.

Bank of Ireland Balance Sheet: Assets

	Note	As at 30 June 2015 €m	As at 31 December 2014 €m
Assets			
Cash and balances at central banks		5,261	4,991
Items in the course of collection from other banks		319	435
Trading securities		158	12
Derivative financial instruments		3,224	3,692
Other financial assets at fair value through profit or loss		12,271	11,528
Loans and advances to banks	15	5,249	4,851
Available for sale financial assets	16	9,699	13,580
Held to maturity financial assets	17	1,946	-
NAMA senior bonds	18	1,896	2,374
Loans and advances to customers	19	85,250	82,118
Interest in associates		58	56
Interest in joint ventures	20	107	233
Intangible assets		433	410
Investment properties		761	701
Assets classified as held for sale	21	159	135
Property, plant and equipment		323	324
Current tax assets		15	11
Deferred tax assets	28	1,598	1,638
Other assets		2,718	2,705
Retirement benefit asset	29	6	6
Total assets		**131,451**	**129,800**

Bank of Ireland Balance Sheet: Liabilities and Equity

Equity and liabilities			
Deposits from banks	23	2,215	3,855
Customer accounts	24	79,186	74,837
Items in the course of transmission to other banks		387	379
Derivative financial instruments		4,137	4,038
Debt securities in issue	25	12,830	16,040
Liabilities to customers under investment contracts		5,859	5,680
Insurance contract liabilities		10,384	9,918
Other liabilities		2,666	2,628
Current tax liabilities		36	30
Provisions	27	72	85
Deferred tax liabilities	28	82	71
Retirement benefit obligations	29	814	992
Subordinated liabilities	26	2,506	2,500
Liabilities classified as held for sale	21	1	-
Total liabilities		**121,175**	**121,053**
Equity			
Capital stock		2,558	2,558
Stock premium account		1,135	1,135
Retained earnings		4,805	4,196
Other reserves		1,048	876
Own stock held for the benefit of life assurance policyholders		(11)	(12)
Stockholders' equity		**9,535**	**8,753**
Other equity instruments	30	740	-
Total equity excluding non-controlling interests		**10,275**	**8,753**
Non-controlling interests		1	(6)
Total equity		**10,276**	**8,747**
Total equity and liabilities		**131,451**	**129,800**

Advantages of Fractional Reserve Banking

- Fractional-reserve banking has generated a lot of criticism over the years along the lines of "how dare these people pretend they have your money when they've actually given it to someone else."
- Don't take these criticisms too seriously. Banks don't pretend they have your money in the vault but they will (almost always) give you your money back on on request if you ask.
- But it has important advantages:

1. Saves depositors money: Banks can charge interest on their loans. Without this interest income, the only way a bank can make a profit is to charge fees to depsitors. Interest earned can be used as an alternative source of income for banks and (assuming competition between banks) this reduces the need for fees related to safeguarding their money.
2. It makes banks an intermediary between those that have money and those that need to borrow money. This *financial intermediation* function is a crucial aspect of the modern economy.

Why Do We Need Financial Intermediaries?

Why can't those with savings just lend them directly to those who want to borrow?

1. **Pooling Savings**: Many savers deposit small amounts. Someone looking for a big loan can get it from a bank rather than having to look for a saver with the correct amount of funds.
2. **Risk Diversification**: Savers lending their funds to an individual borrower face idiosyncratic risk. If that borrower fails to pay back, they lose everything. The bank can lend to many borrowers, take its cut, and pass a safe return back to the saver.
3. **Maturity Transformation**: If I want to have my savings back when I want them, I won't lend the money for one year or more, as borrowers may want. Banks can make these long-term loans, knowing that (hopefully) each period, only some of its depositors will want their money back.
4. **Information Processing**: Banks can specialize in screening borrowers, processing and sharing information, and in writing sophisticated debt contracts.

An Important Disadvantage: Potential for Instability

- Having listed all the advantages of fractional-reserve banking, it turns out there is also a very important *disadvantage* associated with it.
- Banks are supposed to have assets greater than liabilities owed to non-investors (i.e. positive bank capital).
- What if the bank makes bad loans to borrowers that default?
- What if customers suspect the bank does not have assets to pay back money to depositors?
- If this happens, the earlier arguments that only some customers wanting their money back may turn out to be incorrect.
- We may have a run on the bank: Lots of depositors look to get their money back. Banks are generally not able to cope with these runs.
- For these reasons, fractional reserve banking systems are subject to occasional periods of instability, such as the one we are currently experiencing.

Maturity Mismatch

- In an ideal world, a bank would have the maturity of its assets closely match its the maturity of its liabilities, e.g. if it has €100 million euro of demand deposits, it would have the same amount in cash, if it had €500 million in five year deposits, it would have the same amount in five year loans.
- This would limit the possibility of demands for withdrawals that can't be met from liquid funds.
- However, there are limits to this. *Maturity mismatch* is a standard feature of banking: People who supply funds tend to want to have it available for return at shorter terms than people who the bank lends funds out to.
- In the past, governments imposed regulations to limit maturity mismatch: Mortgage lenders took in longer-term savings, banks who had demand deposits only made shorter loans.
- However, these restrictions have generally been lifted over the years.
- Most banks are thus vulnerable if situations arise in which there are demands to pay back a large amount of liabilities over a short period of time.

Part II

Banking Crises and Their Consequences

Insolvency and Bank Runs

- Banks generally make profits by charging higher interest rates on loans than they pay out on deposits. But things can go wrong sometimes.
- Sometimes, borrowers don't pay back their loans or the other assets invested in lose much of their value.
- They can also sometimes make bad investments in other assets such as stocks or bonds.
- What if a bank makes losses so that its assets go below what it owes to depositors and bond-holders, i.e. it has negative equity capital?
- Once it is suspected a bank is insolvent, if depositors fear that they may not get their money back, this can trigger a *bank run*: Depositors line up to demand their money back.
- In September 2007, depositors of Northern Rock, who had limited deposit insurance from the UK government, started to take their money out of its branches. This was the first time since the 1930s that advanced economies saw retail bank runs of this type.
- Last year, depositors in Cyprus lost large amounts of money when their two biggest banks failed.

Bank Panic! (Berlin 1930s)

Bank Panic! (Cyprus Style)

Bank Panic! (British Style)

What Happens When There is a Bank Run?

- The bank can start paying off depositors by selling off its most liquid assets, e.g. cash, excess reserves at the central bank, government debt securities.
- But once those assets are gone, the bank will have to start selling assets that are not liquid and so not easy to quickly turn into cash, e.g. long-term customer loans or property assets.
- Selling off non-liquid assets quickly (an asset fire-sale) often requires having to sell the assets for less than if they had been sold in a more orderly manner.
- The bank run triggered by its insolvency ends up making the bank even more insolvent—the value of its assets fall even farther behind liabilities.
- Sometimes a bank run can be triggered by mere *rumours* that the bank is insolvent. Even if the rumours are false, the bank may still end up being insolvent if it has to sell its assets quickly at a discount to pay back its liabilities.
- For this reason, bankers and governments are always quick to declare that banks are fully solvent. Even if they are not so sure, the bank and the government will want to prevent a run.

Contagion

- On its own, a single bank failing and some depositors losing some money is unfortunate but not necessarily a major concern.
- However, once one bank fails, it can often put other banks under pressure.
- If one bank has lost money on a particular type of loan or security investment, how can depositors be sure that other banks are not also about to lose similar amounts?
- To depositors, two banks with similar loan portfolios probably look the same. If one has lost plenty of money and is insolvent, how can we be sure that the other isn't heading in the same direction.
- So bank runs can be *contagious*: After one bank fails, depositors start to look for their money back from other banks.
- Bank failures thus tend to come together in batches. The banking system may seem healthy one minute and then suddenly the whole system becomes unstable.

Implications of Banking Crises for Credit

- Banking crises usually lead to a severe restrictions on the availability of credit to firms and households.
- To see why, let's look at a stylized balance sheet and think about what happens during a banking crisis:

Assets (Uses of Funds)	Liabilities (Sources of Funds)
Cash and Reserves	Deposits
Securities	Other Borrowings
Loans	Equity Capital

- By definition Loans = Deposits + Other Borrowings + Equity Capital - Cash and Reserves - Securities.
- Banking crises see movements in deposits, other borrowings, and bank cash and securities holdings, all of which lead to a lower quantity of loans.

Why Credit Is Squeezed in a Banking Crisis

1. **Deposits**: If some customers lose faith in banks and prefer to keep cash in a mattress, then banks will have less funds to loan out.
2. **Other Borrowings**: Similarly, bond markets and other providers of funds may be less willing to lend to banks that they worry may fail.
3. **Cash and Reserves**: To survive potential runs on the banks, they will keep larger amounts of cash and reserves for precautionary reasons.
4. **Securities**: Even when money is invested, banks will shift towards securities that can be quickly sold to raise cash.

- The result is a reduction in loans. It's hard for banks to "call in" existing loans but when loans are paid off, banks will keep the funds as cash or reserves or invest in securities instead of making new loans or use them to pay off deposit outflows or maturing bond liabilties.
- So both bank and customer behaviour contributes to a *credit crunch*: Banks are no longer in a position to lend to borrowers and financial intermediation breaks down.

Macroeconomic Effects of Banking Crises

- Financial intermediation is crucial for economic activities like house purchases, car purchases, starting a new business and so on.
- When banking crises happen, banks stop playing their crucial role as financial intermediaries and the economy suffers: Sectors such as housebuilding and consumer durables suffer particularly badly.
- Without access to credit, business and consumer confidence suffers and this has further negative effects on the economy.
- For these reasons, banking crises can be hugely damaging, triggering severe recessions.
- We know that the global financial crisis of 2007/2008 triggered a severe worldwide recession but this was not the first time.

Consequences of Banking Instability: The Great Depression

Ben Bernanke's early research focused on the role played by the banking crisis in worsening the Great Depression. of the 1930s. Here are some quotes from a 1983 *AER* paper (link on website).

> *The banking problems of 1930-33 disrupted the credit allocation process by creating large, unplanned changes in the channels of credit flow. Fear of runs led to large withdrawals of deposits, precautionary increases in reserve-deposit ratios, and an increased desire by banks for very liquid or rediscountable assets. These factors, plus the actual failures, forced a contraction of the banking system's role in the intermediation of credit.*

> *As the real costs of intermediation increased, some borrowers (especially households, farmers, and small firms) found credit to be expensive and difficult to obtain. The effects of this credit squeeze on aggregate demand helped convert the severe but not unprecedented downturn of 1929-30 into a protracted depression.*

Additional Complications in Modern Banking Crises

- Modern banking systems have a number of additional features that make banking crises more difficult to deal with that in the past.
  - **Non-Deposit Funding**: While deposit insurance tends to reduce the chance of retail bank runs, many modern banks obtain substantial non-deposit funding via bond markets or inter-bank money markets. These providers of funds are more prone to "run" than depositors, who are often viewed as a "sticky" source of funding.;
  - **Interbank Linkages**: Funding links between banks can mean that the failure of one bank can directly threaten the failure of other banks.
  - **Financial Assets and Negative Feedbacks**: Many banks now have very large holdings of financial assets, whose valuations (unlike loans) are set in the market every day. During crises, we can see negative feedback loops involving banks selling assets, which then decline in value, thus making bank solvency problems even worse.
- These additional complications produced a range of new government interventions during the global financial crisis, many of which have been expensive for taxpayers.

Part III

Incentive Problems in Banking

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.
- Next, we will discuss how bank executive's incentives can lead them to have banks that

  1. Are too leveraged (i.e. too little equity capital relative to assets).
  2. Have too many risky investments.
  3. Have too much short-term non-deposit funding.
  4. Are too big.

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

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.

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

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.

Excessive Risk Taking in Lending or Investment

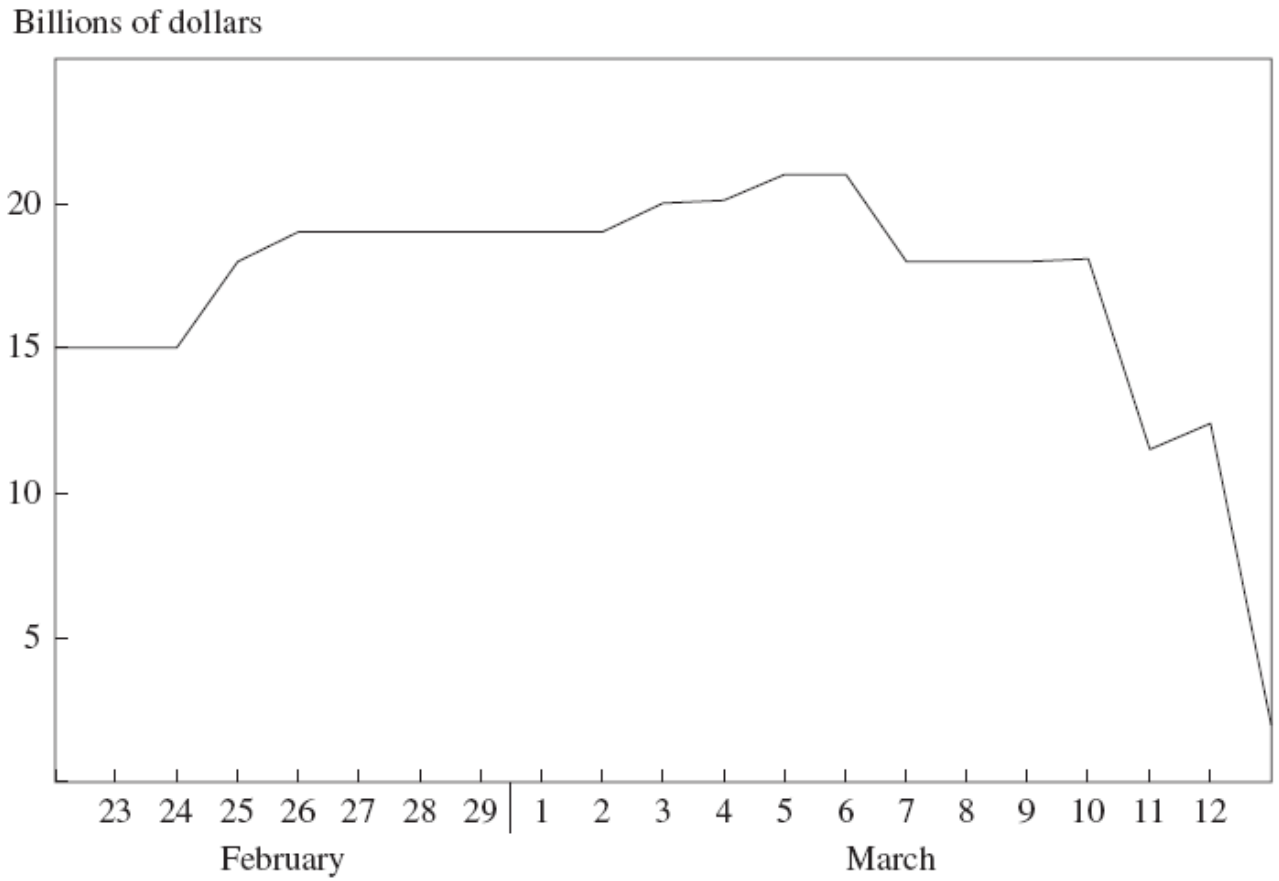
- We have seen how banks may be incentivized to have too much leverage. For a given amount of equity, a bank with more assets will generally deliver a higher return on equity. For bank CEOs, the higher returns from more leverage may matter more than the smaller probability that credit or liquidity risks 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 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."

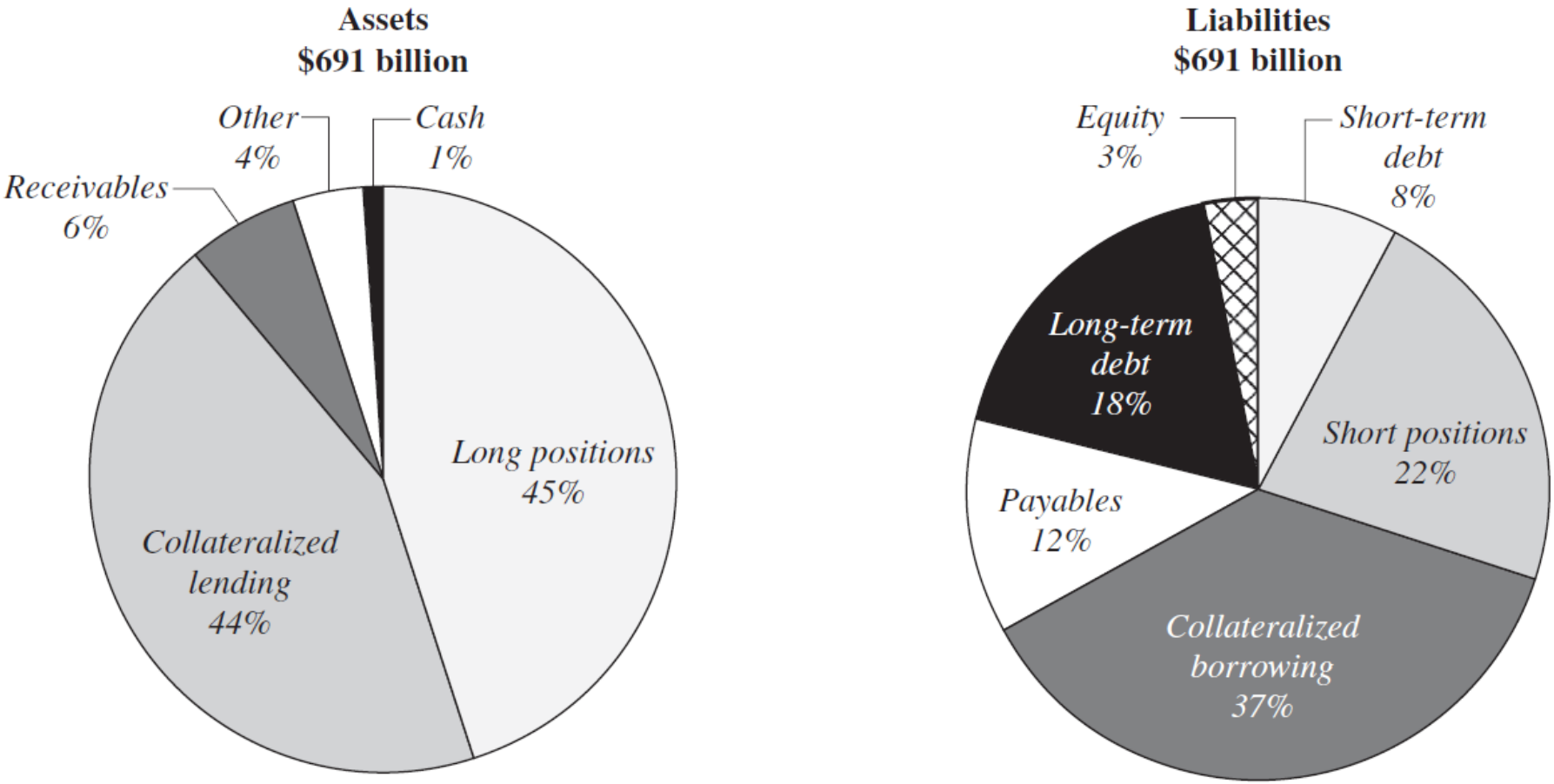
The Demise of Bear Stearns

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



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

Lehman's Assets and Liabilities in 2007



Lehman's Balance Sheet

A number of aspects of this balance sheet stand out:

1. **Proprietary Trading**: They owned lots of securities and also took lots of short positions (borrowing a security, selling it and planning to buy it back later at a cheaper price to give it back.)
2. **Short-Term Funding**: No deposits and very little long-term debt. Most of the "collateralised borrowing" was very short-term borrowing, often overnight. Known as repurchase agreements (repos)—the lender could keep the pledged collateral if the bank failed to pay back the loans.
3. **Long-Term Assets**: Much of the collateralised lending consisted of long-term mortgage backed securities.
4. **Low Liquidity**: Very small amounts of cash.
5. **High Leverage**: Lehman's Tier 1 capital ratio (relative to risk weighted assets) was quite high. But equity was only 3% of assets, so the leverage ratio was over 30.

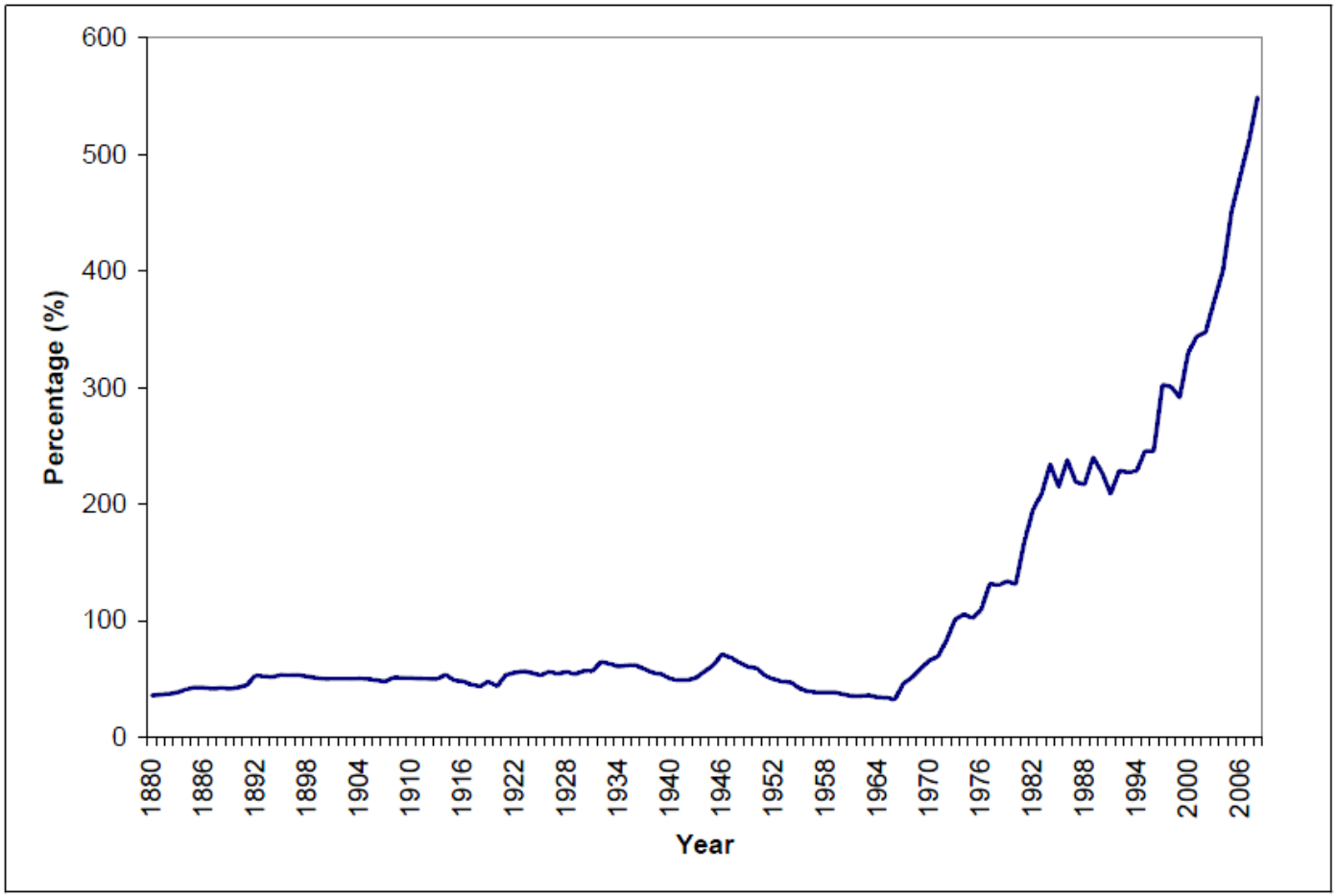
This was a recipe for trouble.

Incentives to be Too Big

- We have discussed the idea of systemic risk. This may mean a bank can 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.

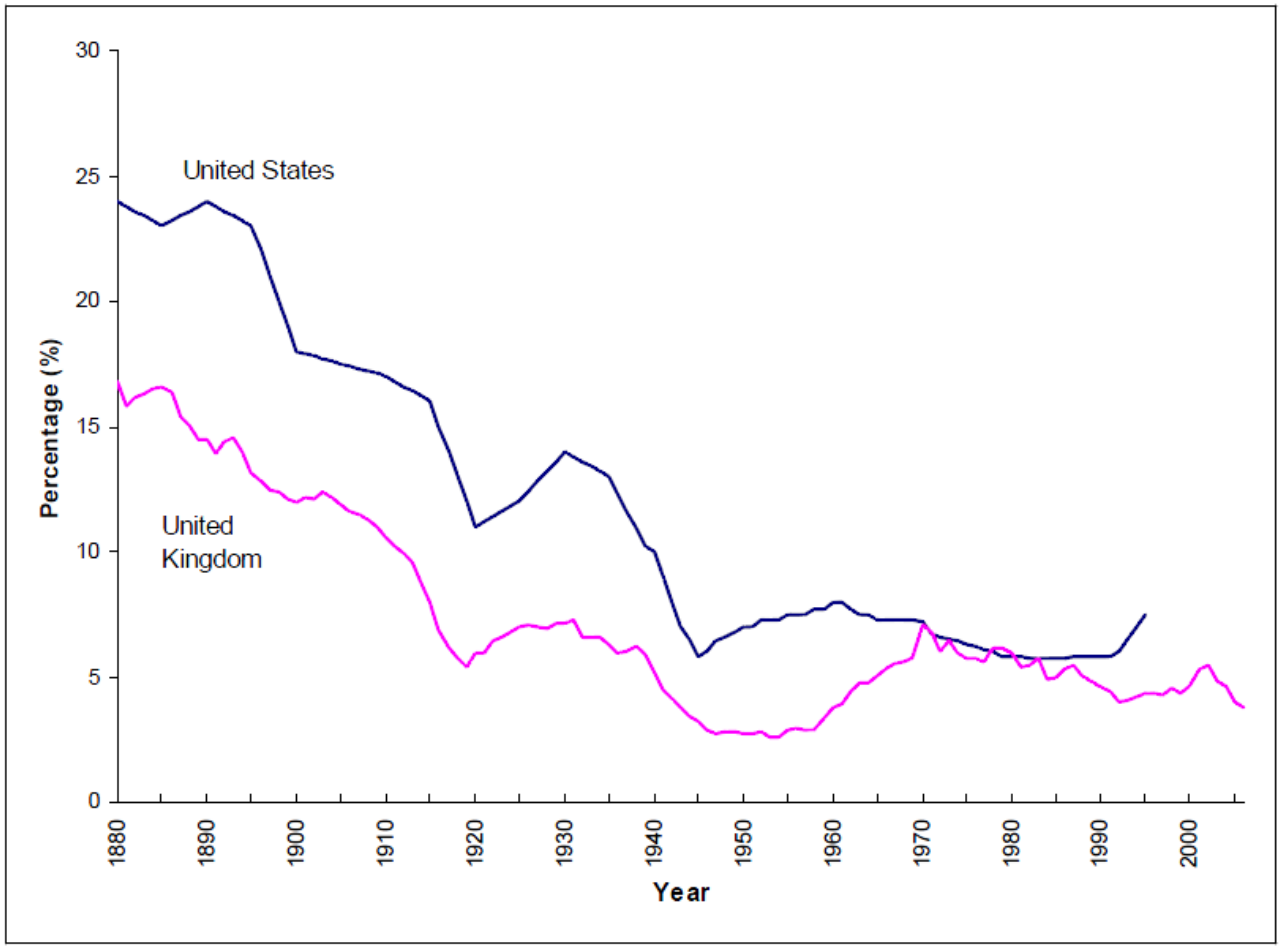
The Banking Sector Has Increased In Size

Chart 1: UK banking sector assets as % of GDP



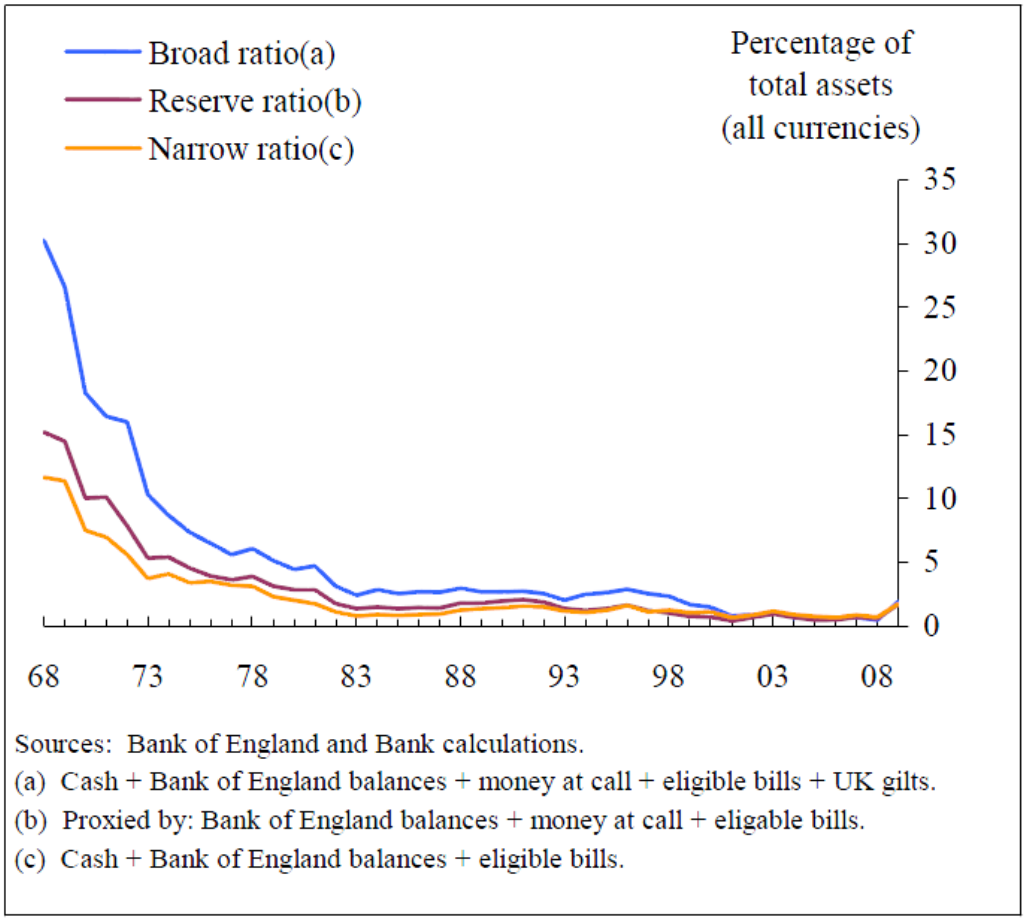
And Has Lower Capital Ratios

Chart 2: Capital ratios for UK and US banks



And Has Less Liquid Assets

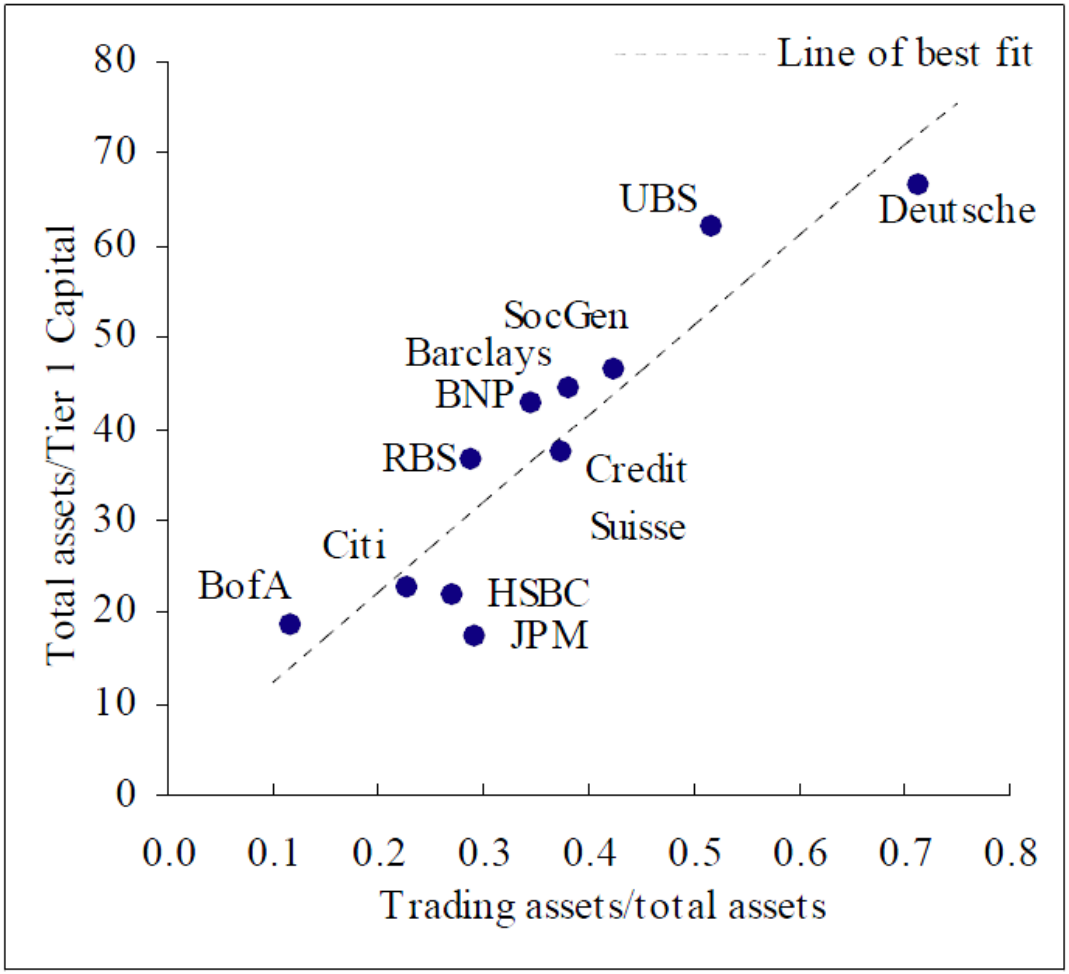
Chart 3: Sterling liquid assets relative to total assets



Sources: Bank of England and Bank calculations.
(a) Cash + Bank of England balances + money at call + eligible bills + UK gilts.
(b) Proxied by: Bank of England balances + money at call + eligable bills.
(c) Cash + Bank of England balances + eligible bills.

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.

Part IV

Capital Adequacy Rules

Who Loses When a Bank Fails?

- Consider the stylized balance sheet:

Assets (Uses of Funds)	Liabilities (Sources of Funds)
Cash and Reserves	Deposits
Securities	Debt Securities (Bonds)
Loans	Equity Capital

- A bank that is insolvent has negative equity capital: It does not have sufficient assets to pay back its liabilities. So who loses out? Shareholders in the wound-up bank get nothing (though there is a hierarchy between *common* and *preferred* equity, with regular shareholders losing first).
- What about other claims? Who loses out among depositors and bond holders? Some bonds ("senior bonds") come with contracts claiming they rank equally ("pari passu"– Latin for "equal footing") with depositors. If there are only enough funds to pay out 80 percent on deposits and senior bonds, then senior bonds get 80 cents for each dollar owed.
- However, there is no requirement for government deposit insurance to make up for the missing 20 cents that bondholders lost.

Subordinated Bonds

- Some bonds, known as subordinated bonds, rank behind senior bonds and deposits. If the bank is wound up, these bond-holders will only get their money back if there is money left after assets have been sold off to pay off the depositors and senior bond-holders.
- Here's an example of the legal rights of a subordinated bond holder, in this case an AIB "Perpetual Preferred Security." "*The obligations of the Guarantor under the Subordinated Guarantee will rank junior as to payments to all liabilities to creditors of the Guarantor (including without limitation depositors, general creditors and subordinated debt holders) and claims of holders of senior ranking securities. In the event that the Guarantor is wound-up, liquidated or dissolved, the assets of the Guarantor would be available to pay obligations under the Subordinated Guarantee only after all payments have been made on such senior liabilities and claims.*"
- Why would someone purchase a bond that could lose out if the bank is wound down? Higher interest rates. To compensate for the additional risk, they yield a higher return and some investors are happy to take this risk.

Regulatory Capital

- We have seen that, unconstrained by regulation, banks will tend to be over-leveraged (or under-capitalised): Assets will be too large relative to the amount of capital.
- To discourage banks from being under-capitalised, banking regulators use *capital adequacy rules*.
- The idea is to ensure that banks have enough room to absorb losses when things go wrong, so that the claims of depositors and senior bond-holders can still be honoured.
- To maintain a level playing field for banks everywhere, capital adequacy requirements have, since the Basle Accord of 1988, been set using a common international approach.
- So what counts as capital to satisfy these requirements? The Basle approach identifies two types of loss-absorbing classes of liabilities:
  1. Tier 1 capital: Equity capital and highly subordinated bonds.
  2. Tier 2 capital: Other subordinated bonds.
- "Regulatory capital" is the sum of these two types of capital and minimum requirements are set for how much of this capital an institution must have.

Risk Weighting of Assets

- So how much regulatory capital do banks need to have?
- The Basle approach requires banks with riskier assets to have more regulatory capital, so those that engaged in the riskiest lending needed to have the biggest cushion to absorb potential losses.
- The original Basle approach assigned assets *risk weights* of zero, 10%, 20%, 50% or 100% to different classes of assets.
- OECD country government debt had a weight of zero, mortgages had a weight of 50%, while most corporate bonds had a weight of 100%.
- Bank capital requirements were then set as a fraction of risk weighted assets (RWA):
  1. Total regulatory capital had to be a minimum of 8% of RWA.
  2. At least half this capital had to be Tier One capital.
  3. At least half of the Tier One capital had to be common equity (i.e. the equity stake of regular shareholders) or so-called "core tier one".
- But the original Basle approach was considered too crude. Within each "bucket" the riskiness of assets varied widely.

Examples

- **Theoretical Example**: Suppose a bank had three kinds of assets:
  1. \$100 in cash, which had a zero risk weight.
  2. \$300 in bonds with a risk weight of 20%
  3. \$600 in mortgages with a risk weight of 50%
- Then the bank would have total assets of \$1000 but its *risk-weighted assets* would equal $\$100 * 0 + 300 * 0.2 + 600 * 0.5 = \$360$
- In this case, this bank would be required to have a minimum amount of regulatory capital of \$0.08*360 = \$28.8.

- **Real World Example**: See the next page for how Bank of Ireland reported their risk weighted assets and regulatory capital ratios as of June 2015.
  - While their total assets at mid-2015 were 131 billion, their risk weighted assets were 52.6 billion, so the average risk weight was $0.40 = 52.6/131$.
  - Because their total capital ratio is 15.9%, we can work out that their regulatory capital equals 8.4 billion ($8.4 = 0.159 * 52.6$).
  - Note that regulatory capital only equals 6.4% of total assets ($8.4/131 = 0.064$).

Bank of Ireland Reporting RWA and Capital Ratios

Balance sheet and key metrics	30 June 2015 €bn	31 December 2014 €bn
Total assets	131	130
Stockholders' equity	9.5	8.8
Return on assets (annualised) (%)[1]	0.94%	0.61%
Loans and advances to customers (after impairment provisions)	85	82
Defaulted loan volumes (€bn)	13.3	14.3
Customer deposits	79	75
Wholesale funding	15	20
Of which:		
Drawings from Monetary Authorities < 1 year to maturity	-	3
Drawings from Monetary Authorities > 1 year to maturity	1	1
Wholesale market funding < 1 year to maturity	4	8
Wholesale market funding > 1 year to maturity	10	8
Liquidity		
Liquidity Coverage ratio	101%	98%
Net Stable Funding ratio[2]	118%	114%
Loan to deposit ratio	108%	110%
Capital[3]		
Common equity tier 1 ratio - Basel III transitional rules	15.9%	14.8%
Common equity tier 1 ratio - Basel III fully loaded (excluding 2009 Preference Stock)	11.1%	9.3%
Total capital ratio	20.7%	18.3%
Risk weighted assets (€bn)	52.6	51.6

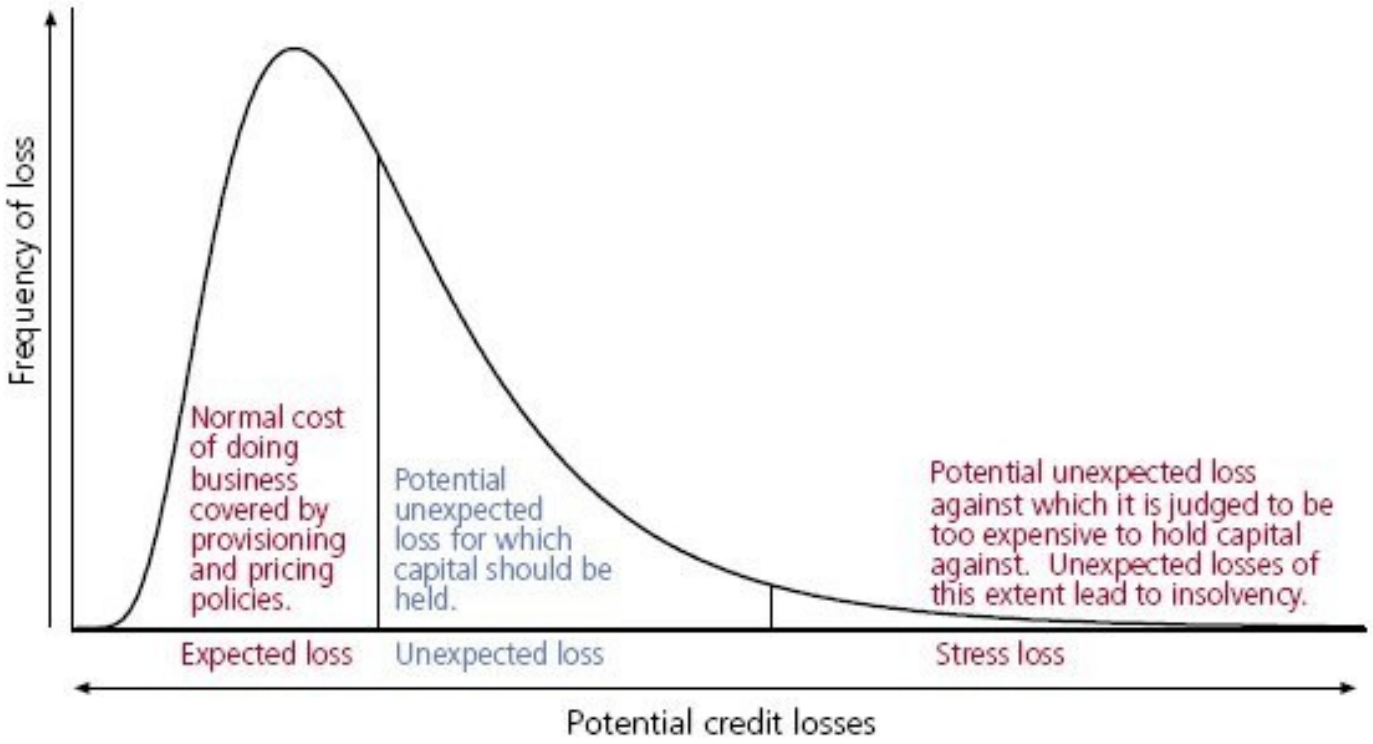
Basle 2

- The original Basle "risk weights" had very little relationship to the actual risk being taken on. Banks were developing "sophisticated" risk modelling approaches and Basle I didn't allow them to be used in calibrating capital requirements.
- Many years in the planning, Basle 2 was rolled out around the world just prior to the financial crisis.
- A number of important differences relative to Basle 1:
  1. A much larger selection of "risk buckets" using ratings agencies risk assessments to better assess the risk of various types of assets (e.g. corporate debt rated AAA has a lower risk weight than debt rated AA).
  2. The option–taken up by many big banks—of using an in-house Internal Ratings Based (IRB) approach to assessing the riskiness of assets.
  3. Mortgages were deemed to be less risky than assumed under Basle 1.
  4. Better public disclosure of financial account information.
- The closer alignment of capital with risk and the other elements all seemed like good ideas. But even full implementation of Basle 2 would not have stopped the current crisis. Indeed, it may have made things worse.

The IRB Approach: Value at Risk

- The IRB model is often described as complex and technical but, in fact, the basic idea behind it is pretty simple.
- Look at the graph on the next page. It describes a statistical distribution for a bank's credit losses.
- The average of the distribution is the "expected loss". Banks are supposed to deal with such losses by writing down part of their loan book every year as "loan loss provisions": This entails valuing assets at less than their current book value in anticipation of future losses.
- The line at the right hand side of the describes an extreme tail of the distribution—the one percent tail is usually used. In other words, it describes a level of losses such that there is only a 1% chance that your losses will be larger than this.
- This figure is normally called the bank's Value at Risk (VaR). If you have \$50 million of weekly VaR, that means that over the course of the next week, there is only a 1% chance that your portfolio will lose more than \$50 million.

Illustrating Value at Risk (VaR)



From Value at Risk to Risk-Weighted Assets

- The IRB approach required banks to have a minumum level of regulatory capital equal to some multiple (usually three) of the unexpected losses indicated by the VaR.
- In other words,once VaR has been calculated the bank can then set

$$\text{Capital Required} = 3 * \text{VaR}$$

- Given that the Basle approach requires banks to have capital that is at least equal to 8 percent of risk weighted assets, this means that VaR is used to indirectly back out the value of risk weighted assets as

$$\text{RWA} = 3 * \text{VaR}/0.08$$

- A few other bells and whistles are added to get the final figure for RWA
  1. **Market Risk**: An upward adjustment is made for risks "pertaining to interest rate related instruments, equities, foreign exchange risk and commodities risk."
  2. **Operational Risk**: An adjustment is made for "inadequate or failed internal processes, people and systems or from external events."

Bank of Ireland's Full RWA Calculation

Risk weighted assets (RWA)

Basel III / CRD IV		Basel III / CRD IV	
Transitional 1 January 2014 €m		**Transitional 30 June 2014 €m**	Fully Loaded 30 June 2014 €m
50.1	Credit risk	48.5	48.5
1.2	Market risk	1.5	1.5
3.5	Operational risk	3.5	3.5
54.8	**Total RWA**	**53.5**	53.5

Implementation Risks for VaR

- The VaR approach, while simple enough in theory, requires a number of decisions to be made when implementing it.
- A bank's VaR figure is usually arrived at by using a distribution of past returns of the assets held.
- But there are lots of potential problems with using this approach:
  - **Estimation Sample**: You never really know the "true" distribution but can only estimate it from historical data. Many banks implementing VaR only used the distribution of returns from recent years. Prior to the global financial crisis in 2008, using returns from 2005-2007 convinced banks that their VaR was low, when in fact disaster was just around the corner.
  - **Tail Risk**: How much do you lose in the 1% case? What about extreme events? Unknown unknowns? Financial markets generate extreme losses more often than predicted by normal distributions (they have "fat tails"). However, the VaR methodology doesn't factor in what happens in very bad outcomes when generating its capital requirement.

Problems Raised by Risk Modelling

- The website has a link to a short paper by Philipp Hildebrand, former Chairman of the Swiss National Bank (i.e. Swiss Central Bank).
- Among the points made by Hildebrand:
  - "While sensible, the higher risk sensitivity of Basel II comes at a price. First, banks and supervisors alike incur significant operational costs to implement the new, highly complex regulation. Second, but in my view more importantly, Basel II creates new risks: Risks about risk assessments. I am tempted to call them the unknowable unknowns. Under Basel II, we increase our dependence on risk models. What if we didn't pick the correct models? What if the data used to calibrate these models turn out to be of poor quality? What if the models were correct in the past, but the future is different? What if certain tail events simply cannot be modelled? These are all important considerations that we have to keep in mind when we interpret the risk figures from complex models. As it turns out, to view the model outputs as a true representation of reality has proven to be a grave mistake."

Example: Northern Rock

- From Northern Rock's Report of Interim Results, 30 June 2007: "The implementation of Basle II results in our Pillar I risk weighted assets at 30 June 2007 falling from around £33.9 billion under Basle I to £18.9 billion under Basle II, a reduction of some 44%. The risk weighting for our residential mortgages reduces to mid-teens %, treasury assets to around half of Basle I requirements, also around mid teens %, reflecting the low risk nature of these portfolios and personal unsecured loans to slightly below Basle I requirements."
- Adam Applegarth (Chief Executive, Northern Rock Group), June 30, 2007: "We are pleased to have achieved approval for use of our Basle II rating systems. This means that the benefits of Basle II enable us to increase our 2007 interim dividend by 30%. Going forward our dividend payout rate increases to 50% of underlying EPS from around 40%. . . . The medium term outlook for the Company is very positive."
- Within months, the bank was in severe difficulties and ended up being nationalised.

How VaR Could be Gamed by Staff

- See New York Times article "Risk Mismanagement".
- "To motivate managers, the banks began to compensate them not just for making big profits but also for making profits with low risks. That sounds good in principle, but managers began to manipulate the VaR by loading up on ... "asymmetric risk positions." These are products or contracts that, in general, generate small gains and very rarely have losses. But when they do have losses, they are huge. These positions made a manager's VaR look good because VaR ignored the slim likelihood of giant losses, which could only come about in the event of a true catastrophe. A good example was a credit-default swap, which is essentially insurance that a company won't default. The gains made from selling credit-default swaps are small and steady and the chance of ever having to pay off that insurance was assumed to be minuscule. It was outside the 99 percent probability, so it didn't show up in the VaR number. People didn't see the size of those hidden positions lurking in that 1 percent that VaR didn't measure."
- Insurance company AIG sold lots of credit-default swaps on MBS, insuring those who bought these bonds against losses. AIG went bankrupt and is now owned by the US government.

Patrick Honohan: The Limits of Risk Modelling

- The website has a link to a paper by Patrick Honohan called "Bank Failures: The Limitations of Risk Modelling".
- Honohan discusses Swiss bank UBS, which made large losses on US subprime MBS: "Most of UBS losses relate to their portfolio of MBS, many of which were being warehoused for sale to other entities. Evidently, the mark-to-market value of these assets fell sharply during 2007. In broad terms, what appears to have happened in respect of at least some of the losses is that insurance and derivatives were bought to hedge only the amount of variation (known to the traders) to which the portfolio was being stress-tested. Market fluctuations larger than envisaged in the stress test were not hedged (otherwise the profit potential of the positions being taken would have been eliminated). In other words, the profits being booked (in the relevant parts of the business) arose primarily because of – and were the reward for – the assumption of catastrophic risk outside that envisaged in the stress test. Senior management understood that certain units were taking large positions, but they assumed that the risk models were good enough to protect against serious loss. Perhaps they would have been good enough if not gamed, but they were not perfect, and that they were gamed was perhaps inevitable."

Problems for Supervisors Caused by Basle 2

- As banking systems around the world have come under stress, financial regulators have come under great criticism.
- What were the bank supervisors doing? How could they not have spotted the problems at these banks.
- However, spotting excessive risk-taking at major banks has become very difficult.
- Again Hildebrand has some interesting thoughts:
  - "Furthermore, the increased reliance on banks' internal models has rendered the job of supervisors extraordinarily difficult. First, supervisors have to examine banks' exposures. Second, they have to evaluate highly complex models. Third, they have to gauge the quality of the data that goes into the computation of these models. To put it diplomatically, this constitutes a formidable task for outsiders with limited resources"

Haldane and Madouros: The Dog and the Frisbee

- Andrew Haldane of the Bank of England is one of the most interesting thinkers today on financial regulation. His paper with Vasileios Madouros "The Dog and the Frisbee" is an important contribution. It argues that regulation would be better if it followed simple rules.
- They give the example of catching a frisbee: "Catching a frisbee is difficult. Doing so successfully requires the catcher to weigh a complex array of physical and atmospheric factors, among them wind speed and frisbee rotation. Were a physicist to write down frisbee-catching as an optimal control problem, they would need to understand and apply Newton's Law of Gravity. Yet despite this complexity, catching a frisbee is remarkably common. Casual empiricism reveals that it is not an activity only undertaken by those with a Doctorate in physics. It is a task that an average dog can master. Indeed some, such as border collies, are better at frisbee-catching than humans. So what is the secret of the dog's success? The answer, as in many other areas of complex decisionmaking, is simple. Or rather, it is to keep it simple. For studies have shown that the frisbee-catching dog follows the simplest of rules of thumb: run at a speed so that the angle of gaze to the frisbee remains roughly constant."

Haldane and Madouros on Complexity

- "The quest for risk-sensitivity in the Basel framework, while sensible in principle, has generated problems in practice. It has spawned startling degrees of complexity and an over-reliance on probably unreliable models. The Tower of Basel is at risk of over-fitting and over-balancing. It may be time to rethink its architecture. A useful starting point might be to take a more sceptical view of the role and robustness of internal risk models in the regulatory framework. These are the main source of opacity and complexity. With thousands of parameters calibrated from short samples, these models are unlikely to be robust for many decades, perhaps centuries, to come. It is close to impossible to tell whether results from them are prudent."
- "As an alternative foundation stone, simplified, standardised approaches to measuring credit and market risk, on a broad asset class basis, could be used."
- "Simple, quantity-based restrictions are the equivalent of a regulatory commandment: Thou shalt not. These are likely to be less fallible than: Thou shalt provided the internal model is correct. That is one reason why Glass-Steagall lasted for 60 years longer than Basel II."
- But risk-weighting versus "simple leverage ratios" is not a simple issue. Read the piece by Dan Davies on the website for an alternative view.

Part V

Macroprudential Regulation

Capital Adequacy Rules and Credit Crunches

- Capital adequacy rules are intended to keep the banking system stable. But they can have the unintended consequence of worsening recessions by causing credit crunches.
- Consider a bank starting to incur serious losses on its loans and expecting to go below its Basle-consistent capital ratio.
- The bank could raise more equity capital by selling shares to private investors. But this would dilute the claim on future dividends of the current owners. And with bank management having messed up, they probably won't even earn a good price for these shares.
- The other option is to maintain the equity capital at its current level and instead reduce risk-weighted assets. Two ways to do this:
  1. Reduce assets (i.e. "Shrink the balance sheet" or "Deleverage"). In particular, the bank can use incoming payments from loans to pay off liabilities instead of using them to issue new loans.
  2. Take less risk. Invest any new funds in government bonds rather than make potentially risky loans to customers.
- Capital adequacy requirements contribute to causing a credit crunch.

Interbank Lending and Systemic Risk

- Interbank markets make it easier for banks to cope with reserve requirements (by lending and borrowing short-term funds) and allowing banks with lots of deposits but without good loan opportunities to lend to banks with good loan opportunities but limited deposits.
- But they can also contribute to making the banking system unstable.
- Consider the following example:
  - Three banks (A, B and C) all have equity capital of €10 million.
  - Bank A has borrowed €25 million from Bank B and Bank B has borrowed €15 million from Bank C.
  - Now suppose Bank A loses €35 million in bad property loans. This wipes out its equity capital. The bank becomes insolvent and is wound up and Bank B does not get its €25 million back.
  - Bank B is now insolvent and cannot pay back the €15 million it owes Bank C. This means that Bank C also has no equity capital and so is insolvent.
- Bank A going down brings the whole system down. This example describes what is known as *systemic risk*.

Asset Price Fire Sales and Spillovers

- The previous example is not very realistic. It required the first bank to lose an amount that wasn't just greater than its own capital but an amount greater than the capital of the whole system.
- Beyond behavioural contagion, there is another important channel through which one bank getting in trouble affects others.
- When banks get into trouble and start selling liquid assets (stocks, bonds, etc) in a hurry to pay off depositors or lenders—often term a fire-sale of assets—this places downward pressure on the prices assets.
- Modern banking regulations have required banks to "mark their tradable assets to market" as much as possible. So if the failure of one bank leads to the prices for some financial assets falling, then other banks have to mark down the value of their assets also.
- The asset price fire sales reduce the equity capital of other banks and place them under threat. A single bank failure can lead—via contagion and spillovers from asset sales—to the whole system becoming unstable.
- See my European Parliament briefing paper "Containing Systemic Risk" for a discussion of these issues.

Bernanke on Fire Sales

- Fed Chairman Ben Bernanke gave a speech on September 24, 2010 titled "Implications of the Financial Crisis for Economics." It is linked to on the website.
- He discusses fire sales: "The notion that financial assets can always be sold at prices close to their fundamental values is built into most economic analysis, and before the crisis, the liquidity of major markets was often taken for granted by financial market participants and regulators alike. The crisis showed, however, that risk aversion, imperfect information, and market dynamics can scare away buyers and badly impair price discovery. Market illiquidity also interacted with financial panic in dangerous ways. Notably, a vicious circle sometimes developed in which investor concerns about the solvency of financial firms led to runs: To obtain critically needed liquidity, firms were forced to sell assets quickly, but these 'fire sales' drove down asset prices and reinforced investor concerns about the solvency of the firms. Importantly, this dynamic contributed to the profound blurring of the distinction between illiquidity and insolvency during the crisis."

Adrian and Shin: Liquidity and Leverage

- The analysis of the next few pages follows the paper "Liquidity and Leverage" by Tobias Adrian and Hyun Song Shin.
- Let's think about a bank doing a lot of proprietary trading and that has a target of keeping a leverage ratio of 10.
- They starting with equity of 10 and debt of 90 and use it to buy assets.
- So the balance sheet starts out like this

Assets		**Liabilities**	
Securities	100	Equity	10
		Debt	90

Rising Asset Prices

- Now asset prices rise by one percent, so the balance sheet becomes.

Assets		**Liabilities**	
Securities	101	Equity	11
		Debt	90

- Leverage is now $101/11 = 9.18$. To get back to target, they borrow an additional 9 units of debt and the balance sheet becomes.

Assets		**Liabilities**	
Securities	110	Equity	11
		Debt	99

- The increase in asset prices induced financial institutions to borrow to buy more assets.

Falling Asset Prices

- Suppose instead asset prices had fallen by one percent, so the balance sheet becomes

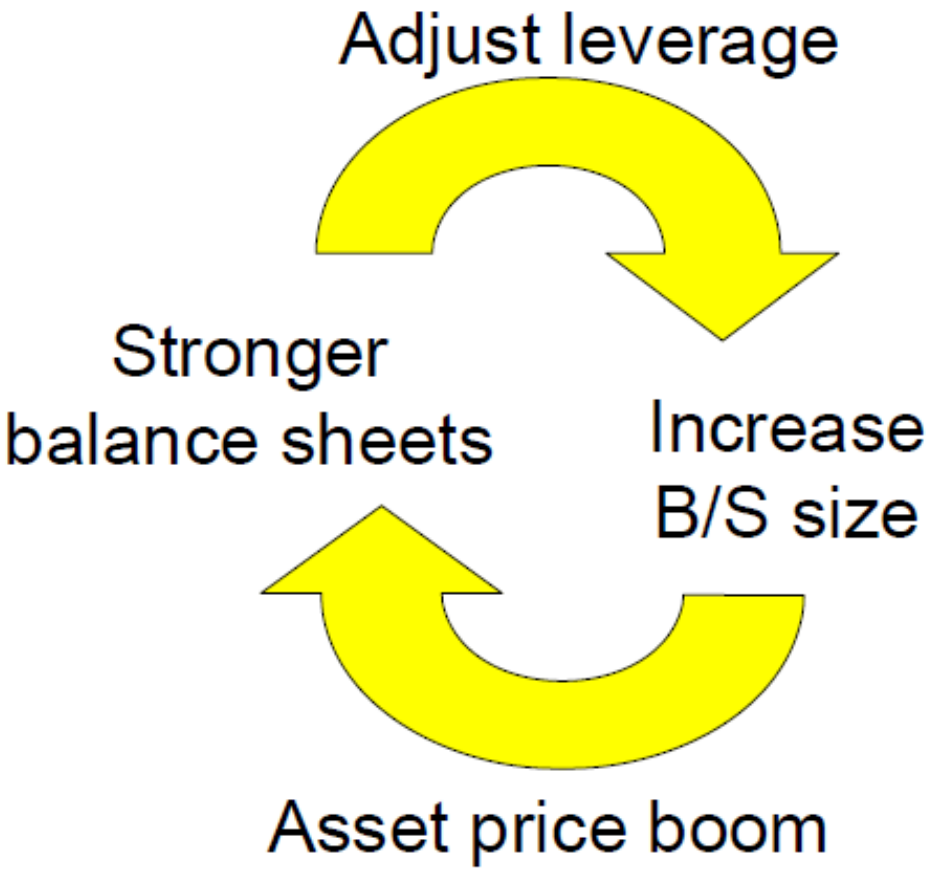
Assets		**Liabilities**	
Securities	99	Equity	9
		Debt	90

- Leverage is now $99/9 = 11$. To get back to target, they sell 9 units of assets and use it to pay off debt (deleverage). The balance sheet becomes

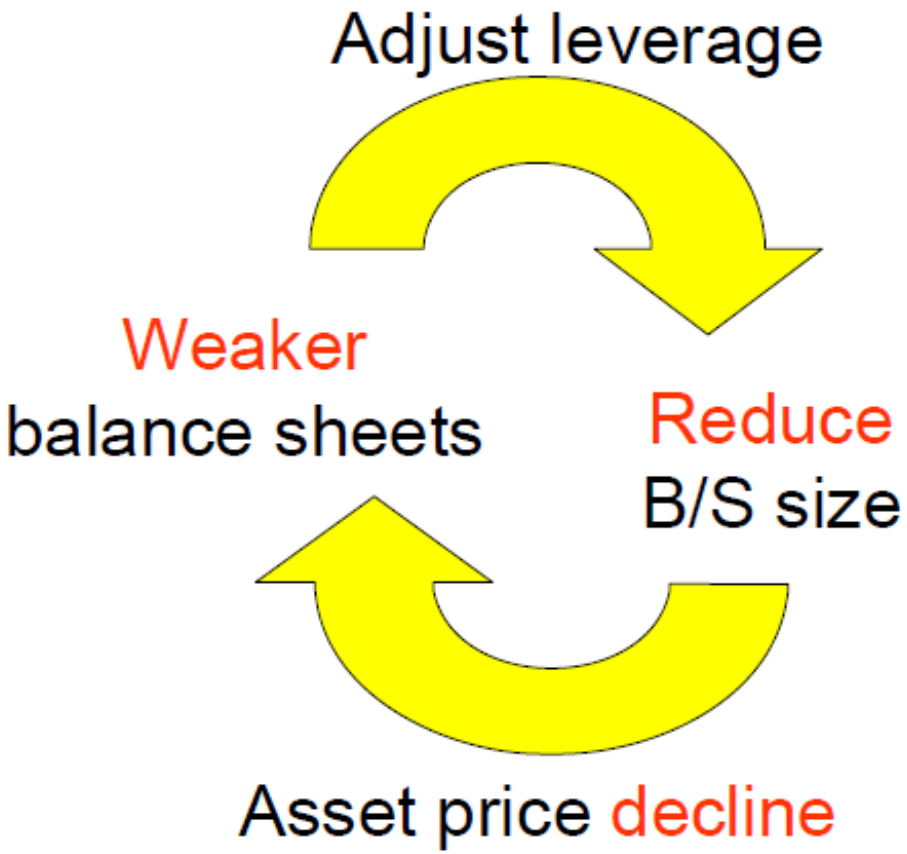
Assets		**Liabilities**	
Securities	90	Equity	9
		Debt	81

- The fall in asset prices triggers selling of assets. With liquidity and fire-sale effects this can lead to a nasty downward spiral.

Adrian and Shin: The Virtuous Cycle



Adrian and Shin: The Virtuous Cycle in Reverse



Micro Stability versus Macro Stability?

- The point of capital rules are to keep individual institutions solvent. Indeed, these rules are called *prudential* regulation: They are there to maintain stability by encouraging prudence.
- However, rules put in place to encourage each institution to be prudent can lead to the whole financial system becoming unstable:
  1. In upswings, asset prices rise, loans are all paid back and this increases equity for banks. Because of the increase in equity, the regulatory capital rules allow banks to expand their operations by acquiring new assets. With lots of demand, nobody worries about liquidity or risk. Assets boom further.
  2. But booms never go on forever. Eventually, cycles play out and recession arrives. Now asset prices fall and loans default, eroding equity. Banks worry about meeting their capital requirements and so they sell off assets. These sales drive down asset prices and erode equity across the system.

Andrew Crockett: Micro versus Macro-Prudential

- In an important 2000 paper, Andrew Crockett, former head of the Bank of International Settlements, distinguished between *micro-prudential* and *macro-prudential* policy. Here are some quotes.
- "It follows that the macro-prudential paradigm stresses the possibility that actions that may seem desirable or reasonable from the perspective of individual institutions may result in unwelcome system outcomes. This is a logical contradiction in the micro-prudential vision as defined here. Illustrations of such fallacies of composition are not hard to find. For instance, for a single bank it is only natural to tighten lending standards in a recession, but if all banks do the same the resulting impact on economic activity can lead to a further deterioration in the credit quality of its portfolio. The mirror image during the upswing could generate an unsustainable lending boom, sowing the seeds of subsequent financial instability. Likewise, cutting exposures as market prices fall can deepen the decline in those prices, leading to a drying up of liquidity and exacerbating financial distress."

Andrew Crockett: Micro versus Macro-Prudential

- "The quintessential micro-prudential dictum is that "financial stability is ensured as long as each and every institution is sound". From a macro-prudential perspective, two objections can be levied against this, on the surface, compelling statement. First, it may strive for too much; second, it may deliver too little.

  It may strive for too much, because the occasional failure of individual institutions is not the problem. Trying to avoid such outcomes risks providing excessive protection, with the result that market disciplinary and allocative mechanisms are weakened. The statement may deliver too little, because while at one level it is a truism, how the soundness of each individual institution is pursued is crucial. Unless the authorities take into account the impact of the collective behaviour of institutions on economic outcomes, they may fail to monitor risks and take remedial action appropriately."

Value at Risk and Cyclicality

- Value-at-Risk models tended to exacerbate the procyclicality induced by capital adequacy rules. VaR was applied in these institutions but they tended to use relatively short time windows for calculating risk. During booms, they thought risk was low, during recessions they thought it was high.
- Because the VaR model told the banks that risk was low during booms, this meant that risk-weighted assets didn't increase nearly as much as total unweighted assets.
- Banks could massively increase their leverage and yet their regulatory capital ratio didn't show them to be taking big risks.
- Again, Andrew Crockett's paper has a useful alternative way to think about this: "The received wisdom is that risk increases in recessions and falls in booms. In contrast, it may be more helpful to think of risk as *increasing* during upswings and *materialising* in recessions."
- One way to deal with this would be for regulators to change capital ratios across the cycle. In booms, they could insist on higher capital ratios (lower leverage). Then, in recessions, they could lower the capital ratios (higher leverage) to prevent fire sales.

Warnings About Basle 2

- Some people foresaw how the Basle 2 VaR approach was storing up trouble.
- Shin and co-authors at the LSE submitted a paper to the BIS in 2001. They said: "The proposed regulations fail to consider the fact that risk is endogenous. Value-at-Risk can destabilise and induce crashes when they would not otherwise occur.

  Heavy reliance on credit rating agencies for the standard approach to credit risk is misguided as they have been shown to provide conflicting and inconsistent forecasts of individual clients' creditworthiness. They are unregulated and the quality of their risk estimates is largely unobservable.

  Financial regulation is inherent procyclical. Our view is that this set of proposals will, overall, exacerbate this tendency significantly. In so far as the purpose of financial regulation is to reduce the likelihood of systemic crisis, these proposals will actually tend to negate, not promote this useful purpose."

What is Macro-Prudential Policy?

The webpage has a link to a paper by Samuel Hanson, Anil Kashyap and Jeremy Stein called "A Macroprudential Approach to Financial Regulation." Some of the policies they see as part of this approach are:

1. **Time-Varying Capital Requirements**: Make banks have higher capital ratios in good times than bad times. Retain earnings and build up capital during booms and allow lower ratios in recessions.
2. **Higher Quality Capital**: Increase immediate loss absorption capacity with higher requirements for regular common equity and less reliance on instruments like preference shares or subordinated debt.
3. **Prompt Corrective Action in Dollars, Not Ratios**: Banks that fall below required capital ratios are asked by regulators to get back to the target ratios by prompt action. This incentivizes them to restrict credit. Requirements expressed as dollar amounts don't have this drawback.
4. **Contingent Capital**: Encourage banks to issue debt instruments that automatically convert to equity if capital ratios fall below a certain level.
5. **Liquidity Regulation**: Discourage excessive use of short-term debt and encourage holding of assets not subject to fire-sale discounts.

Macro-Prudential Policy and the Housing Market

- In many countries (such as Ireland and Spain) the housing market has been at the centre of pro-cyclical interactions between asset prices and banks.
- Banks that are confident house prices will rise may provide loans that fund almost all of the purchase price (or which are a high fraction of the borrower's income) because they are confident they won't lose money should the borrower default and the bank repossesses the home.
- Rising house prices strengthen the balance sheets of households and firms, who then borrow more money, which further fuels house prices.
- When house prices fall, banks make losses on mortgages and cut back on providing credit to the wider economy, perhaps triggering a recession and further reducing house prices.
- Restrictions on loan-to-value (LTV) or loan-to-income (LTI) ratios, such as have been introduced in Ireland, can be used as a macro-prudential tool.
- Even if an individual bank may be well-capitalised (and apparently in a position to cope with losses on risky loans) or an individual household appears well positioned to take on a loan with a high LTV or LTI, imposing these restrictions can help to make the system as a whole more stable.

Part VI

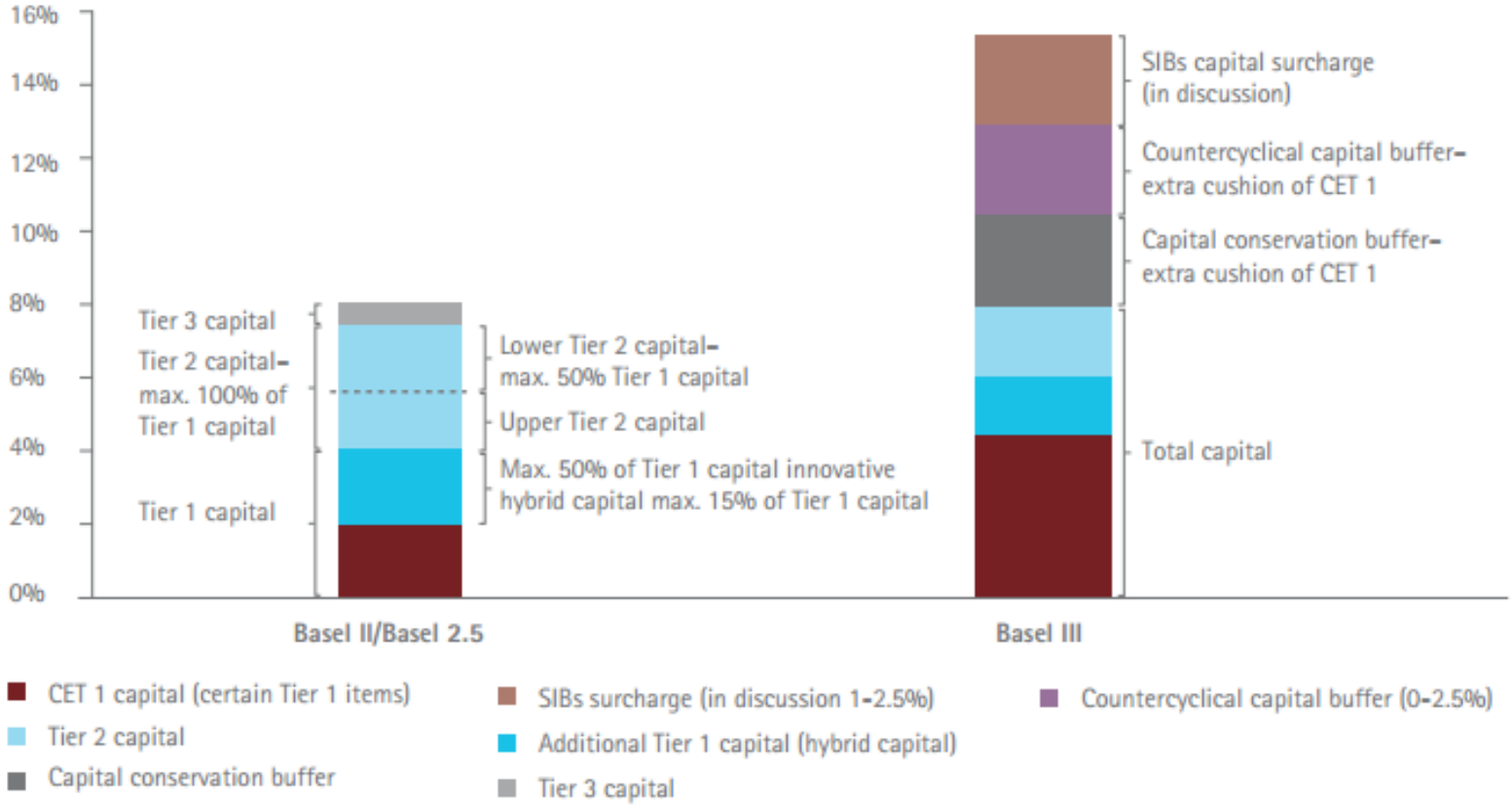
Current Policy Developments and Debates

Basel 3 Agreements

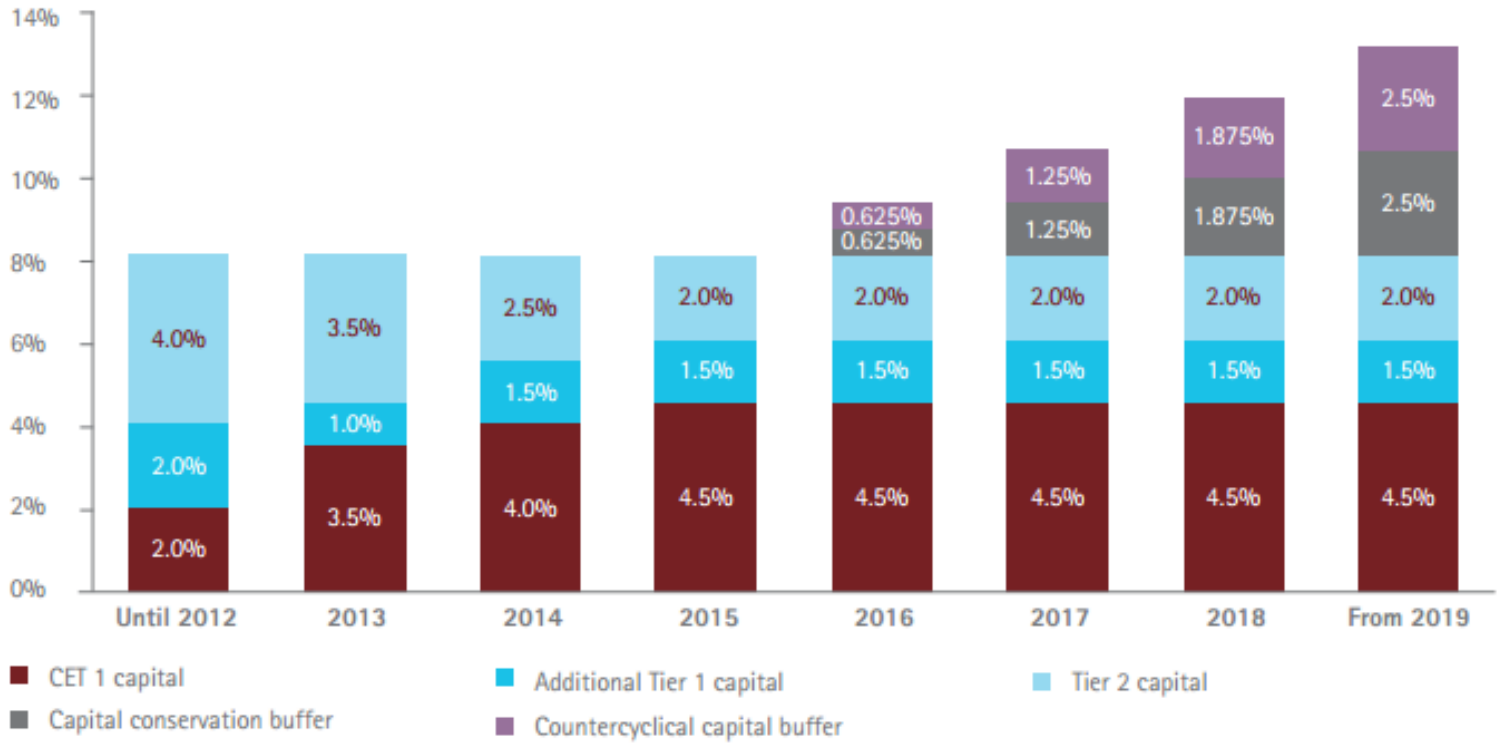
After the global financial crisis, a new global banking regulation framework was agreed in 2010. This Basel 3 agreement includes a number of new regulations that are being phased in over a number of years:

1. A common equity requirement of 7% in normal times.
2. A common equity buffer of 2.5% "that can be used to absorb losses during periods of financial and economic stress" meaning a minimum allowable common equity requirement of 4.5% (up from 2%).
3. An additional cyclical buffer for the common equity requirement with a range of 0-2.5% that would "be in effect when there is excess credit growth that is resulting in a system wide build up of risk."
4. Stricter definitions of capital (e.g. requiring more deductions for things like staff pension fund shortfalls).
5. A maximum leverage ratio: A limit on the ratio of unweighted assets to capital. Addresses some of the problems due to over-reliance on risk modelling.

Higher Basel 3 Capital Requirements for a Large Bank



Gradual Phase-In for Higher Basel 3 Capital Requirements



Other New Regulations

- **Liquidity Reforms**: Basel 3 introduces a "liquidity coverage ratio" designed to ensure that banks can survive for 30 days in a stress scenario when large amounts of funding is being withdrawn and a "net stable funding requirement" which "establishes a minimum acceptable amount of stable funding based on the liquidity characteristics of an institution's assets and activities over a one year horizon."
- **Too Big to Fail**: The Basel Committee identified 28 global systemically important banks (G-SIBs) "whose failure could threaten the world's economy" and is proposing higher Tier One capital ratios ranging between 1% and 2.5%.
- **Structural Reforms**: Some countries are proposing limits on how much risky financial trading can be done by deposit-taking banks.
  - The US Dodd-Frank Act introduces the so-called "Volcker rule" (proposed by former Fed chair, Paul Volcker) that places limits on how much proprietary trading can be done by depository institutions.
  - In the UK, the Vickers report has proposed "ringfencing" the deposit-taking part of large banks from financial trading components.

Are the Post-Crisis Regulations Enough?

While they definitely represent progress, the Basel 3 regulations could be criticised as not going far enough to prevent future financial crises:

1. Phased-in over a long period up to 2019.
2. The "excess credit" cyclical buffer seems open to being ignored by regulators who may not want to admit that credit growth is dangerously high.
3. While the loss-absorbing quality of capital is being improved, overall regulatory capital requirements for regular banks don't increase by that much.
4. The proposed maximum leverage ratio of 33.3 is still very high.
5. No limits on annual growth in assets at individual institutions.
6. The Basel 3 G-SIB proposals were quite limited in nature.
7. Structural reforms (Volcker rule, UK ring-fence) are being introduced in an un-coordinated manner and may be possible to get around.

TLAC for G-SIBs

- Founded in 2009, the Financial Stability Board is a new body set up the G20 group of countries with a mandate to international financial regulation.
- In November 2015, the FSB issued a recommendation for a new standard for Total Loss-Absorbing Capacity (TLAC) to be applied to all G-SIBs.
- TLAC is defined as "a minimum requirement for the instruments and liabilities that should be readily available for bail-in within resolution at G-SIBs."
- G-SIBs will be required to meet a Minimum TLAC requirement of at least 16% of risk-weighted assets (TLAC RWA Minimum) from 1 January 2019 and at least 18% from 1 January 2022.
- The ratio of TLAC to non-risk-weighted assets must also be at least 6% from 1 January 2019, and at least 6.75% from 1 January 2022.
- Mark Carney, Chair of the FSB said "*The FSB has agreed a robust global standard so that G-SIBs can fail without placing the rest of the financial system or public funds at risk of loss. This new standard, which will be implemented in all FSB jurisdictions, is an essential element for ending too-big-to-fail for banks.*"

Systemic Risk or Macro-Prudential Regulators

- With the exception of the limited "cyclical capital ratios" element, Basle 3 doesn't take many steps towards the vision of "macro-prudential regulation."
- However, around the world, "macro-prudential supervision" and "systemic risk" are now key buzzwords among central bankers and regulators.
- New agencies are being proposed to act as Systemic Risk Regulators. The EU has set up a *European Systemic Risk Board* (ESRB) consisting of central bank Governors and regulators from each country.
- In the UK, the Bank of England has a new Financial Policy Committee. Andrew Haldane, in a fantastic speech titled "The Bank and the banks" says the FPC "was put on earth to do macro-prudential policy, to act as the bridge, to provide the missing link, to monitor the punchbowl before it is emptied and before aspirin needs administering .... The financial system and economy are suffering the hangover from hell. The FPC's task is to keep the system safe in the face of heightened risks of a relapse, while at the same time keeping the banks' credit arteries open to support the economy."
- Time will tell whether these new bodies can achieve their goals.

Modelling Interbank Claims and Financial Distress

- One important part of modelling the system is getting the data to have a full picture of the all the claims and counter claims that banks and other financial institutions have on each other.
- In theory, this could allow you to model the effect of large losses at one bank on the rest of the system.
- I say "in theory" because, without modelling firesales, liquidity, and capital adequacy policy, these kinds of models generally look really stable.
- Look at the example of three symmetric banks in my paper "Containing Systemic Risk." Without the firesale/liquidity story, a single bank can only bring the whole system down if it loses an amount equal to the capital of the whole system. This is very unlikely to ever happen.
- But when we incorporate capital adequacy concerns, firesales and jittery suppliers of short-term funds, problems at one bank can spread throughout the system.
- The Bank of England have a model called RAMSI (Risk Assessment Model for Systemic Institutions) that attempts to model these mechanisms. This is important work but at an early stage.