

International Money and Banking:

11. Banking Regulation

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The Rationale for Banking Regulation

- We have seen that, left to their own devices, bankers will take decisions that will occasionally lead to large systemic banking crises, which cause huge damage to the economy.
- In the language of microeconomics, the bankers do not take into account the “negative externalities” generated by their behaviour.
- Negative externalities of this sort are a classic example of when government intervention can improve economic outcomes. In this case, there is an argument for government regulation of the banking sector.
- In these notes, we will discuss banking regulations, starting with capital adequacy rules that aim to prevent banks from being excessively leveraged.
- We will then move on to recent developments and policy debates about banking regulation.

Part I

Capital Adequacy Rules

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 Basel Accord of 1988, been set using a common international approach.
- So what counts as capital to satisfy these requirements? The Basel 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 Basel 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 Basel 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 Basel 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%
Capital³		
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

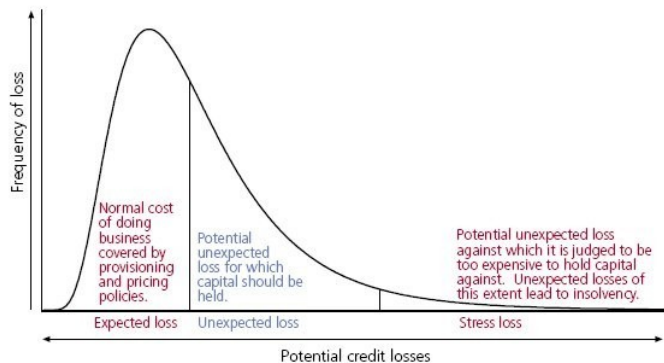
Basel 2

- The original Basel “risk weights” had very little relationship to the actual risk being taken on. Banks were developing “sophisticated” risk modelling approaches and Basel I didn’t allow them to be used in calibrating capital requirements.
- Many years in the planning, Basel 2 was rolled out around the world just prior to the financial crisis.
- A number of important differences relative to Basel 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 Basel 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 Basel 2 would not have stopped the global financial 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 minimum 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 Basel 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		Transitional	Fully Loaded
1 January		30 June	30 June
2014		2014	2014
€m		€m	€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 Basel II results in our Pillar I risk weighted assets at 30 June 2007 falling from around £33.9 billion under Basel I to £18.9 billion under Basel II, a reduction of some 44%. The risk weighting for our residential mortgages reduces to mid-teens %, treasury assets to around half of Basel I requirements, also around mid teens %, reflecting the low risk nature of these portfolios and personal unsecured loans to slightly below Basel I requirements."
- Adam Applegarth (Chief Executive, Northern Rock Group), June 30, 2007: "We are pleased to have achieved approval for use of our Basel II rating systems. This means that the benefits of Basel 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’s 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 Basel 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 actually a simple issue. Read the piece by Dan Davies on the website for an alternative view.

Part II

Macroprudential Regulation

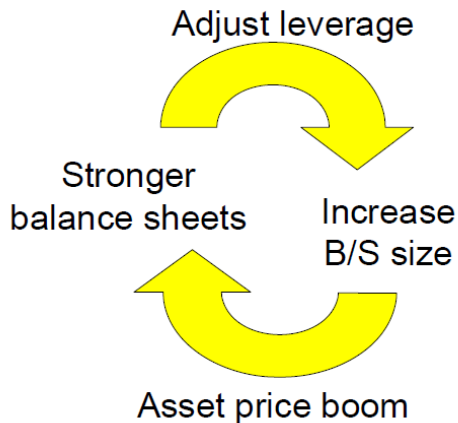
Capital Adequacy Rules and Credit Crunches

- 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 Basel-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.

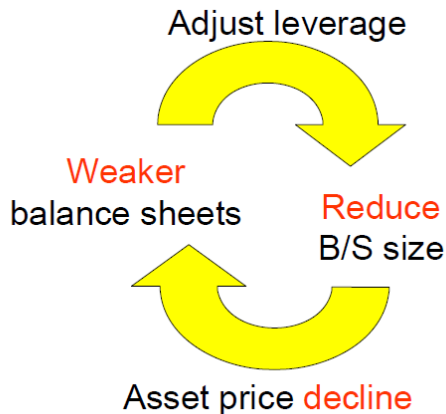
Micro Stability versus Macro Stability?

- 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.
- The charts on the next few pages illustrating this process come from the paper “Liquidity and Leverage” by Tobias Adrian and Hyun Song Shin.

Adrian and Shin: The Virtuous Cycle



Adrian and Shin: The Virtuous Cycle in Reverse



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 Cyclicity

- 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.

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 III

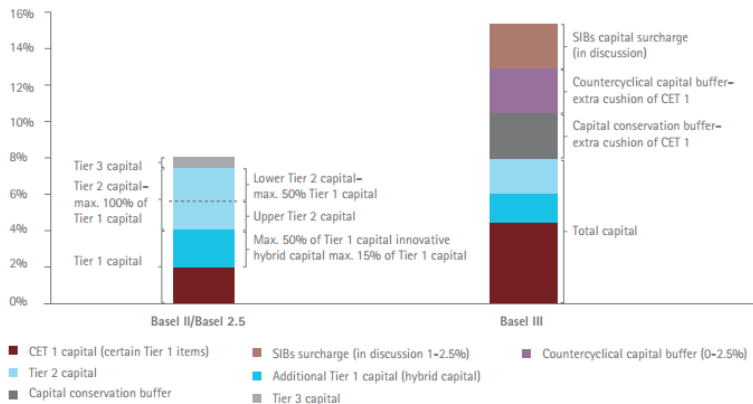
Post-Crisis Policy Developments

Basel 3 Agreements

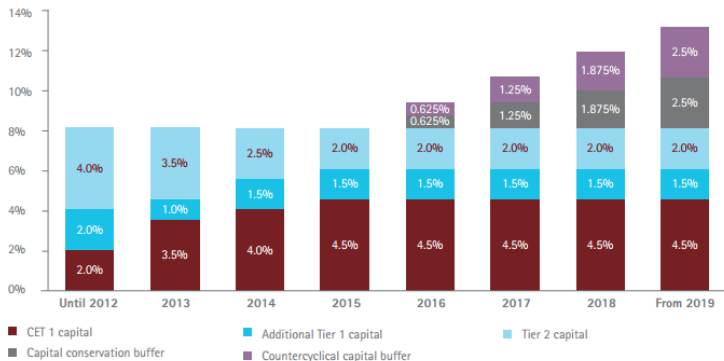
After the global financial crisis, a new global banking regulation framework was agreed in 2010. This Basel 3 agreement included a number of new regulations that are being phased in over a number of years:

- 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. Addressed some of the problems due to over-reliance on risk modelling.

Higher Basel 3 Capital Requirements for a Large Bank



The Phase-In of Higher Basel 3 Capital Requirements



Other Post-Crisis 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%.
- **Separating Deposit Taking from Risky Investments:**
 - ▶ The US Dodd-Frank Act introduced 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, rules were introduced to “ring-fence” the deposit-taking parts of large banks from financial trading components.

TLAC for G-SIBs

- Founded in 2009, the Financial Stability Board was set up by 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.”*

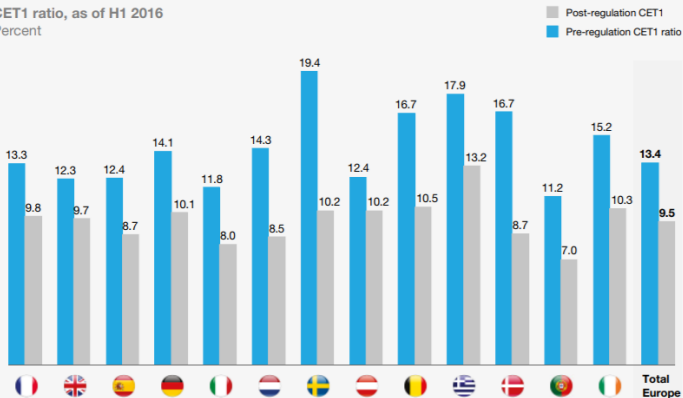
And More Reforms: “Basel 4”

- In 2017, the Basel committee agreed a further round of reforms to capital regulation (sometimes informally referred to as “Basel 4”) to be introduced from 2022 onwards. These included
 - ① Revisions to the “standardised approach” to improve its “granularity” and risk sensitivity. Example: In the revised standardised approach mortgage risk weights depend on the loan-to-value (LTV) ratio of the mortgage.
 - ② Limiting the use more advanced IRB approaches for certain asset classes such as exposures to large and mid-sized corporates, and exposures to banks and other financial institutions
 - ③ “Output floors” for calculating risk-weighted assets. Banks’ risk-weighted assets must be calculated as the higher of the total risk-weighted assets calculated using the approaches that the bank has supervisory approval to use in accordance or 72.5% of the total risk-weighted assets calculated using only the standardised approaches.
 - ④ A higher requirement for capital to deal with operational risk.
- These reforms will substantially reduce measured capital ratios and increase pressure to raise capital levels.

McKinsey Estimates of Impact of Basel 4 on Core Tier 1 Capital Ratios

Exhibit 3: CET1 ratios of Sweden, Denmark, Belgium, the Netherlands, and Ireland are affected most under the new regulatory scenario

CET1 ratio, as of H1 2016
Percent



SOURCE: McKinsey Analysis, European Banking Authority (EBA) (incl. EBA "2016 EU-wide transparency exercise results" and EBA "2016 EU-wide stress test results"), S&P Global Market Intelligence (SNL Financial and S&P Capital IQ)

Recap: Key Points from Part 11

Things you need to understand and remember from these notes:

- 1 Definition of regulatory capital.
- 2 Difference between Tier 1 and Tier 2 capital.
- 3 How risk-weighted assets are measured.
- 4 How Basel 2 differed from Basel 1.
- 5 Value at Risk models and their weaknesses.
- 6 How capital adequacy rules can cause credit crunches.
- 7 General meaning of macro-prudential policy.
- 8 Specific examples of macro-prudential policy.
- 9 How Basel 3 differs from Basel 2.
- 10 The TLAC proposal.
- 11 “Basel 4” reforms.