

International Money and Banking:

7. Micro-Prudential Banking Regulation

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Banking Regulation

- Now that we have discussed the problematic incentive structures of the banking industry, we will move on to discuss banking regulations.
- We start with so-called **micro-prudential policies**, which are regulations and procedures aimed at keeping individual banks sound. In particular, we will focus on capital adequacy rules that aim to prevent banks from being excessively leveraged.
- We will then move on to discuss **macro-prudential policies**, which are regulations and procedures that aim to keep the whole financial system stable.

The Architecture of Banking Regulation

- Banking is a global business. To maintain a level playing field for banks everywhere, banking regulations have, since the Basel Accord of 1988, been set using a common international approach co-ordinated by the Bank for International Settlements (BIS) in Basel. The BIS is effectively “the central bank for central banks.”
- There have been a series of major accords since 1988 and regular more incremental changes over time.
- The Basel accords are a set of principles rather than specific laws. These principles are then implemented at a national level.
- In the EU, banking regulations are set by a series of directives which are then drafted into national law. For examples, rules on bank capital across the EU are currently set by Capital Requirements Directive 4, passed in 2013.
- As discussed before, the ECB took over as the “single supervisor” of euro area banks in 2015. This means the ECB checks that banks are complying with the rules. The ECB can also assess a bank’s corporate governance and risk-taking culture and has the power to withdraw banking licenses.

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** to ensure that banks have enough room to absorb losses when things go wrong, so claims of depositors and senior bond-holders can still be honoured.
- Since the original Basel Accord of 1988, capital adequacy rules have been central to the Basel process.
- 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 liabilities.
- Tier 1 capital is more “at risk” than Tier 2 capital.
- **“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:** The table on the next page is from Bank of Ireland's 2021 annual report.
 - ▶ While their total assets at the end of 2021 were €155.3 billion, their risk weighted assets were €46.4 billion, so the average risk weight was $0.3 = 46.4/155.3$.
 - ▶ Because their total capital ratio is 22.3%, we can work out that their regulatory capital equals €10.3 billion ($8.4 = 0.223 * 46.4$).
 - ▶ Note that their “leverage ratio” – regulatory capital divided by total assets – only equals 6.6% of total assets.

Bank of Ireland Reporting Its Capital Position

	Regulatory €m
Capital Base	
Total equity	11,932
<i>less foreseeable distribution deduction²</i>	(350)
<i>less AT1 capital</i>	(975)
Total equity less foreseeable distribution deduction and equity instruments not qualifying as Common equity tier 1	10,607
Regulatory adjustments being phased in / out under CRD IV	(917)
<i>Deferred tax assets³</i>	(802)
<i>10% / 15% threshold deduction</i>	(145)
<i>IFRS 9 transitional adjustment</i>	30
Other regulatory adjustments	(2,147)
<i>Expected loss deduction</i>	(165)
<i>Intangible assets and goodwill</i>	(981)
<i>Pension asset deduction</i>	(625)
<i>Other adjustments⁴</i>	(376)
Common equity tier 1	7,543
Additional tier 1	
AT1 instruments (issued by parent entity BOIG plc)	975
Total tier 1 capital	8,518
Tier 2	
Tier 2 instruments (issued by parent entity BOIG plc)	1,632
Instruments issued by subsidiaries that are given recognition in Tier 2 capital	-
Provisions in excess of expected losses on defaulted assets	-
Regulatory adjustments	
Other adjustments	(160)
Total tier 2 capital	1,472
Total capital	9,990
Total risk weighted assets (€bn)	47.5
Capital ratios^{5,6}	
Common equity tier 1	15.9%
Tier 1	17.9%
Total capital	21.0%
Leverage ratio	6.5%

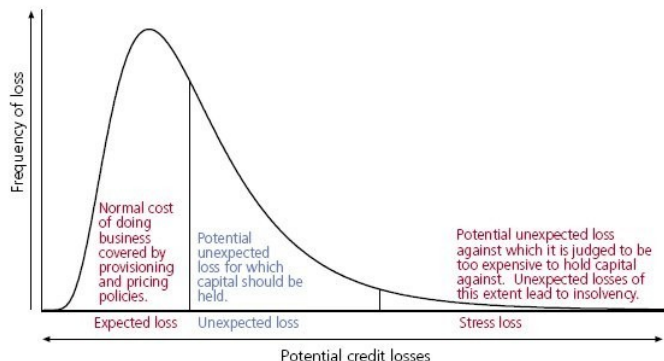
Basel 2

- The original Basel “risk weights” had only a weak relationship to the actual risk being taken on. Banks were developing “sophisticated” risk modelling approaches and the Basel rules 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 global financial crisis of 2008.
- There were 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.
- 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. These include
 - 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

	Regulatory €bn
Risk weighted assets	
Credit risk	35.9
Counterparty credit risk	0.8
Securitisation	1.4
Market risk	0.4
Operational risk	4.8
Other assets / 10% / 15% threshold deduction	4.2
Total RWA	47.5

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.
- Hildebrand:
 - ▶ *“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, a former chief economist of the Bank of England, has been a prominent contributor to debates on financial regulation. His paper with Vasileios Madouros “The Dog and the Frisbee” argued 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

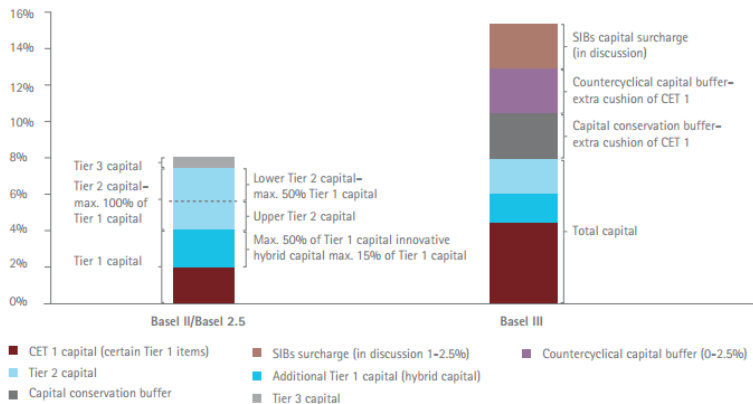
- *“The quest for risk-sensitivity in the Basel framework, while sensible in principle, has generated problems in practice. It has spawned startling degrees of complexity and an over-reliance on probably unreliable models. The Tower of Basel is at risk of over-fitting and over-balancing. It may be time 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. The short article by Dan Davies gives the alternative view.

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 Capital Requirements

Fully phased-in final Basel III leverage ratio, by region

Consistent sample of G-SIBs, weighted average

Figure B



Note: Data points from H1 2011 to H2 2012 use the original (2010) definition of the leverage ratio. Data points from H1 2013 to H1 2017 use the 2014 definition of the leverage ratio. The data points for H1 2013 use an approximation for the initial definition of the Basel III leverage ratio exposure where gross instead of adjusted gross securities financing transaction values are used. Data points from H2 2017 onwards use the final definition of the leverage ratio to the extent data are available.

Source: Basel Committee on Banking Supervision

Other Post-Crisis Regulations

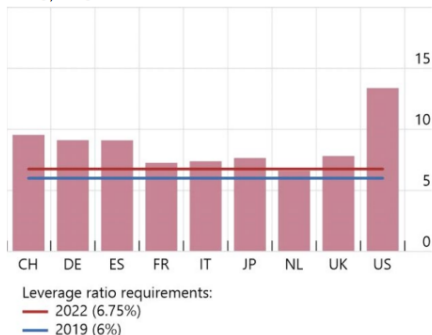
- **Liquidity Reforms:** Basel 3 introduced a “liquidity coverage ratio” designed to ensure that banks can survive for 30 days in a stress scenario when large amounts of funding is being withdrawn and a “net stable funding requirement” which “establishes a minimum acceptable amount of stable funding 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 proposed 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.

More Acronyms: 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 cannot use common equity that is already used to meet regulatory capital requirements as part of TLAC.
- G-SIBs were 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 had to 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 ... is an essential element for ending too-big-to-fail for banks.*”

The Impact of TLAC on Leverage Ratios

Average LAC leverage ratio, by jurisdiction
TLAC, for G-SIBs



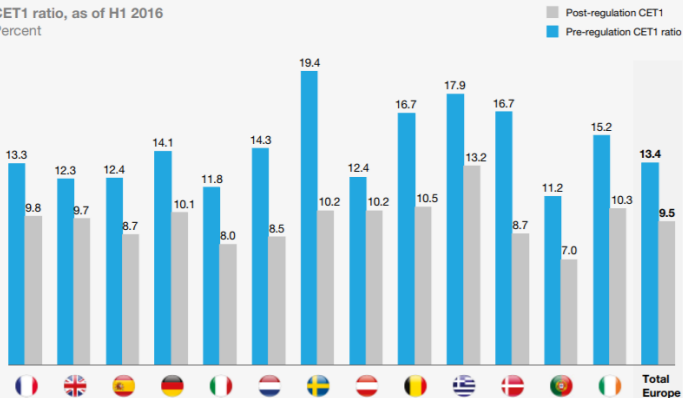
And More Reforms: “Basel 4”

- 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 “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 of 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.
- For a given level of capital, these reforms will reduce capital ratios relative to risk-weighted assets and thus will increase pressure on banks to raise capital. Banks often now report their ratios under both current and future regulations.

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)

Arguments For and Against More Bank Capital

- It is clear that higher capital levels make an individual bank less likely to fail and make the financial system more stable.
- However, bankers often argue against higher capital requirements.
- Mostly, this is because bankers like the return-enhancing aspect of being highly leveraged.
- And some of these arguments put forward are spurious and misleading e.g. we often hear about banks being required “to hold capital back” or “hold capital in reserve.” This suggests higher bank capital levels somehow prevent lending, which is completely false. Capital requirements affect how a bank funds itself, not what it does with that funding.
- At a more serious level, bankers often argue that because equity funding is risky and thus equity investors require high rates of return, higher capital requirements increase their funding costs. So, for example, the need to pay additional dividends to new equity investors could require banks to raise interest rates on their loans to cover these costs.
- While taken seriously by many in the banking and regulatory community, this argument has been criticised by leading finance academics.

Do Higher Capital Requirements Raise the Cost of Funding?

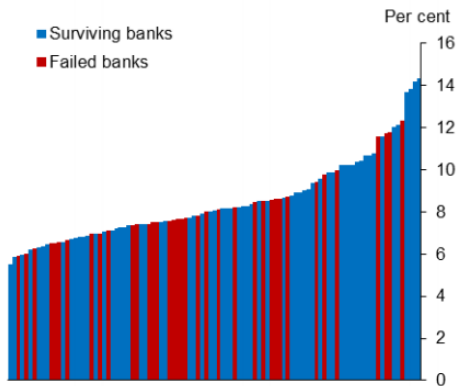
- In a 2013 book, *The Bankers' New Clothes*, leading academic economists Anat Admati and Martin Hellwig argue that higher capital level would make the banking system more safe and they rebut the arguments that high capital ratios would raise interest costs for the rest of the economy.
- They argue that while equity funding is more costly than debt funding, the argument that increases in equity funding raises overall funding costs ignores some other key elements:
 - ▶ Higher levels of equity funding reduces the risk born by each unit of equity. If you double a bank's equity capital, then any specific amount of losses generates half the loss for equity holders that it would have otherwise.
 - ▶ Higher capital levels make debt funding safer and can reduce its costs.
 - ▶ Admati and Hellwig invoke the famous Modigliani-Miller theorem from finance: A firm's overall cost of funding should depend on the riskiness of its assets and not on its mix of debt and equity funding.

Can We Trust Capital Ratios?

- While higher capital levels can play an important role in making the financial system more stable and less prone to crises, we need to be careful about interpreting the capital ratios of individual banks as being a perfect guide to their underlying health.
- Capital levels depend on asset valuations and asset values can fall fast in a crisis or may be mis-stated at too high a level by a bank in its accounts.
- Haldane and Madouros's 2012 paper, "The Dog and the Frisbee", argues for a simpler approach to capital regulation with more emphasis on leverage measures and less on measures based on risk-weighted assets.
- They argue that pre-crisis regulatory capital ratios did not turn out to be a good guide to which banks survived the financial crisis well versus those that failed or needed to be bailed out, with simple leverage ratios doing a bit better at predicting bank failure.
- Banco Popular passed EBA stress tests in 2016, with an adequate capital ratio being reported even in a stress scenario. It was put into resolution in 2017.
- Bank supervisors need to rely on collecting lots of other information beyond the published capital ratios to assess the possibility of a bank failing.

Pre-Crisis Capital Ratios Didn't Predict Failures

Chart 3: Risk-based capital ratios of major global banks, end-2006^(a)



Source: Haldane and Madouros (2012): The Dog and the Frisbee

Key Points

- 1 The definition of regulatory capital.
- 2 Tier 1 capital being more at risk than 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 to go from Value at Risk to risk-weighted assets.
- 7 Modern Developments: Basel 3, “Basel 4” reforms, G-SIBs, TLAC proposal.
- 8 Arguments for and against imposing higher capital requirements on banks.