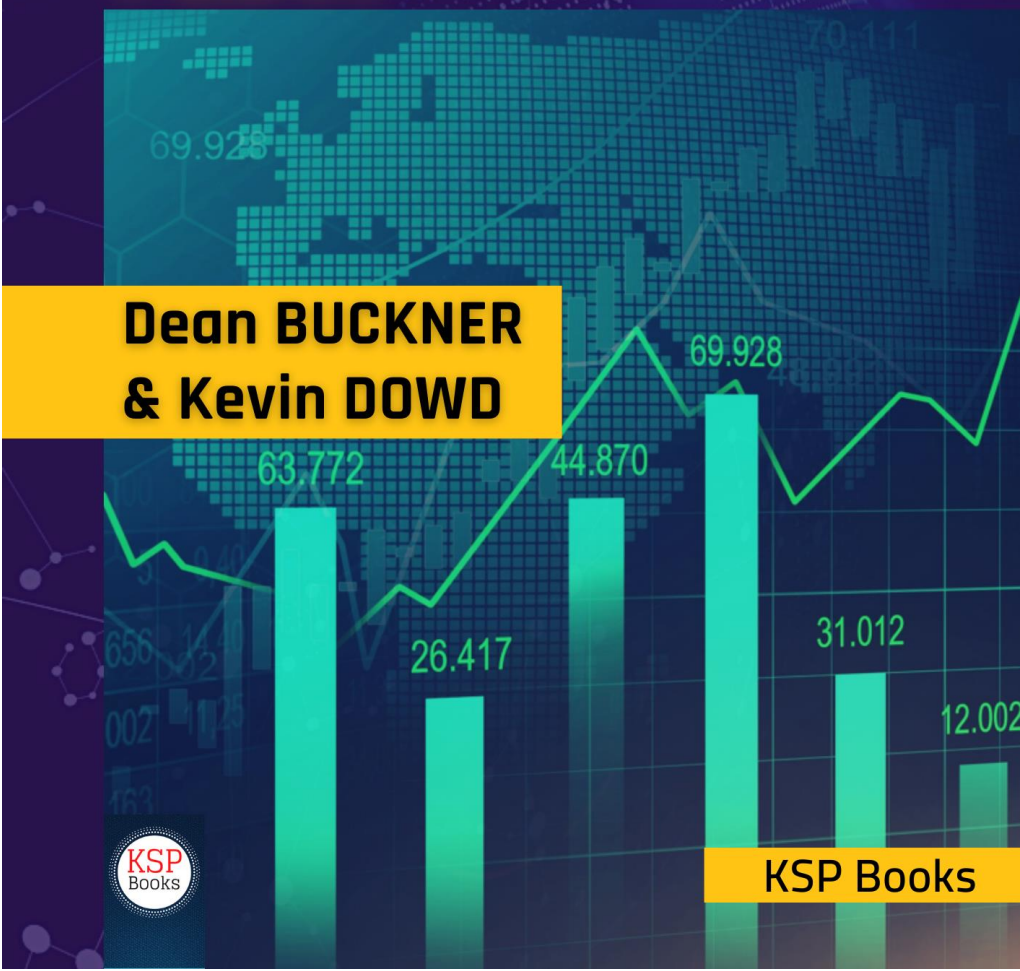
Can UK Banks Pass the COVID-19 Stress Test?



Dean BUCKNER
& Kevin DOWD

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Dean Buckner
The Eumaeus Project, UK
Kevin Dowd
Durham University, UK

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Author: ***Dean Buckner*** [a] ***and Kevin Dowd*** [b]

[a] The Eumaeus Project, UK.

[b] Durham University, Business School, UK.

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Preface

As the UK economy enters the COVID-19 downturn, the Bank of England (BoE) continues to maintain that the UK banks are strongly capitalised. Yet there is considerable evidence that they are anything but.

The core metrics of the Big Five UK banks have deteriorated sharply since the New Year, and even more since the end of 2006, i.e., the eve of the Global Financial Crisis. Their market capitalisation is now £140.6 billion, down 61% since December 2006; their average price-to-book ratio is 39.2%, down from 255% at end 2006; their average capital ratio, defined as market capitalisation divided by total assets, is 2.3%, down from 11.2% at the end of 2006; their corresponding leverage levels are 43.3, up from 8.9 (end 2006). By these metrics, UK banks have much lower capital ratios and their leverage is nearly 5 times what it was going into the previous crisis.

These metrics indicate a sickly banking system. If the banks were in good financial shape, their PtB ratios would

be well above 100% and their capital ratios well above current levels. Traditional rules of thumb also suggest that leverage levels should be no greater than 10 or 15 to be considered safe.

In addition, UK banks have hidden problems relating to their off-balance-sheet positions, their gameable 'Fair Value' Level 3 (or 'mark to model') and loan book valuations, and their problematic implementation of IFRS 9, all of which have further adverse consequences for their capital adequacy.

The BoE's 'Great Capital Rebuild' narrative about a strongly recapitalised UK banking system is little more than an elaborate, and occasionally shambolic, window dressing exercise. The BoE focused most of its efforts on making the banking system *appear* strong by boosting banks' regulatory capital ratios instead of ensuring that the banking system *became* strong through a sufficiently large increase in actual capital meaningfully measured. The result is that the UK banking system enters the downturn in a worryingly fragile state and avoidably so.

Dean Buckner & Kevin Dowd
29 May, 2020
Durham, UK.

"On Monday 17 March 2008 I was at the annual conference of the Royal Economic Society listening to a lecture on financial stability by Hyun Shin… Bear Stearns had been bailed out the very day before. … it barely crossed my mind that events were in train that, but for huge government rescues, would collapse the western banking system. In fact the thought did flit across my mind, only to be dismissed, naively, as incredible.

I tell this story to illustrate that the real shock of 2008 was not the shock – of subprime, the drops in property prices, &c – but the system's lack of resilience to the shock. Put another way, the "it" that few saw coming was not the sharp movement of asset prices, but the fragility of the system. It is a basic proposition of financial economics, and no ground for criticism of economists, that you can't see sharp asset price movements coming. *Failure to anticipate systemic fragility in the face of such shocks is an altogether different matter.*

Inadequate equity capital was the basis for that fragility. Of course there were liquidity problems too, but they were often down to (justified) perceptions of capital inadequacy, as Northern Rock itself showed. And there were problems of management conduct and incentives and corporate culture too, but their consequences for the economy are far more severe when capital falls short. *Banks' capital adequacy is a cornerstone of our economic system.*"

Sir John Vickers (2019, our emphasis)

Acknowledgment

Buckner (http://eumaeus.org/wordp/index.php/contact/) is a former senior valuation specialist at the Prudential Regulatory Authority and founder of The Eumaeus Project. Dowd (kevin.dowd@durham.ac.uk) is professor of finance and economics at Durham University Business School, Mill Hill Lane, Durham DH1 3LB, United Kingdom. This report draws freely from Dowd's earlier 'No Stress' reports published by the Adam Smith Institute. Thanks to Anat Admati, John Allison, James R. Barth, David Blake, Tim Bush, Jim Dorn, Ed Farmer, James Ferguson, Jonathan Ford, Charles Goodhart, Phil Joel, Gordon Kerr, Cavin O'Driscoll, Gerald P. O'Driscoll, Martin Hutchinson, John Skar, Sir John Vickers and Walker Todd for many helpful inputs. The authors thank Bilal Kargi and KSP Publishers for publishing the report and bear sole responsibility for any remaining errors.

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1 The Big (Divs) Freeze

By late March, it was clear that the UK economy was going into a major COVID-19 downturn. Even so, UK banks were still intending to go ahead with their plans to pay some £7.5 billion in dividends to their shareholders. The first payment, by Barclays, was due on Friday, April 3rd.

News of the banks' intentions triggered a public outcry. Kevin Hollinrake MP, the chair of the all-party parliamentary group on fair business banking, was appalled: "They live in a different world, don't they? Why on earth would you pay a dividend right now? It's shocking they could even contemplate this." Taxpayers had already rescued the banks once, he said, and it would be outrageous if they had to be supported a second time (Hosking, 2020).

He wasn't alone:

> Sir John Vickers, former chairman of the Independent Commission on Banking, has urged the

> Bank of England to block more than £7.5 billion of dividends to be paid out by banks.
>
> The intervention by Sir John, a former senior official at the Bank, heaps more pressure on Andrew Bailey, the governor, to force banks to abandon payout plans, starting with Barclays, which is pressing ahead with a promise to pay £1.03 billion next Friday [April 3rd].
>
> "For the sake of the health of the financial system, dividend payouts by banks should now be totally out of the question. … I'm surprised the Bank hasn't yet put a stop to them. It should do so at once.
>
> "As well as further weakening banks' ability to bear the losses that they face [from the virus-related downturn], dividend payouts would dilute the Bank of England's measures to support lending. They should be stopped at once if banks don't withdraw them."
>
> The concern that banks are unnecessarily weakening themselves at a moment of unprecedented uncertainty was echoed by Robert Jenkins, a former member of the Bank's financial policy committee: "If Barclays is permitted by Andrew [Bailey] to do this, then the regulators have officially given up the game. This is a defining moment." (Hosking, 2020).

As late as Friday March 27th, the BoE was said to be "relatively unfazed" about the dividend payments going ahead, although in private the BoE had been telling the banks ever so gently that it was "concerned about the optics."

Come the next Monday, March 30th, and the bankers were holding out. To quote a subsequent article in the *Financial Times*:

> some of the banks argued their balance sheets were strong enough to make the payouts. They pointed out that they had passed the BoE's stress tests last year, which measured whether the lenders were able to withstand an economic shock on a similar

> scale to the coronavirus fallout (Crow, Morris & Megaw, 2020).

Most of the banks were still holding out even after a series of phone calls from deputy governor Sam Woods to the banks' CEOs. As the *FT* article continued:

> Mr Woods' intention was for the banks to make the announcement without public direction from the BoE, but leaders at four of the five lenders balked at the plan, the people said. RBS, which is majority owned by the taxpayer, was the only one willing to comply.
>
> "We all had exactly the same view," said an executive at one of the four refusenik banks. "Just being asked to do it was not enough. We would have chosen to go ahead in paying the dividend and told the [BoE], 'thanks very much for your input but we disagree'."

The next day, Tuesday March 31st, Mr. Woods wrote to the CEOs requesting that they confirm to PRA by 20:00 *that evening* that they would not be proceeding with dividend payments, buybacks or cash bonuses to senior bankers, otherwise there'd be trouble. His letter is a classic:

> The PRA welcomes the consideration given by you and your firm to suspending dividends and buybacks on ordinary shares until the end of 2020. Should your board take such a decision the PRA would publicly welcome it.
>
> I am also writing to ask you to cancel payments of any outstanding 2019 dividends.
>
> The PRA also expects banks not to pay any cash bonuses to senior staff, including all material risk takers, and is confident that bank boards are already considering and will take any appropriate further actions with regard to the accrual, payment and vesting of variable remuneration over coming months.
>
> Please confirm to the PRA by 20:00 today whether or not your group is prepared to agree to this request.

> The PRA stands ready to consider use of our supervisory powers should your group not agree to take such action.
>
> We would expect you to make a statement by 21:00 and the PRA would issue its own statement at that time. A draft text of a PRA statement and possible form of words for your statement, depending on your decisions on these matters, is included below (see Annex) (Woods, 2020).

Faced with an offer they could hardly refuse, the bankers backed down. Mr. Woods had certainly raised a few eyebrows.

So why the change of heart by the central bank? The BoE's decision to play the heavy

> hardly smacks of a considered change of direction; more a handbrake U-turn that left black rubber marks all over the road.
>
> No, it is not whether the central bank should have acted: few seriously dispute that the country's lenders should be conserving their capital given the economic shock Britain is experiencing. Rather, it's the opposite. Why did it take so long? (Ford, 2020).

Mr. Ford points out that the official explanation is coronavirus and the pressures that that puts on the banks. He continues

> But the virus did not become news only last Tuesday [March 31st]. What is puzzling is the failure to gate earlier all capital distributions. It's hard to believe the central bank trusted bank bosses to show restraint, especially when the likes of Barclays' Jes Staley had big bonuses riding on the payouts.
>
> More likely, the central bank believed its own story that the lenders were super well-capitalised. That has certainly been the mood music from Threadneedle Street, with the now departed governor Mark Carney boasting recently that their balance sheets were now so strengthened that, unlike 2008, the banks could be "part of the solution".

The next day, the prices of the Big Five UK banks' shares plunged: 12% for Barclays, 9.5% for HSBC, 11.7% for Lloyds, 5.2% for RBS and 7.3% for Standard Chartered.

There is deeper puzzle, however. If it believed that UK banks are super strong, why didn't the BoE just let the dividend payments go ahead? The proposed payments were barely 2.1% of the Big Five banks' book value capital, which, by hypothesis, was super adequate. Allowing the payments to go ahead would have sent the perfect signal of strength to the market, especially at a time of so much uncertainty. The BoE blocking those payments then looks like a panicky overreaction that unnecessarily spooked the markets, because it gave the impression that the BoE was having second thoughts about how strong it thought the banks really were. How else to explain the market reaction the next day?

So the question is, how strong *is* the UK banking system? Or, more precisely, does the UK banking system have the financial resilience it needs to withstand a major shock and still emerge in good shape?

This book seeks to answer these questions. Our answer is, inevitably, involved, and is laid out in the follow steps. Section Two outlines our main argument. Section Three looks at banks' current share prices and market capitalisations, and how these have changed since the New Year and since before the Global Financial Crisis (GFC). Sections Four and Five examine banks' price-to-book (PtB) and market value capital to asset ratios. Section Six discusses how the UK banking system is now bifurcated into two sub-systems – HSBC and the other banks – and discusses HSBC's exposure to Hong Kong. Section Seven examines off-balance sheet (OBS) and other hidden risk and valuation problems facing the banks. Section Eight examines the uselessness of the regulatory capital framework, section Nine examines the BoE's claims that the UK banking system is now superstrong

and section Ten discusses the BoE's track record in the GFC. Section Eleven discusses the underlying political economy of bank capital and section Twelve concludes.[1]

[1] The article is followed by sixteen Appendices that go into more detail on important issues that are raised in the text, and which underpin much of the argument in the text: Appendix 1 gives a primer on bank capital; Appendix 2 examines market values vs book values; Appendix 3 deals with banks' low price-to-book (PtB) ratios; Appendix 4 demonstrates that the Bank of England's preferred interpretation of low PtB ratios is not supported by the model it uses to explain them, namely, its own Discount Dividend Model; Appendices 5 and 6 examine alternative denominators in banks' capital ratios; Appendix 7 discusses how high minimum required bank capital to asset ratios should be; Appendix 8 examines UK banks' GFC losses; Appendix 9 examines HSBC's exposure to Hong Kong and the rest of China; Appendix 10 discusses Enron as a case study of the potential unreliability of 'Fair Value' Level 3 valuations; Appendix 11 examines the unreliability of banks' loan book valuations due to the regulators' approach to credit risk modelling; Appendix 12 discusses the 'hold capital' fallacy which is endorsed by industry and regulators alike, and which leads to important misconceptions about the tradeoffs involved with higher capital requirements; Appendix 13 addresses maximum possible bank leverage under Basel III; Appendix 14 discusses the unreliable track record of regulatory bank capital ratios that use the Risk-Weighted Assets (RWA) denominator; Appendix 15 examines the Bank of England's repeated claim that minimum required capital ratios in the UK are now 'ten times' what they were before the GFC; and Appendix 16 examines the BoE's UK bank stress tests.

2 Outline of Argument

To summarise the main argument, as the UK enters the downturn, the BoE continues to maintain that UK banks are strongly capitalised. However, reliable evidence indicates otherwise. The core metrics for the Big Five UK banks have deteriorated sharply since the New Year, and even more since the end of 2006, i.e., the eve of the Global Financial Crisis (GFC). Their market capitalisations, their price-to-book ratios and their ratios of market capitalisation to total assets have fallen sharply since the New Year and even more since before the GFC. Their corresponding leverage levels have correspondingly increased. For example, banks' average price-to-book ratios are now 39.2%, down from 255% at the end 2006, and their average leverage, defined as total assets divided by market capitalisation, has soared to 43.3, up from 8.9 at the end of 2006. Few would disagree that banks were already over-leveraged going into the GFC and yet UK banks are more than four times more leveraged now than they were then.

These metrics indicate a sickly banking system. If the banks were in good financial shape, their PtB ratios would be well above 100% and their capital ratios well above current levels. Traditional rules of thumb also suggest that leverage levels should be no greater than 10 or 15 to be considered safe.

In addition, UK banks have hidden problems relating to their off-balance-sheet positions, their gameable 'Fair Value' Level 3 (or 'mark to model') and loan book valuations, and their problematic implementation of IFRS 9, all of which have further adverse consequences for their capital adequacy.

The BoE's 'Great Capital Rebuild' narrative about a strongly recapitalised UK banking system is an elaborate window dressing exercise. The BoE focused most of its efforts on making the banking system *appear* strong by boosting banks' regulatory capital ratios instead of ensuring that the banking system *became* strong through a sufficiently large increase in actual capital meaningfully measured. The result is that the UK banking system enters the COVID-19 downturn in a woefully fragile state and avoidably so.

The assurances of the central bank about the supposed strength of the banking system must also be weighed against its unimpressive track record from the GFC: the BoE completely failed to see the crisis coming, despite market signals that something was amiss; then, when the crisis did come, the BoE persistently misdiagnosed the true nature of the crisis as being a liquidity crisis (which is not a big deal) rather than the capital or solvency crisis that it was (which is a big deal), despite the fact that markets had been signalling capital problems since 2007. The scale of the losses overwhelmed the UK banking system and blew the UK's fragile regulatory capital framework out of the water.

Fast forward to the present, markets are again signalling major problems and the Bank of England is again insisting,

against the evidence, that all is well. As Deputy Governor Sam Woods reiterated to the Treasury Committee on Wednesday April 15th, "We go into this with a well capitalised banking sector."

We end with some speculations about the underlying political economy of bank capital, i.e., the game that is really going on. In a *laissez faire* world, bankers who took excessive risk could reasonably expect to bear the consequences of those risks, so they would restrain their risk-taking out of their own self-interest.

Enter central banks and regulators, who set up lender of last resort facilities, deposit insurance and such like, and associated expectations of bailout. The bankers respond to these incentives by increasing their leverage and taking more risks to boost their returns on equity, which are the basis of bank CEOs' remuneration. High leverage seeks to maximize the value of the (often implicit) central bank or government guarantees by letting banks borrow at rates subsidised by society at large, thereby privatising profits on the upside and socialising losses on the downside. The bankers' Social Contract is highly destructive, however. The regulators attempt to rein it in by capital adequacy regulation, the aim of which is to constrain leverage, but the bankers are able to defeat them each time by 'capturing' the regulatory system which they then manipulate to their own advantage. Thus, the regulator's dismal performance, while shocking, is only to be expected.

At some point, there will need to be radical reform to reverse the ever more destructive banksterisation of the economy and re-establish a Social Contract in which the bankers serve the public and not the other way round.

To go back to the Vickers quote with which we started, "Banks' capital adequacy is a cornerstone of our economic system." A healthy economy – a healthy society, even –

depends on banks' capital adequacy being restored and then protected against those who would knock it down.

3 Bank Share Prices and Market Cap

Let's start with some evidence. Consider the following chart, which gives the changes in the prices of the Big Five banks' share prices since the New Year.[1]

Dead Bat Bounce

Figure 1. *Changes in Big Five UK Banks' Share Prices Since 2006*
Source: FT; period spanning January 2nd 2007 to May 29th 2020.

[1] The Big Five UK banks account for about 90% of the assets of the UK banking system.

Between the end of 2006 and the close of business on Friday, May 29th 2020, the banks' share prices fell by between 54.8% in the case of the best performer, HSBC, and 98.1% in the case of the worst performer, RBS.

Table 1. *Big Five Banks' Market Capitalisation (May 29th 2020)*

Bank	Market Cap (£bn)
Barclays PLC	20.0
HSBC Holdings PLC	74.7
Lloyds Banking Group PLC	21.0
Royal Bank of Scotland Group PLC	13.3
Standard Chartered PLC	11.6
Total	140.6

Notes: Authors' calculations based on banks' own and *FT* data.

The big five banks' latest market capitalisation ('market cap') is £140.6 billion. This number is to be compared to the banks' total assets, £6,093.3 billion, which is 43.3 times their market cap.

To see how much their market cap has changed, the next table shows the corresponding market cap numbers as of December 31st 2006.

Table 2. *Big Five Banks' Market Cap: Dec 31st 2006*

Bank	Market cap (£bn)
Barclays PLC	62.9
HSBC Holdings PLC	100.5
Lloyds Banking Group PLC	16.0
Royal Bank of Scotland Group PLC	166.0
Standard Chartered PLC	15.6
Total	**360.9**

Notes: As per Table One.

Banks' market cap was £360.9 billion at the end of December 2006. Banks' current market cap has fallen by 61% since 2006.

Not much sign here of the Great Capital Rebuild.

4 Price-to-Book Ratio

Another metric is the price-to-book (PtB) ratio, the ratio of a bank's market cap to its reported or book capital.[1]

Theoretical considerations about price-to-book

A healthy bank would have a PtB ratio well in excess of 100%.

Why is that?

Imagine that we build a factory costing £100. We finance it through some mix of debt and equity, say, £90 in debt and £10 in equity. Shareholders are assumed to operate under unlimited liability, i.e., we are back in early Victorian England. I report the book value of my equity as £10. Shareholders anticipate that our factory business will be

[1] The following discussion draws on material that is discussed in more detail in two Appendices: Appendix 1, which provides a primer on bank capital issues and Appendix 2, which provides a more extensive justification for why capital is best measured as market cap rather than book value equity (e.g., shareholder equity) or one of the regulatory book value measures (e.g., Common Equity Tier 1 aka CET1 or Tier 1 aka BaselIII's idea of going concern capital).

profitable, so they are presuming a positive franchise value, i.e., that future profits will be positive. Therefore, they value the firm at more than book, say, £15 reflecting a franchise value of £5. So the price to book ratio is £15/£10 = 150%. The law is then changed to allow shareholders the protection of limited liability, i.e., they can now walk away from any losses exceeding the share capital they have subscribed. Limited liability is valuable to shareholders, and they value the implicit limited liability put option as, say, £3. The market value of their shares therefore rises to £18 and the PtB rises to £18/£10 or 180%. The lesson is that we would expect a healthy business to have a PtB in excess of £100 because of (a) franchise value and (b) the value of the limited liability put. Substitute 'bank' for 'factory' and the same applies.[2,3]

Now suppose that the skies darken and the market anticipates that future profits will be zero, so the whole of the franchise value has been wiped out. Revaluing the franchise value at £0, the market value of the firm's equity falls from £18 to £13 and the firm's PtB becomes £13/£10 or 130%.

But wait.

Since the market now takes a more pessimistic view of the firm's profit prospects, the value of the put option rises from £3 to, say, £4. So the market value of the firm's equity goes

[2] This example is based, in part, from one by Vickers (2016).

[3] To quote Vickers (2019) in his speech, "Safer but not safe enough," "Where price-to-book ratios are persistently below one, there are at least serious questions about regulatory measures of capital. Price-to-book ratios should substantially exceed one because market capitalisation reflects a view of the value of current exposures, less obligations to depositors and bondholders, plus the franchise value of future profits in excess of the cost of capital, plus the option value arising from shareholders' limited liability."

up again, from £13 to £14 and the PtB ratio becomes £14/£10 or 140%.

The question then is what would it take to get the PtB under 100%?

Presumably either a perception by the market that the firm is carrying hidden losses or a perception by the market that the NPV of its future cash flows is well below zero. Either way, a PtB less than 100% is a bad sign.

The implication is a strong one: a healthy bank should have a PtB ratio comfortably over 100%. Conversely, if a bank has a PtB ratio under 100%, then there is *something wrong*.

Price to book ratios for UK banks

How do the Big Five banks' PtBs look? The answer is not so good.

Table 3. *Big Five Banks' Price to Book Ratios (May 29th 2020)*

Bank	Price to Book Ratio
Barclays PLC	29.2%
HSBC Holdings PLC	48.8%
Lloyds Banking Group PLC	39.9%
Royal Bank of Scotland Group PLC	30.2%
Standard Chartered PLC	28.7%
Weighted average	**39.2%**

Notes: As per Table One. The weighted average is by share of total assets.

By PtB ratios, the best performer is HSBC at 48.8%, the average is 39.2% and the lowest is Standard Chartered at 28.7%. To point out the obvious: these ratios are well below 100%. Ergo, the market must believe that there is something wrong with the banks.

We are reminded of Merton Miller's comments about a 50% PtB: "That's just the market's way of saying: look at these guys; you give them a dollar and they'll manage to

turn it [or perhaps he meant, burn it] into fifty cents (p. 199)."[4]

It would appear that UK banks can't even manage that.

The next table shows the corresponding PtB ratios as of end-2006 and end-2019:

Table 4. *Big Five Banks' Price to Book Ratios: December 31st 2006*

Bank	Price to Book Ratio
Barclays PLC	232%
HSBC Holdings PLC	181%
Lloyds Banking Group PLC	139%
Royal Bank of Scotland Group PLC	413%
Standard Chartered PLC	176%
Weighted average	**255%**

Notes: As per Table Three.

[4] The full passage is weirdly appropriate to contemporary conditions. Referring to a conference that took place around 1979, Miller writes:

"My particular panel was set up in a lovely room overlooking the well-manicured lawns of the village green and our subject that day was (what else?) capital requirements in banking. Some things never seem to change. The banker sitting next to me had just finished his presentation, the burden of which was that his bank was being forced to pass up profitable lending opportunities because it was bumping up against its capital constraint.

"Then, why don't you just raise more capital?" I asked him.

"It's too expensive," he said. "Our stock is selling for only fifty percent of book value."

"That has no bearing on your cost of capital," I replied. "That's just the market's way of saying: look at these guys; you give them a dollar and they'll manage to turn it into fifty cents."

At that point, there was a rumbling noise from the audience of bankers, most of whom were selling for even less than fifty percent of book value. I happened to look up at that moment and through the window I could see a platoon of soldiers in Revolutionary War costume and muskets marching on the village green toward the town hall.

My God, I thought, they're sending for the firing squad.

They didn't actually shoot me, needless to say, but they didn't let me say much of anything else either. I never could seem to catch the moderator's eye." (Miller, 1997).

The average PtB ratio was 255% at the end of 2006.

By this criterion, UK banks are in considerably worse shape than they were going into the GFC.

As a cross check, according to a BoE spreadsheet, the average price to book ratio for UK banks fell from 211% at the end of 2006 to 85% by November 2015. Unfortunately, that series ends in November 2015 and appears to have since disappeared from the BoE's website. (Good job we kept a copy. For those who wish to see it, we provide a link to it here, see sheet '9. Bank equity measures,' cell B194.) The Bank's numbers are a little different to ours, but the story is much the same.[5]

[5] There is more to be said about PtB issues, but we defer further discussion of these to Appendices 3 and 4.

5 Capital Ratios and Leverage

Theoretical considerations

A bank's capital strength is traditionally evaluated in terms of its capital ratio, the ratio of its capital to its assets, and by its leverage, which is inverse of the capital ratio i.e. the ratio of assets to capital.

We will work on the presumption that the numerator in the capital ratio, capital, should be measured as market cap, and that the denominator, assets, should be measured as total assets.

In defence of the use of market cap as a capital measure, we would point out that if you want to sell an asset, you have to sell at market value and the book value doesn't matter; if you want to buy an asset, then you would be a fool to pay book value if market value were lower, and you would have to pay market value if market exceeds book. Similarly, if a bank wants to sell its shares, it gets the market value (or less, if it sells via a rights issue) and again the book value is irrelevant.

We can also think of this market value vs book value issue in terms of loss absorbency. In general terms, we can

think of loss absorbency as the ability of a bank to experience losses and still be able to function normally. For a bank, the losses would arise from a fall in asset values. Equity capital is loss absorbing because it is a liability whose value is determined by the level of asset value. By contrast, a bond or a bank deposit is not loss-absorbing because its contractual value, the amount owed, remains the same regardless of fluctuations in asset values. So the greater the bank's equity, other things being equal, the greater its loss absorbency. The issue then is whether we should measure a bank's loss absorbency in terms of its market cap or its book value share capital.

Consider two schools of thought. School M says that we should use market cap as our measure of capital. School B says to use book value. Now suppose that the market cap and book value capital are initially the same. Suppose too that the bank reports on an annual cycle and had only yesterday reported its book value. Tomorrow the share price falls. According to School M, the bank's capital (=market cap, the product of the number of shares outstanding and the share price) then falls. School B however maintains that the bank's capital (=book value capital, e.g., the book value of shareholder equity reported yesterday) stays the same, market cap irrelevant.

Now suppose that the share price keeps falling. By its logic, School B must continue to maintain that the bank's capital remains constant, *however low* the share price goes, so market cap is still irrelevant.

After a few days equity market investors conclude that the bank will never pay them any further dividends, so the share price and market cap go to zero. School M says that the bank's capital has gone to zero, bank irretrievably bust. School B maintains that the bank's capital hasn't changed because the book value hasn't changed, so (presumably) the market cap is *still* irrelevant. School M maintains that the

capital losses *have already* occurred, School B maintains that the losses to capital, if there are to be any, *will occur* or should *be deemed to have occurred* only when the next annual report comes out in fifty one weeks' time.

Substitute a dead parrot for the bank and you have a situation reminiscent of a well-known comedy sketch.

To continue. Suppose you are still supporting School B by this point. You re-read the last annual report that contains the capital number, book value, that you believe to be the appropriate one to use. You then discover that the bank was planning to move from a one year reporting cycle to a two year reporting cycle. OK, the example is getting a little silly, but logic being what it is, you must now believe that the capital losses that we think have already occurred will now occur or should be deemed to have occurred in almost two years' time. OK, you say. But what if the new reporting cycle is five years instead of two, or ten years? Are you OK with those too? You can see where we are going here. Book value is irrelevant if it was last reported in 1926. School B does not end up in a happy place.

Still not convinced?

Then ask yourself, what is the bank's loss absorbency at this point? School M gives a clear answer: zero. The shareholders who own the bank can't absorb further losses because they have lost their entire investment (i.e., have nothing left to lose) and, because shareholders have limited liability, the bank's creditors cannot sue them for any further losses that they (the creditors) might experience.

You disagree and continue to insist that loss absorbency is still book value. Then explain to us why purported loss absorbency numbers like book value capital are still the preferred numbers to use even though market conditions have changed drastically since those numbers were released, so those numbers are no longer remotely relevant to current

market conditions. What useful information do you think those numbers are telling us?

Perhaps they are telling us that the bank will come back from the dead.

There is also the issue of timeliness. Consider the following quote from Morris' Goldstein's book *Banking's Final Exam*:

> (a) Note that when former Federal Reserve Chairman Ben Bernanke testified to Congress in 2007 about the subprime crisis, he estimated that it would generate total losses in the neighborhood of $50 billion to $100 billion [over period of years] … (b) But … when Bernanke gave testimony in an AIG court case… he explained that, by September and October of 2008, 12 of 13 of the most important financial institutions in the United States were *at risk of failure within a period of a week or two*. The question for stress test architects and modelmakers is, How do you make your models generate a transition from (a) to (b) in the course of, say, a year or two? This is not a technical sideshow. In stress modeling, it is the main event (Goldstein, 2017, p.251).

Goldstein is referring to the lack of timeliness of the Fed's stress tests, but the same point can be made about the lack of timeliness of book value capital numbers. When a crisis occurs, market prices fall so fast that book values become irrelevant.

For the avoidance of doubt, we are *not* saying that book value measures have no merit. We *are* saying that for reasons especially of (a) loss-absorbing capacity and (b) timeliness, market cap is generally to be preferred to any book value measure.

Regarding the use of total assets as the denominator, we would point out that there are two alternative denominator measures, Risk Weighted Assets (RWA) and the Leverage

Exposure (LE). These are both highly flawed however.[1] The drawbacks of the former are explained in Appendix Five[2] and the drawbacks of the latter are explained in Appendix Six.

Capital ratios and leverage for UK banks

The next table shows the Big Five banks' ratios of Market Cap (MC) to Total Assets (TA) and their corresponding leverage numbers (i.e., TA/MC):

[1] One cannot defend the use of either of these alternative measures by pointing to flaws in the TA measure, of which there are many, because TA is dependent on a slew of underlying assumptions made by accountants. The reason is that both RWA and LE are essentially derivative of TA, the former explicitly and the latter implicitly. The RWA measure takes the TA measure and then applies arbitrary (and frankly, senseless) fixed 'risk weights' to its components. The LE works by taking the components of TA and adding a different set of fixed risk weights known as credit conversion factors to off-balance sheet positions, but these make no sense either. Thus, both measures incorporate the flaws of the TA measure, but add more, i.e., whatever its flaws, the TA measure is the best we have. At the same time, replacing any these measures with a reliable risk measure is a search for the holy Grail, so that's out too.

[2] To summarise for those who are too busy to read Appendices: (1) The RWA measure is unsound on principle. (2) The RWA measure is highly gameable and the banks are aggressively gaming it to get their RWA numbers down to boost their CETI capital to RWA ratios, which are the ones the regulator focuses on. (3) The latest available (i.e. end-20q1) average risk weight, the ratio of total RWA to TA, is 26.8%. Therefore, one might say that 73.2% of the total assets of the Big Five banks is deemed by the regulatory 'risk weighting' system to have zero risk, which point confirms point (1) above.

5. Capital Ratios and Leverage

Table 5. *Big Five Banks' Capital Ratios and Leverage (May 29nd 2020)*

Bank	MC/TA	Leverage (=TA/MC)
Barclays PLC	1.4%	72.3
HSBC Holdings PLC	3.2%	31.5
Lloyds Banking Group PLC	2.4%	41.0
Royal Bank of Scotland Group PLC	1.6%	61.3
Standard Chartered PLC	1.9%	53.2
Weighted average	**2.3%**	**43.3**

Notes: As per Table Three.

These MC/TA capital ratios vary from 1.4% for Barclays to 3.2% for HSBC, with a weighted average of 2.3%.

These are on the low side considering that many experts led by Anat Admati have been calling for minimum capital requirements of 15% or more. If we accept the Admati Capital Standard, and there are compelling reasons why we should accept it),[3] then UK banks' capital is a small fraction of what it should be, to be considered capital adequate.

The average current MC/TA ratio of 2.3% can be interpreted as suggesting that a loss on total assets of under 2.3% would be enough to wipe out the banks' entire capital, and that any higher loss would push the banks into technical insolvency.

The corresponding leverage (=TA/MC) numbers vary from 31.5 for HSBC to 72.3 for Barclays, with an average of 43.3. The dangers of high levels of leverage were vividly described by John Cassidy in the *FT* in 2010:

> Leverage kills. In March 2008, Bear [Stearns] had tangible equity capital of about $11bn supporting total assets of $395bn – a leverage ratio of 36. For several years, this reckless financing enabled the company to achieve a profit margin of about a third and a return on equity of 20 per cent; when the market turned, it left Bear bereft of capital and willing

[3] For further details, see Appendix 7.

> creditors. During the ensuing months, the same story was to be played out at scores of other banks and non-banks (Cassidy, 2010).

By the Admati Standard, the maximum leverage should be at most 1 divided by 15% or 6.7.

Alchemists of Loss (Dowd & Hutchinson, 2010) quotes a traditional leverage rule of thumb used in the City:

> "The maximum safe leverage is 10 to 1 for banks and 15 to 1 for brokers dealing in liquid instruments." This Copybook Heading was widely ignored [in the run up to the GFC], most openly by investment bankers operating at leverage ratios of over 30 to 1 by the end of 2007, the sin made worse by banks hiding their risks by pushing assets off their balance sheets by use of "structured investment vehicles" funded by commercial paper that was apt to become illiquid when most needed. This god's revenge is traditionally very painful and is proving so again (Dowd & Hutchinson, 2010, p.12).

Table Six shows the banks' capital ratios and leverage as of end-2006.

Table 6. *Big Five Banks' Capital Ratios and Leverage (Dec 31st 2006)*

Bank	MC/TA	Leverage (=TA/MC)
Barclays PLC	6.3%	15.8
HSBC Holdings PLC	11.5%	8.7
Lloyds Banking Group PLC	4.6%	21.5
Royal Bank of Scotland Group PLC	19.0%	5.3
Standard Chartered PLC	11.5%	8.7
Weighted average	**11.2%**	**8.9**

Notes: As per Table Three.

As of the end of 2006, the MC/TA ratios varied from 4.6% for LBG to 19% for RBS, and the weighted average was 11.2%.

The corresponding leverage varied from 5.3 to 21.5, and the average was 8.9.

Thus, UK banks are considerably more leveraged now than they were going into the GFC, and yet reasonable people agree that excessive leverage *then* was a key factor aggravating the severity of the GFC. [4]

The elephant in the room then trumpets: if the average leverage of 8.93 at end 2006 was too high, why is the current average leverage of 43.3 not *way too* high?

And what does the Bank of England's spreadsheet tell us?

It tells us that the average market-based capital/asset ratio (it actually uses the term 'market-based leverage ratio') falls from 8.31% at end 2006 to 5.28% by Nov 2015 (see cells C87 and C194), and the corresponding average leverage rises from 12 to almost 19. The BoE spreadsheet agrees with us that (market value) capital ratios were higher pre crisis than post, and market-value leverage, lower.

Therefore, the current weakness of the banks cannot be ascribed to the impact of COVID-19 or to the introduction of IFRS 9, because banks were in poor shape well before those came along.

[4] To give an example, the then German Finance Minister, Peer Steinbrück told *Newsweek* in December 2008: "When I ask about the origins of the [GFC], economists I respect tell me it is the credit-financed growth of recent years and decades. Isn't this the same mistake everyone is suddenly making again…?" Or to quote Mark Carney eight years later, "We are all aware that the UK banking system was woefully undercapitalised in the run-up to the crisis." (Mark Carney letter to Andrew Tyrie, April 8th 2016).

6 HSBC and Hong Kong

However, the UK's strongest bank, HSBC, is not looking that strong itself, and has its own issues quite apart from being leveraged well over three times more than was the UK banking system going into the GFC.[1] To quote an article by Patrick Jenkins in the *FT* on January 6th this year:

> In the third quarter of last year, the latest reported period, the Hong Kong and Shanghai Bank, true to its name, made about 80 per cent of its profits in Hong Kong and mainland China.
>
> For much of the bank's 155-year history, that often vibrant home market has been a strength, offering high profit margins and high growth. But, with the fate of Hong Kong as a semi-autonomous Chinese territory hanging in the balance, it is starting to look like a vulnerability.

He then mentions three risks facing the bank.

The first is a set of risks relates to sustainability of its business in the region. These include slowing Chinese

[1] HSBC latest leverage = 3.13 vs the Big Five's average end-2006 leverage of 8.9.

growth, the impact of China-US trade tensions and slowing trade growth. He also mentions the "direct fallout for HSBC from the US-China stand-off as well: last summer the bank infuriated Chinese officials after it provided information that helped US prosecutors build a case against telecoms group Huawei, leading to the arrest of its finance director."

> A second risk for HSBC is Hong Kong-specific and pending. The hit to travel and tourism as a result of the protests will soon feed through to the banking system — a prospect foreshadowed when HSBC more than doubled its estimated credit losses from the territory in the third quarter. …
>
> The third headache is far more fundamental. The conflict between Hong Kong and Beijing could not clash more awkwardly with HSBC's core business model. Hong Kong is by far its biggest market. But good relations with Beijing have been crucial as it has expanded across the Pearl River Delta and beyond. If tensions escalate further, HSBC is bound to upset one or other camp — with four-fifths of profits hailing from greater China, the downside risk is substantial. …
>
> [Viewed from the broader historical perspective] Hong Kong and greater China are coming once again to dominate the bank's revenues and profits just as the fragility of the region is more evident than ever.

The BoE also flagged up UK banks exposures to Hong Kong in its December 2019 *Financial Stability Report* (p.27):

> UK banks have significant exposure to Hong Kong, representing around 160% of their common equity Tier 1 (CET1) capital. The recent political protests in Hong Kong have been accompanied by a sharp slowdown in growth and falling asset prices. GDP growth contracted by 3.2% in Q3 — the weakest quarterly growth rate since the peak of the financial crisis in 2009 (Chart C.2).

6. HSBC and Hong Kong

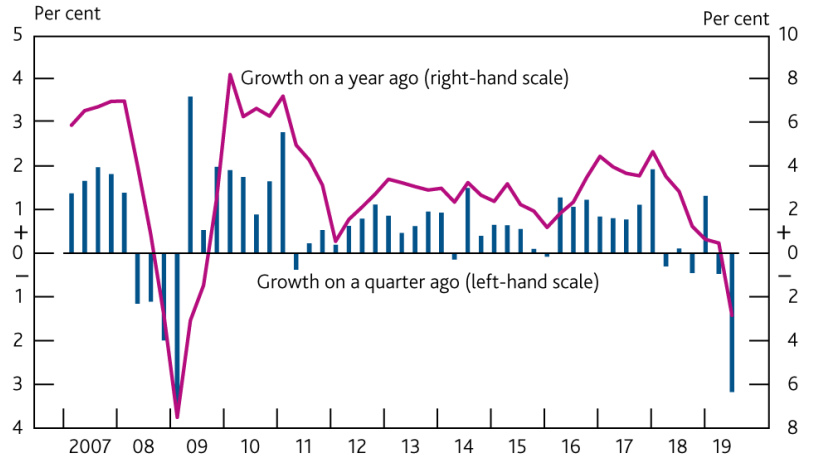

Chart C.2 *Hong Kong is now in recession (Hong Kong real GDP)*

Sources: Eikon from Refinitiv and Bank calculations.

The major Hong Kong equity index is 12% lower than its level seen in April when protests began. Transactions in the commercial real estate (CRE) market since April contracted by 31% when compared to the same period last year …

There have also been significant portfolio capital outflows from investment funds in Hong Kong. The total cumulative outflows since April were around US$5 billion, accounting for around 1¼% of Hong Kong GDP (Chart C.3).

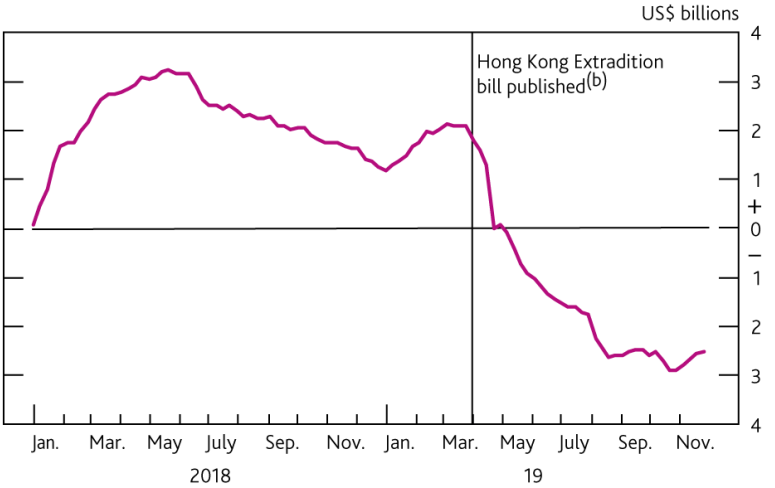

Chart C.3 *There have been outflows from investment funds in Hong Kong since April*

Portfolio capital flows via investment funds in Hong Kong[a]

Sources: EPFR Global, Eikon from Refinitiv and Bank calculations.
(a) Cumulative weekly capital flows from January 2018.
(b) Bill published on 29th March 2019.

> The protests, and their impact on the real economy, highlight political risk as a key vulnerability in Hong Kong. And these political tensions pose risks, given Hong Kong's position as a major financial centre.

The latest figures just out show that Q120 GDP declined Year-on-Year by 8.9%, the biggest fall on record, bigger than the previous largest fall of 8.3% in 3Q98 (Durden, 2020).

There is also the question of HSBC's exposure to the HK and to a lesser extent Chinese property markets. To give a sense of this exposure, consider the HK residential price indices in Figure Two:

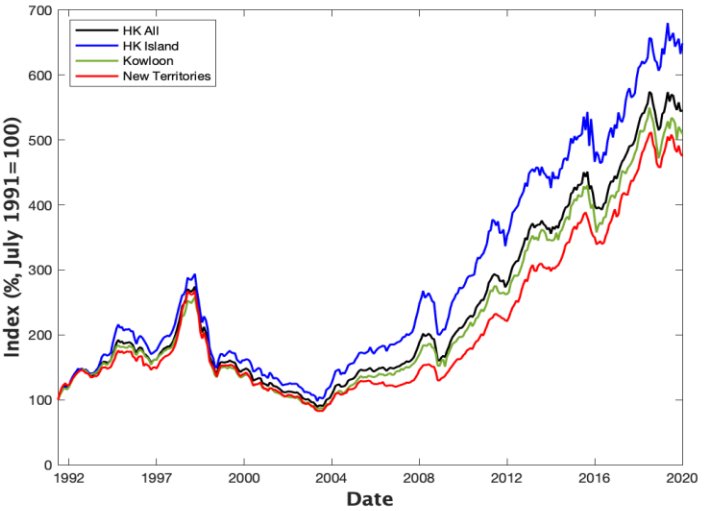

Figure 2. *Hong Kong Residential Property Prices*
Source: K.W. Chau, University of Hong Kong.

We see an initial rapid rise, then a dip of nearly 70%, followed by a rise to current value of nearly 500 to almost 650, depending on the index.

As an aside, this chart would provide the basis for a good stress test. A 'prudent' (in the PRA sense) stress test would be to assume only a 70% fall in HK prices, then see how that hits the HSBC loan to value. One does not have to do the actual analysis to see that the results would not be pretty.

We give a more detailed analysis of HSBC's Hong Kong exposure in Appendix 9.

And so we have the unprecedented situation that the financial condition of the UK banking system depends on one bank which is itself not only highly leveraged but also has enormous exposures to one of the most volatile regions in the world.

The UK banking system is now dependent on one humongous bet that the (presumably overvalued?) Hong

Kong property market won't go into a meltdown – and that nothing much else will go wrong in the region either.

We have here a most remarkable failure of prudential regulation.

7 Off Balance Sheet and Other Hidden Problems

Returning to the main theme, you might say that the capital ratios we reported don't take account of off-balance-sheet (OBS) positions and you would be right. They don't. The implication is that our leverage numbers paint a rosier picture of banks' leverage than is warranted. Who knows what hidden leverage or hidden losses lurk beneath?

We can however surmise that there is quite a bit of it.

There are four sets of issues here: OBS, 'Fair Value' valuations, credit book valuations and the impact of IFRS 9.

Let's consider each of these in turn.

Off-balance-sheet positions

The problems of OBS positions were nicely summarised in a perceptive analysis by Frank Partnoy and Lynn Turner:

> Abusive off-balance sheet accounting was a major cause of the financial crisis. These abuses triggered a daisy chain of dysfunctional decision-making by removing transparency from investors, markets, and

> regulators. Off-balance sheet accounting facilitated the spread of the bad loans, securitizations, and derivative transactions that brought the financial system to the brink of collapse. ...
>
> Off-balance sheet problems have recurred throughout history, with a similar progression. Initially, balance sheets are relatively transparent and off-balance sheet liabilities are minimal or zero. Then, market participants argue that certain items should be excluded as off-balance sheet. Complex institutions increase their use of off-shore subsidiaries and swap transactions to avoid disclosing liabilities, as they did during both the 1920s and the 2000s. Over time, the exceptions eat away at the foundations of financial statements, and the perception of the riskiness of large institutions becomes disconnected from reality. Without transparency, investors and regulators can no longer accurately assess risk. Finally, the entire edifice collapses. This is the story of both the 1920s and today.
>
> As in the past, the off-balance sheet complexity and exceptions have gone too far. The basic notion that the balance sheet should reflect all assets and liabilities has been eaten away, like a piece of Swiss cheese with constantly expanding holes.
>
> What is off the balance sheet swallows up what is on the balance sheet. Off-balance sheet abuses render banks' financial statements virtually useless and their true exposures become impenetrable (Partnoy & Turner, 2010).

Insert "almost" before "impenetrable" and we would agree.

Problems with 'Fair Value' valuations

Then there are banks' Level 1, Level 2 and Level 3 'fair value' valuations.

Roughly speaking: Level 1 assets have readily observable prices and reliable fair market values. Level 1 assets include

listed stocks, government bonds, or any assets that are regularly marked to market. Level 1 is not easy to manipulate, unless you manipulate the underlying market prices, which is more difficult, but not unknown.

Level 2 (or 'mark to model') assets do not have directly observed market values and are traded less frequently in thin markets, but have (one hopes) approximate fair values that can be obtained from models calibrated to observed market prices. Examples include some corporate and most municipal bonds. Level 2 valuations are at best approximate and can sometimes be gamed by selecting the model or proxy price that gives the preferred valuations.

Level 3 (or 'mark to model' or less politely, 'mark to myth') assets are highly illiquid and can only be fair-valued using models calibrated to guesstimates of key parameters. Level 3 valuations are unreliable and potentially highly gameable, because both models and calibrations can be chosen to manipulate valuations and because this gaming is difficult for outsiders to detect. Examples of Level 3 positions include asset-backed and mortgage-backed securities and many forms of CDS. The experience of the GFC showed that Level 3 positions can lose much of their value in a crisis. To paraphrase Warren Buffet, its only when the tide goes out do you discover who's been swimming naked. Therefore it would be prudent to presume that Level 3 valuations might have been manipulated and that this manipulation would be revealed in a crisis when some Level 3 valuations might, e.g., collapse. Enron provides a good example of the potential unreliability of Level 3 valuations due to unscrupulous gaming of both valuation models and fair value accounting standards, but it is far from being the only one.[1]

[1] The Enron case is discussed further in Appendix 10.

Now suppose we are reading these valuations with an eye to how they might be affected, i.e. what might go wrong, in a stress: (a) When we read the Level 1 FV valuations, it might be prudent to presume that Level 1 valuations would go with the market, i.e., down. We should also be asking about the volatility of the market prices on which the valuations are based and be concerned not with normal market volatility, but with potential market volatility in a stress, which could be considerably higher.[2] (b) When reading Level 2 valuations, we might start with the Level 1 valuations and look for adverse slippage between the Level 1 and Level 2 valuations. (c) When reading the Level 3 valuations, we might ask what would happen if those were to fall further than the Level 2 valuations, keeping in mind the possibility that those involved might have succumbed to the temptation to game the system by fiddling models or adopting an 'aggressive' approach to accounting valuations to produce preferred outcomes. Table Seven gives the banks' Level 1, Level 2 and Level 3 valuations.

Table 7. *Big Five Banks Level 1, Level 2 and Level 3 Valuations*

Bank	Assets (£bn)			Liabilities (£bn)			MC (May 1st 2020)
	Level 1	Level 2	Level 3	Level 1	Level 2	Level 3	
Barclays	95.0	432.9	353.5	442.2	439.7	4.4	17.8
HSBC	410.1	621.5	836.6	62.2	1,739.5	6.3	81.8
LBG	125.9	124.1	457.4	2.8	607.8	6.7	22.3
RBS	67.8	232.3	323.0	328.0	275.0	60.3	13.7
STAN	65.9	291.4	198.6	31.2	498.4	0.5	12.9
Total	764.7	1,702.2	2,169.1	866.5	3,560.4	78.2	148.5

[2] A classic example was 'Black Monday,' October 19th 1987, when the Dow Jones fell 22.6%. A more extreme but not uncommon example is where a previously fixed exchange rate unexpectedly changes (i.e., where volatility was previously zero but suddenly jumps), with potentially devasting effects on those who had been taking positions (e.g., such as carry trades) that presupposed that the exchange rate would remain fixed.

Notes: As per Table Three. L1' means 'Level 1' etc. FV valuations as per 31 Dec 19, but using the exchange rate prevailing on May 1st 2020.

Table Eight gives the valuations as percentages of market cap.

Table 8. *Big Five Banks Level 1, Level 2 and Level 3 Valuations as Percentages of Market Cap*

Bank	Assets			Liabilities		
	Level 1	Level 2	Level 3	Level 1	Level 2	Level 3
Barclays	534%	2,431%	1,985%	2,484%	2,470%	25%
HSBC	501%	760%	1,023%	76%	2,126%	8%
LBG	564%	556%	2,049%	13%	2,723%	30%
RBS	495%	1,697%	2,359%	2,396%	2,008%	440%
STAN	511%	2,257%	1,538%	242%	3,861%	4%
Total	515%	1,146%	1,460%	583%	2,397%	53%

Notes: As per Table Eight.

There are some red flags here.

Credit book accounting

A former City analyst recently told one of us, "Credit book accounting and IFRS 9 are worse than IFRS 13 level 3. Most of the valuation of a loan book is just fantasy." By the former, he was referring to the problems arising from the use of credit risk models to value banks' credit books.[3]

To explain: Credit exposures on the trading book are marked to market on the assumption that the market price reflects all information on credit risk. However, there is typically no market information on the credit risk of a bank's *loan* book and banks traditionally relied on valuations based on the expertise and subjective judgments of their internal credit teams. But under Basel III's 'advanced ratings based'

[3] The reader will recall that we discussed other modelling problems (e.g., excessive reliance on Gaussianity assumptions and Value at Risk models) in Appendix 5.

(AIRB) approach, qualifying banks (i.e., the big ones) are allowed to produce valuations by inputting their own calibrations into a credit risk capital model approved by the regulators. There are many problems with this approach, but the one that stands out is the dependence of the resulting valuations on the input values of the default probabilities involved. Unfortunately, the default probability is both notoriously difficult to calibrate and easy to game. Therefore, loan book valuation can be highly unreliable.[4]

IFRS 9

Finally, there are the problems from the implementation of the accounting standard (IFRS, International Financial Reporting Standard) 9, which deals with the reporting of expected loan losses.[5] IFRS came into force on January 1st to replace the old (IAS, International Accounting Standard) 39 which stipulated an 'incurred loss' model, i.e., banks' expected losses were typically not recognised.[6]

The main departure regarding impairment accounting is that IFRS 9 requires the recognition of (at least some) expected credit losses. IFRS 9 also introduces a three-stage model for classifying credit assets.

As soon as a financial instrument is originated or purchased, and if expected losses have not increased significantly, the instrument is categorised as Stage 1 (i.e., low-risk) with the requirement that its expected losses *over the next year* should be reported and provided for. If the credit risk has 'increased significantly' but the instrument is not considered credit-impaired, then the instrument is categorised as Stage 2 and its expected losses *over its lifetime* should be reported and provisioned. Reclassifying a

[4] We address this issue further in Appendix 11.

[5] [Retrieved from].

[6] At least at a portfolio level: they can be recognized for individual assets.

hitherto Stage 1 loan as a Stage 2 loan then creates a 'cliff edge' effect, i.e., a significant increase in reported losses and associated provisions, an effect aggravated further by the banks not being able to offset the lifetime expected losses by lifetime expected income. Credit-impaired instruments are categorised as Stage 3 and full lifetime expected credit losses are to be recognised for them too.

Johannes Borgen on Twitter[7] has a nice take on the way IFRS 9 works:

> Under IFRS 9, there are three types of loans: Stage 1 (all good), stage 3 (defaulted) and the tricky Stage 2, which does not depend on the credit quality of a loan but whether that credit quality has deteriorated.
>
> You can have a Stage 1 loan rated CCC if you originated it at CC and a A-rated loan in stage 2 if you originated it at AA. I know, it is very weird, but that's how it works.
>
> The HUGE difference between S2 and S1, is that in S1, you book a provision for the Expected Loss (EL) over a year whereas in S2 you take EL over the loan's *entire lifetime*. The difference can be huge for some long-dated loans, like… Mortgages!
>
> When the macro becomes shitty, IFRS 9 has a double blade effect;
>
> 1) A-year EL increase, but that was already taken into account in bank regulations so it's not a significant change.
>
> 2) a bunch of loans go to Stage 2 and therefore losses have to be calculated over a much longer horizon (and for a low probability for default (PD) a 5-year PD looks a lot like 5 times the 1y PD… Ouch.

This cliff edge makes banks reluctant to reclassify Stage 1 loans that have become problematic to Stage 2 where they belong. The accounting standards also give banks considerable discretion in how they classify their loans, i.e.,

[7] JohannesBorgen@jeuasommenulle; tweets from April 20th.

IFRS 9 gives banks the means, motive and opportunity to disguise problem loans by keeping them classified as Stage 1 instead of moving them to Stage 2, where higher losses would be reported which would entail higher provisions and a bigger hit to capital. We might then infer that many Stage 1 loans are misclassified and that banks are carrying higher reported losses than they are reporting.

Since banks (a) have large Stage 1 positions and (b) are strongly incentivised to keep loans classified as Stage 1, then it is reasonable to suppose that the problem would be on a considerable scale and will worsen as the economy goes into recession.

As an example of this cliff edge effect, LBG has a large (£500 billion) loan book. 90% of that loan book is in Stage 1 with an impairment rate of 15 pbs.[8] The expected loss on its Stage 1 loans is therefore nearly 0.0015 times £450 billion = £675 million. But if its Stage 1 loans were reclassified as Stage 2 then the expected loss and associated provisions rocket up by about £15 billion, which is 22 times as much. The capital hit is two thirds of its market cap. Furthermore, this calculation is based on the optimistic assumption of a 3.5% expected lifetime loss on a Stage 2 book. The actual loss would likely be higher than that in a severe downturn, so the capital hit would plausibly be higher still.

Table 9. *Lloyds Banking Group Lending by Stage (£bn): Dec 31st 2009*

Item	Stage 1	Stage 2	Stage 3	POCI[1]	Total
Gross lending	450.0	28.5	6.0	13.7	498.2
Gross lending as % of total	90.3%	5.7%	1.2%	2.8%	100.0%
ECL[2]	0.7	1.0	1.4	0.1	3.3
Net balance sheet carrying value	449.3	27.5	4.6	13.6	495.0
ECL rate[3]	0.15%	3.50%	24.10%	1.00%	0.65%

[8] This example is a modified version of one set out earlier by Johannes Borgen on April 20th and Jonathan Ford in his article "Bank accounting an early casualty of Covid-19," *Financial Times* April 27th 2020.

Notes: 1. POCI = Purchased or originated credit-impaired. 2. Expected credit loss allowance on drawn balances. 3. ECL on drawn and undrawn balances divided by gross lending. Based on LBG's 2019 *Annual Report*.

Table Ten shows the Stage 1/Stage 2/Stage 3 positions for the Big Five banks. Their Stage 1 loans are £2.1 trillion. Were we to apply the same impairment rates to these as we did with LBG, then the expected losses would rise from £3.3 billion if the loans remained in Stage 1 to almost £74 billion (or over 21% of market cap) if they were moved to Stage 2, and to even more if the Stage 2 loss rate were to increase as well.

Table 10. *Big Five Banks' Loan Breakdown by Stage (£ billion)*

	Stage 1	Stage 2	Stage 3	Total	Market Cap
Size	2,108	189.6	37.8	2,335	140.6
Percentage	90	8	2	100	

In short, the classification of loans into Stage 1 vs Stage 2 under IFRS 9 provides us with another promising source of hidden losses on a large scale.

To quote Jonathan Ford:

> Of course, UK regulators are not blind to these pitfalls [of IFRS 9]. Last week they urged companies to go easy on Covid-related provisioning, having already urged them to take advantage of transitional arrangements, which permit them to shield their regulatory book equity from IFRS 9-related losses, only taking them over several years.[9] There are other

[9] To clarify, in his 'Dear CEO' letter of March 26th, Sam Woods writes: '11. Under IFRS 9, loans are required to be moved from Stage 1 to Stage 2 if and only if they have been the subject of a SICR [significant increase in credit risk]. A SICR occurs when there has been *a significant increase in the risk of a default occurring over the expected life of a financial instrument*. 12. To date payment holidays granted in response to financial difficulty have generally been regarded as *a reliable proxy* for identifying whether a SICR has occurred. We consider that in the case of government-endorsed

> measures designed to defer crystallising provisions, linked to sectors in receipt of relief, or government-backed loans.
>
> But while this might be expedient to deal with the "cliff-edge" problem, the immediate recourse to forbearance is unfortunate. Not least because it defeats the rule's whole original aim.
>
> Remember the "bad" old days when banks used to deal with the difficulty of valuing loans through a process of obfuscation; smoothing their profits almost at will through the use of hidden reserves? Fine-grained accounting rules were devised in the hope of giving greater transparency in the accounts of financial institutions.
>
> There are doubts about the efficacy of this switch, and the propensity of rules-based (and hence gameable) systems to drive out prudence and judgment in the boardroom. But one thing is clear with rulemaking: it can never succeed in enforcing executive accountability if each time there is a crisis, the rule is either waived or withdrawn (Ford, 2020).

He is correct, and in any case, such responses from the regulator do not make the underlying problem (that there could be a lot of losses coming through) go away. Instead, they only hide that problem. Such responses are akin to breaking the thermometer when it gets too hot in the kitchen: 'fair value' valuation is of little use if it is only implemented on a 'fair weather' basis.

There are further problems too. The PRA has no legal authority to interfere in how banks report their statutory balance sheets. To quote Cardale and Buckner in a recent *FT* letter:

> payment holidays (and similar schemes), *the position is different and it should not be assumed that those borrowers that are granted a payment holiday have suffered a SICR*.' (Our emphasis).

> The PRA… is responsible for capital adequacy only, and has no business interfering with the reporting of the statutory balance sheet. Statutory reporting is governed by the True and Fair requirement set out in the Companies Act, and it is the responsibility of company directors and auditors, not the bank, to provide assurance the financial statements meet that requirement, and taken as a whole, are free from material misstatement (Cardale & Buckner, 2020).

In any case, the regulators' retreating at the 'first whiff of grapeshot' by immediately putting further transitionals in place suggests that they have little confidence in their own capital adequacy system *and* subverts the whole point of having any such system in the first place.

8 The Uselessness of Existing Capital Regulation

The bank regulatory capital regime Basel III imposes a bewilderingly complicated set of constraints on minimum required capital ratios, most importantly those based on the ratio of CET1 capital to Risk Weighted Assets. This point made, a significant innovation in Basel III was the introduction of a leverage constraint.

So what is the maximum permitted leverage under Basel III?

The Basel rules on this point as they apply to the UK are set out in the PRA Rulebook:

> **3. Minimum Leverage Ratio**
>
> 3.1
>
> 03/10/2017
>
> A firm must hold sufficient tier 1 capital to maintain, at all times, a minimum leverage ratio of 3.25%.
>
> 3.2
>
> 01/01/2016

> For the purposes of complying with 3.1, at least 75% of the firm's tier 1 capital must consist of common equity tier 1 capital.

The attentive reader will note an entertaining error here. "A firm must *hold … capital …*" We encounter here a good example of the 'hold capital' fallacy that we address below[1] and in the PRA Rulebook of all places. Bank don't 'hold' capital, they issue it. To say that a bank 'holds' capital is to treat capital as an asset to the bank (it is not!) and put it on the wrong side of the balance sheet, which is an elementary mistake. And since banks cannot 'hold' their own capital, this requirement is impossible for them to meet and therefore impossible to enforce. Well done PRA but let's move on.

The Basel III leverage ratio is the ratio of Tier 1 capital to TE and, somewhat confusingly, is the inverse of the leverage, where leverage is measured as TE divided by Tier 1 capital.

Thus, Basel III imposes a maximum leverage level of 1 ÷ by 3.25% equals 30.8, where leverage means TE over Tier 1 capital.

Now Tier 1 capital = Common Equity Tier 1 (CET1) capital plus Additional Tier 1 (AT1) capital, which are capital measures set out in the regulatory rulebooks. The point to note is that AT1 capital includes 'hybrid' instruments known as Contingent Convertible bonds (CoCos), which ought not to be considered as capital instruments at all (Dowd, 2018). CET1 should then be considered a more reliable measure of capital than Tier 1.

Translating into a maximum permitted leverage expressed in terms of CET1 rather than Tier 1 as the denominator, the maximum permitted leverage (=LE/CET1) becomes 48.3. The calculations are set out in Appendix

[1] We provide a more extensive discussion of this fallacy in Appendix 13.

Thirteen. The 48.3 number does not take account of hidden leverage either.

In English, the Basel III capital rules allow banks to maintain remarkably high leverage and still be Basel III-compliant.

You might say that a maximum permitted leverage of 48.3 plus hidden leverage is a loose leverage constraint and we would agree. But here is the punchline: since CET1 capital is a book value regulatory capital measure and Basel III does not impose any constraint on market-value leverage, the maximum permitted market-value leverage under Basel III is theoretically unbounded: Basel III does not impose *any* maximum constraint on market value leverage!

The single most important capital measure that Basel should have addressed is the one it left out.

9 The BoE Position: UK Banks are Strongly Capitalised

Great Capital Rebuild

The BoE's position, repeated many times, is the narrative of the 'Great Capital Rebuild', i.e., that UK banks are now so strongly recapitalised after the trauma of the GFC that they could go through a much worse than GFC event and still emerge in good shape (Dowd, 2017). The following quotes are typical:

> The resilience of the system during the past year in part reflects the consistent build-up of capital resources by banks since the global financial crisis. ... As a result the UK banking system is well placed to provide credit to households and businesses during periods of severe stress.
>
> That conclusion is corroborated by the 2016 stress test ….[1]
>
> This stress is a big, big hit to capital.[2] (Carney, 2016).

[1] Opening remarks by Governor, FSR press conference, November 30th 2016, p.3.

> "The 2019 stress test shows the UK banking system would be resilient to an unprecedented combination of simultaneous recessions in the UK and global economies that are more severe than those during the global financial crisis, large falls in asset prices, and a separate stress of misconduct costs.
>
> All seven major banks and building societies in the test can not only withstand these extreme shocks but also continue to meet the demands for credit from UK households and businesses.
>
> In part, that's because their *capital ratios* [DB/KD: by which he means their CET1/RWA ratios] *are currently over three times higher than they were at the start of the global financial crisis*. Even after stress, their capital ratios would still be more than twice their pre-crisis levels.[3] (Carney, 2016).

Consider the following table.

Table 11. *Big Five Banks' Capital: December 31st 2006 vs December 31st 2019*

Dec 31st 2006	Dec 31st 2019	Increase	% Increase
Book Value Shareholder Capital (£ billion)			
143.2	344.5	+201.3	+ 141%
Market Value (=Market Cap, £ billion)			
360.9	246.0	-114.9	-32%

As of December 31st 2006, the Big Five banks' shareholder equity was £143.2 billion. By December 31st 2019, it was £344.5 billion, an increase of £201.3 billion and a percentage increase of 141%.

Now we could hardly not acknowledge that £344.5 billion is a lot larger than £143 billion, but these numbers are book value and for reasons explained above (and also in Appendix Two), it would be preferable to use market value

[2] Q&A, FSR press conference, November 30th 2016, p. 19.

[3] Opening remarks by the Governor, FSR press conference, December 16th 2019, p. 1.

numbers instead. Looking at the lower line in the Table, market cap was £360.9 billion on December 31st 2006 and fell to £246.0 billion on December 31st 2019, a fall of £114.9 billion and a percentage fall of 32%.

Book value capital rose, but market value capital fell and it's the market value that really counts.

Let's face it: the 'Great Capital Rebuild' isn't there in the data.

CET1 ratio

What about the BoE's capital ratios? The BoE's favourite illustration of the banks' capital rebuild is to present a chart showing the increase in CET1 ratios since the GFC.

Consider Chart B.3 in the Bank's November 2016 *Financial Stability Report*

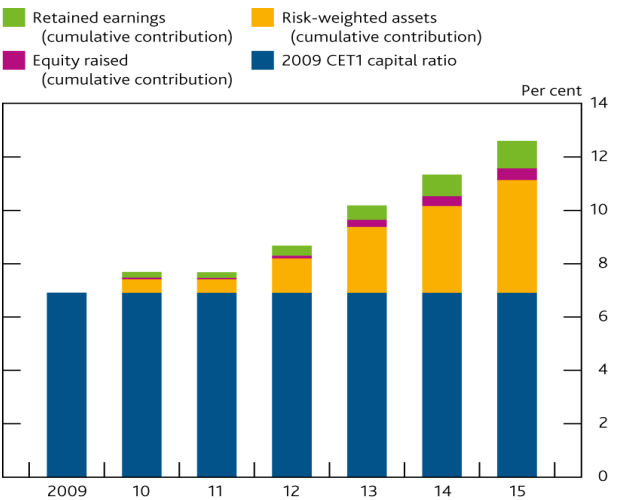

Chart B.3 *Most capital building to date has reflected falls in risk-weighted assets*

Estimated allocation of changes to UK banks' CET1 ratios due to equity raising, retained earnings and RWA reduction[(a)(b)(c)]

Sources: Thomson Reuters Datastream and Bank calculations.

(a) UK banks are Barclays, HSBC, LBG, RBS and Standard Chartered.

(b) Weighted average using market capitalisation.

The title states that "Most capital rebuilding to date has reflected falls in risk-weighted assets" – a delightful piece of duckspeak – and then gives a breakdown of this 'rebuild' in terms of its constituent components. The rebuild it is referring to is not quite what it might seem, however: it refers to the rebuild in the banks' average ratio of CET1 capital to RWA relative to 2009. Now the CET1 ratio was 6.92 percent in 2009 and had risen to 12.61 percent by end-2015. That increase breaks down into 0.45 percentage points in new equity raised, 1.02 percentage points in retained earnings and 4.22 percentage points in reductions in risk-weighted assets. Therefore, only 0.45 + 1.02 = 1.47 percentage points of that increase in the capital ratio represents *actual increases in capital*; the rest merely reflects the decrease in the RWA denominator, which is irrelevant to the actual amount of capital.

The increase in the CET1 ratio from 6.92 percent to 12.61 percent might seem impressive at first sight – an increase of 82 percent – but the actual capital rebuild was only from 6.92 percent to 8.39 percent, an increase of only 21 percent. That, and that alone, is what the chart should have shown.

A big increase in a regulatory capital ratio is one thing, but a big increase in actual capital is quite another. The sin is to pass off the former as the latter.

These tricks are straight out of Darrell Huff's classic *How to Lie with Statistics* (Huff, 1954). The main trick here is known in the trade as the 'semi-attached figure.' To quote:

> If you can't prove what you want to prove, demonstrate something else and pretend that they are the same thing. In the daze that follows the collision of statistics with the human mind, hardly anyone will notice the difference. … There are many forms of counting up something and then reporting it as something else. The general method is to pick two things that sound the same but are not. (Huff, 1954, pp.71, 81).

But going to substance as opposed to (misre)presentation, the Bank is right that the CET1 ratios have considerably increased. By December 2019, they had increased over threefold.

CET1 ratios are unreliable indicators of capital strength, however. The RWA denominator is unreliable, both because it is unsound on principle and because it is highly gameable.[4] The unreliability of the CET1 ratio is confirmed empirically by the poor track record of regulatory capital ratios with RWA denominators: time and again, banks have appeared strong by such ratios and then suddenly defaulted out of the blue. There are many examples during and after the GFC, including banks from the UK and Europe, and virtually the entire Icelandic and Irish banking systems.[5]

The implication is clear: regulators would be wise not to rely on such ratios.

Leverage ratio

Then there is the leverage ratio. The following chart is a reproduction of Chart B.2 from the BoE's November 2016 *Financial Stability Report*:

[4] Appendix 5 explains the unreliability of the RWA measure in more detail.

[5] A fuller treatment of these cases is given in Appendix 14.

9. The BoE Position: UK Banks are Strongly Capitalised

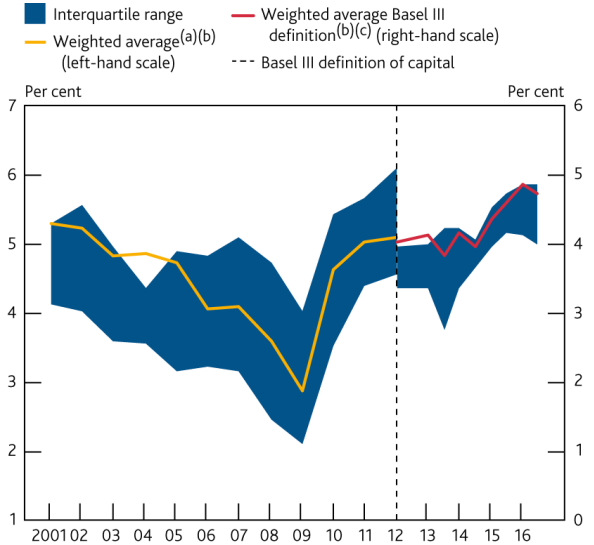

Chart B.2. *Leverage positions have strengthened since the crisis. Major UK banks' leverage ratios*

Sources: PRA regulatory returns, published accounts and Bank calculations.

(a) Prior to 2012, data are based on the simple leverage ratio defined as the ratio of shareholders' claims to total assets based on banks' published accounts (note a discontinuity due to introduction of IFRS accounting standards in 2005, which tends to reduce leverage ratios thereafter). The peer group used in Chart B.1 also applies here.

(b) Weighted by total exposures.

(c) The Basel III leverage ratio corresponds to aggregate peer group Tier 1 capital over aggregate leverage ratio exposure. Up to 2013, Tier 1 capital includes grandfathered capital instruments and the exposure measure is based on the Basel 2010 definition. From 2014 H1, Tier 1 capital excludes grandfathered capital instruments and the exposure measure is based on the Basel 2014 definition.

This chart shows some of the BoE's estimates of UK banks' leverage ratios spanning 2001 to 2016. In essence the BoE uses the chart to show that the leverage ratio in 2016 was higher (in fact, about 25% higher) than it was on the eve of the GFC.

Table Twelve below confirm the increase (here 47%) in the average leverage ratio interpreted as the average ratio of book value capital to total assets.

Table 12. *Big Five Banks' Capital Ratios: December 31st 2006 vs December 31st 2019*

31 Dec 2006	31 Dec 2019	Increase	% Increase
Book Value Shareholder Capital (%)			
4.4%	6.5%	2.1 percentage points	+ 47%
Market Value (=Market Cap, %)			
11.2%	4.7%	-6.5 percentage points	-58%

Note: Denominator is Total Assets.

However, the Table also shows that the average ratio of market value capital to total assets ratio *fell by 58%* over the same period.

Capital requirements '10 times' higher

Another plank in the Great Capital Rebuild fairy story is that minimum bank capital requirements are ten times higher than they were before the GFC. Mark Carney is fond of making this point.[6] To give one example,

> "The largest banks are required to have as much as ten times more of the highest quality capital than before the crisis… (Carney, 2017, his emphasis).

The implicit suggestion is that, since multiplying by ten times is a lot, then Basel III capital requirements should now be considered high.

Even 10 times higher, bank capital standards are still low, in the sense that they still allow high leverage. Using latest average risk weights, we calculate that under Basel II UK banks can operate at a leverage level of almost 35 and still be Basel III compliant. And that is maximum permitted

[6] For more examples and an underlying analysis, see Appendix 15.

leverage in book value terms, let alone in market value terms. Basel III imposes no limit on market value leverage.

The bottom line is that a large *percentage* increase in capital requirements does not represent a large *absolute* increase in capital requirements if the base is low to start with.

And why was the base so low? Because Basel II had imposed *extremely low* minimum capital requirements.

The technical term for the BoE's '10 times' trick is statisticulation:

> "Buy your Christmas presents now and save 100 per cent," says an advertisement. This sounds like an offer worthy of old Santa himself, but it turns out to be merely a confusion of base. The reduction is only fifty per cent. The saving is one hundred percent of the reduced or new price, it is true, but that isn't what the offer says (Huff, 1954).

Correctly interpreted, Carney's '10 times' narrative does not imply that banks now face high capital requirements. It is, instead, a damning indictment of the inadequacy of both Basel II *and* Basel III.

Martin Wolf got it right when he said that Basel III was the mouse that did not roar (Wolf, 2010).

The financial health of the UK banking system not confirmed by the Bank of England's stress tests

The final plank in the 'Great Capital Rebuild' fairy story is that the strength of the UK banking system is confirmed by its stress tests. But how is this even possible? UK banks are weak now, so it is impossible for a set of weak banks to go through a stress that is at least as severe or even multiple times more severe than the GFC and still come out strong. If you weren't smelling too good when you fell into the sewer, how could you come up smelling of roses? The only logical explanation for the UK banks' 'strong' performance in the

BoE's stress tests is poor modelling and more detailed analyses confirm that that is the case (Dowd, 2015; 2016; 2017; 2019; Ferguson, 2016).

The many weaknesses of the BoE's stress tests include: unreasonably demanding pass standards; insufficient numbers of adverse scenarios; reliance on unreliable and gameable metrics such as RWAs and Tier 1 capital; reliance on book value instead of market value numbers; failure to address the PtB issue; the use of loss models that implied (and by a long shot) implausibly low losses that fail basic reality checks; and more. Correct almost any one of these problems and the results of the stress tests start to look a lot different.

The credibility of the stress tests is also undermined by a conflict of objectives. On the one hand, the BoE wants to use the stress tests to investigate the financial resilience of the banking system, but on the other, the BoE has a responsibility to promote confidence in the system. So what would happen if the BoE were to carry out an intellectually defensible stress test that found (and it would) that the banking system was weak? The BoE could hardly publish the results, because doing so would undermine confidence in the banking system and in the BoE's stewardship of it. So when the BoE publishes the results of stress tests, and leaving aside that the modelling is obviously flawed, then the results have all the hallmarks of a Communist election in which the Party always wins, i.e., the stress tests always show that the banking system is strong.

One last point about these tests. A recurrent theme in the BoE's stress test PR is that the BoE's main stress scenario is a lot more severe than the GFC, the point being to emphasise that the stress is *very* severe. Since the GFC was bad, a scenario multiple times more severe is, you might say, Doomsday.

Consider as an example the Bank's statements about its 2016 stress tests. To quote the then Governor, the adverse stress scenario in this set of tests led to "system-wide losses of £44 billion over the first two years of the stress – five times those incurred by the same banks over the two years at the height of the financial crisis."[7]

This statement misled some commentators into thinking that the stress scenario was five times more severe than the GFC, but it wasn't.

Carney's statement implies that the system-wide losses over the two height years of the crisis were less than £44 billion/5 = £8.8 billion. Such an inference is clearly wrong, however: the system-wide losses were vastly greater than that.[8] His £44 billion loss estimate is also inconsistent with the BoE's own estimates that HBOS alone experienced losses of £34.6 billion in 2008-2009 and losses of £52.6 billion in the period 2008-2011 (Bank fo England, 2015). Among the big 4, RBS experienced a loss of £40.7 billion in 2008 alone (Financial Services Authority, 2011). Carney's claim about the losses banks experienced in the crisis is demonstrably wrong.

The trick here is to pass off something (reported net losses, £44 billion) that sounds similar to something else (actual GFC losses, £500 billion plus, over ten times as much).

One cannot really blame the journalists. They have only hours to file their stories and are overwhelmed with stress test gobbledegook (and however well they might be prepared, there seems to be more of it every year), so they look for leads from the BoE and pick up on the 'losses five times worse than GFC' theme – which the BoE helpfully

[7] Governor's remarks, p. 4. Strictly speaking, the £44 billion number is only the net loss, and it might have been more appropriate to have reported the gross loss (£63 billion) instead.

[8] They were in fact about £500 billion and counting. See Appendix 8.

highlighted in its exec summary. And so the Doomsday scenario is born.

So well done BoE. It successfully co-opted the press into promoting its PR line that UK banks could withstand a stress five times more severe than the GFC and still be in good shape.

If only it were true.[9]

[9] The BoE's stress tests are discussed in further detail in Appendix 16.

10 The Bank's Track Record: The Global Financial Crisis Revisited

When assessing the BoE's confident claims about the banking system being strong enough to withstand a crisis more severe than the GFC and still be in good shape, let's not forget how badly the Bank got it wrong the last time round.

As late as July 2007, the Bank had no idea of impending trouble. There were some liquidity problems in the markets, the Court of the Bank was told, but these were not sufficiently serious to warrant any action. The crisis started the next month when hedge funds started to experience their once in a zillion years 25 sigma events.[1]

On September 12th 2007 the Court was told that despite some market turmoil, the Tripartite (BoE, Financial Services Authority, Treasury) System was working well and the banking system was sound. The next day, they were called to an emergency meeting as the BBC announced that

[1] We discuss these further in Appendix 5, footnote 24.

Northern Rock had applied for a rescue. The run on the Rock – the first English bank run since Overend Gurney in 1866 – occurred a day later.

Even after that, the Bank continued to downplay the nature and scale of the crisis: it confidently maintained that there was only a liquidity problem and that the banking system was more than adequately capitalised.

By as late as January 2008, the Bank was *still* reassuring Treasury Committee that the crisis, such as it was, was merely a liquidity one and that there was *no question* of the banks' capital adequacy. As Governor King told the Committee

> I do not believe that in a year's time people will look and say that there was any lasting damage to the British banking system. It is very well capitalised, it is very strong… [Retrieved from, p.291].

The next month, Northern Rock began revealing losses and went from liquidity support to full nationalisation.

However, Northern Rock was relatively minor; it represented less than 1% of the total capitalisation of the UK listed banking system in 2007.[2]

Then came the shock of the Lehman crisis in September 2008. That was swiftly dealt with and a month later, the Bank gave itself a well-deserved pat on the back: "there was now a real sense that a corner had been turned and the bank could be proud of its work," the minutes reveal.[3]

Except that the BoE had got it wrong again.

By 2009, 30% of the UK listed banking system had failed and most of the rest were on state support.

[2] See Local Authority Pension Fund Forum, *UK and Irish Banks Capital Losses - Post-Mortem*, p.5.

[3] After all that, the Bank – which never ceases to remind us of its openness, transparency and accountability – fought the Treasury Committee for years to prevent the publication of the Court's minutes.

The losses incurred by the banks from the GFC (and bear in mind that many of these losses took a long time to be revealed, and it appears that some still haven't been) were perhaps £500 billion[4] and still counting. Estimates of the banks' GFC losses vary from at least 139% to at least 349% of their starting capital, depending mainly on how one estimates the latter. The banks' GFC losses more than wiped out the capital of the UK banking system and arguably over three times over.

What most people failed to appreciate at the time was that a liquidity problem (the inability to obtain or renew creditor funding) is often a consequence of well-founded suspicions that the banks could be harbouring hidden losses aka a capital problem.

In June 2011, Governor King at last confirmed that the crisis was not a liquidity crisis, but was, and always had been, a capital (or solvency) crisis:

> Right through this crisis from the very beginning... an awful lot of people wanted to believe that it was a crisis of liquidity," Sir Mervyn said. "It wasn't, it isn't. And until we accept that, we will never find an answer to it. It was a crisis based on solvency... initially financial institutions and now sovereigns (LAPPF, 2011).

As Tim Bush observed:

> It is perhaps an indictment of conflicts of interest in the financial (and regulatory) system that the obvious takes four years to emerge as the true reason for something, when capital markets (equity, debt and money markets) had intuitively deduced the problem in 2007 and reacted accordingly. For a banking crisis to have been confused for four years as a "liquidity"

[4] We thank James Ferguson for the £500 billion number, which is his estimate of the big five banks' losses from June 2007 to June 2017. Appendix 8 gives more details on the losses the banks experienced from the GFC.

> rather than a capital crisis is not an insignificant matter, given that many policy decisions will have been made on a false diagnosis.
>
> Because the banking crisis was in truth a capital crisis, there has to have been a systemic failure in the capital adequacy regime, making what was, in truth, capital consumption appear like capital generation (LAPPF, 2011).

In short: (a) the BoE's crystal ball completely failed to see the crisis coming, despite market signals that something was amiss; then, when the crisis did come, (b) the BoE persistently misdiagnosed the true nature of the crisis as being a liquidity crisis (which is not a big deal) rather than the capital or solvency crisis that it was (which is a real big deal), despite the fact that markets had been signalling capital problems since 2007; and (c) the scale of the losses overwhelmed the UK banking system and blew the UK's fragile regulatory capital framework out of the water.

Two further lessons to be learned from the GFC are that we should use market cap as our metric (not the accounting or regulatory book value numbers!), because market cap numbers gave the best signals of impending trouble, and that banks then, though better capitalised than banks now, were far from being adequately capitalised going into the GFC.

Fast forward to the present, markets are again signalling major problems and the Bank of England is again insisting, against the evidence, that all is well. As Sam Woods reiterated to the Treasury Committee on Wednesday April 15th, "We go into this with a well capitalized banking sector."

Cue Yogi Berra: "It's like déjà vu all over again."

11 The Political Economy of Bank Capital

It is helpful at this point to consider the big picture, the underlying political economy of bank capital. In a *laissez faire* world with no central bank and no financial regulation, banks would sink or swim with no expectation of being bailed out by the state or its agencies if they get themselves into difficulties.

Enter central banks and regulators, who set up lender of last resort facilities, deposit insurance and such like, and associated expectations of bailout. The bankers respond to these incentives by increasing their leverage and taking more risks to boost their returns on equity, which are the basis of bank CEOs' remuneration. High leverage seeks to maximise the value of the (often implicit) central bank or government guarantees by letting banks borrow at rates subsidised by society at large, thereby privatising profits on the upside and socialising losses on the downside. The bankers' social contract is not a good one for everyone else, however. The central bank huffs and puffs that banks should not take excessive risks and threaten to let them fail, but the bankers

see through these empty threats and call their bluff, knowing that in a crisis, central bankers will bail them out for fear that not doing so might collapse the financial system. Round One to the bankers.

The central bankers' respond with capital adequacy regulation, the aim of which is to impose an upper limit on leverage. The industry responds with calls for greater 'risk-sensitivity' in the system. Greater risk sensitivity seems like a good idea and the regulators buy into it on 'appliance of science' grounds greased by plenty of revolving doors, first with the Market Risk Amendment to the original Basel Accord, now known as Basel I, in 1996, and then with the Basel II project, which took nearly a decade to complete. The hallmark of Basel II was the use of credit risk models to determine banks' capital requirements for credit-risky positions. The bankers then use their credit risk models to obtain much lower capital requirements and boost their leverage, and so defeat the whole purpose of the Basel system. Round Two to the bankers.

Basel II is then rolled out to great fanfare, the GFC hits shortly afterwards and it became clear (admittedly, earlier to some than to others) that Basel II had allowed banks to be woefully under-capitalised.

One of the main problems of Basel II was its complexity. Complexity produces gameability and the big banks, being heavily involved in the drafting of the Basel II rulebook, had ensured that there was plenty of it. The complexity of the system was key to its ineffectiveness and you might say this complexity was not so much a flaw as a design feature, at least from the bankers' point of view: Basel II offered almost unlimited scope for arbitrage. Basel I was 30 pages long and had only 5 risk weights, Basel II was 347 pages long, an order of magnitude longer than Basel II, and a big bank operating under Basel II might easily have several million parameters to calibrate (Haldane & Madouros, 2012). Then

Basel III was pushed out in an unholy rush in 2010, weighing in at 616 pages, nearly twice the length of Basel II, and experts were anticipating that the eventual rulebook might run to over 60,000 pages (Haldane & Madouros, 2012). More of the same that didn't work before is rarely the right answer. Round Three to the bankers.

The banks promoting *higher* leverage means the banks promoting *excessive* leverage, and excessive leverage periodically crashes the financial system, leading to one disaster after another and repeated taxpayer bailouts, each bigger than the last, until eventually the public refuse to put up with it any longer.

The remuneration received by the bankers for taking the excessive risks that led to the crisis was but a small fraction of the banks' subsequent losses which was in turn but a small fraction of the damage inflicted on the economy.[1] So huge damage is being inflicted on the economy so that bankers can extract relatively small rents from it. The bankers have become the new unions.

[1] Consider the following. (a) We can estimate this remuneration as the size of the subsidy that banks receive by virtue of taxpayers being expected to bail them out when their risk-taking goes wrong. To estimate this subsidy, Haldane (2011) outlines an approach that estimates the value to banks of the difference between typical credit agency ratings, the first of which takes into account likely government support, and the second of which does not. Based on this (admittedly rough) methodology, he estimates the annual risk-taking subsidy to UK banks to be about £59 billion over 2007-2009, and to be almost twice that for 2009 alone. So the subsidy is roughly on a par with their reported annual profits. (b) Bank losses from the GFC were at least £500 billion. (c) Haldane (2011, p. 4) reports GFC-related output losses for the UK of between £1.4 trillion and £7.4 trillion. The first and third of these estimates should be regarded as very rough, but it is reasonable to consider them as giving respective orders of magnitude. See A.G. Haldane, "The $100 billion dollar question," speech given to the Institute of Regulation & Risk, Hong Kong, March 30th 2010.

It is, accordingly, imperative for those with the public interest at heart to appreciate the game that the banking lobby has been playing so successfully against the public, who are repeatedly called on to bail the bankers out.

If the bankers were to pursue their socially destructive high leverage agenda out in the open, where everyone could see it for what it is – that the bankers make a lot of profits for themselves in the good times, and the public bail them out in the bad – then it would be harder for them to get away with it: there would be a public outcry and politicians would be under enormous pressure to put a stop to it. The bankers therefore need some cover story to give them a fig leaf of respectability, the objective being to make high leverage seem reasonable, and even desirable.

This is where the 'hold capital' fallacy – the claim that banks 'hold' capital – comes in. This fallacy feeds into the widespread misperception, promoted both by the banking industry and by the BoE, that high capital requirements are somehow a constraint on bank lending. "Of course we know that excessive debt is a bad thing," they say, as if excessive leverage was anything but that, "but if we have to hold more capital, then lending and unemployment will be badly affected, and no one wants that."

The bankers' pitch *sounds* right, but it isn't.

To quote Admati:

> If capital is falsely thought of as idle cash, the discussion of capital regulation is immediately derailed by imaginary trade-offs. Nonsensical claims that increased capital requirements prevent banks from making loans and 'keep billions out of the economy' may resonate with media, politicians and the public just because the jargon is misunderstood. In light of this confusion and its ability to muddle the debate, it is disturbing that regulators and academics, who should know better, routinely collaborate with the industry to obscure the issues by using the

> misleading language and failing to challenge false statements. If, instead, the language that is used focused attention properly on funding and indebtedness, the debate would be elevated and more people would be able to understand the issues. (Admati, 2016).

And again:

> This is not a silly quibble about words. The language confusion creates mental confusion about what capital does and does not do. This confusion helps bankers, because it creates the false impression that [more] capital is costly and that bankers should strive to have as little of it as regulators will allow.
>
> For society, there are in fact significant benefits and essentially no cost from much higher capital requirements (Admati & Hellwig, 2013, p.98).

It is, then, unhelpful when the regulator, who should be holding the fort on the public's behalf, buys into the industry PR campaign with statements like this one:

> The FPC was concerned that banks could respond to these developments by *hoarding capital and restricting lending*. (Carney, 2016, our emphasis).

When the regulator itself promotes industry PR instead of debunking it, then we should not expect the regulator to be effective. In truth, the regulator has long since been captured by the industry and the regulator's dismal performance, while shocking, is only to be expected. The bank capital regulatory system is broken and it will take a lot more than any Basels IV, V or VI to put it right. At some point, there will need to be radical reform to reverse the ever more destructive banksterisation of the economy and re-establish a Social Contract in which the bankers serve the public and not the other way round.

12 Conclusions

We asked earlier (p.7) whether the UK banking system has the financial resilience it needs to withstand a major shock and still emerge in good shape.

The BoE gives a reassuring upbeat answer, essentially the 'Great Capital Rebuild,' the merits of which we have discussed at some length.

In his final remarks as Governor, Mark Carney reiterated much the same message:

> Some watching will recall the financial crisis a little more than a decade ago. Then, the financial system was the core of the problem. Now, it can be part of the solution.
>
> Over the past decade, the UK financial system has been transformed. We didn't build this strength for its own sake.
>
> This is prudence with a purpose.
>
> Resilience with a reason.[1]

We hope he is right.

[1] "Opening statement by the Governor and Andrew Bailey," Bank of England press conference, March 11th 2020, p. 5.

Our concern, however, is that the evidence points the other way.

Using the latest available figures, the Big Five UK banks have an average price-to-book ratio of 39.2%, an average market cap to total asset ratio of 2.3% and an implied leverage of 43.3. These are not healthy metrics. The PtB ratio for a healthy banking system is well over 100%. The average capital ratio is far below the minimum values recommended by many experts, and the leverage is far above any accepted reasonable safe level. And these numbers ignore the hidden leverage, hidden losses and other problems in banks' books, and there appear to be plenty of those too.

UK banks are not only in poor shape, but they are also in considerably worse shape now than they were going into the GFC. Taking the end of December 2006 as a yardstick, their average PtB ratio then was 255% and has since fallen by 212 percentage points, their average capital ratio has nearly halved and their average leverage has close to doubled. Remember too that insufficient capital (or if you prefer, excessive leverage) was rightly blamed as a major contributor to the severity of the GFC.

By these metrics the BoE's medicine has not only failed to restore the patient to health, but has left the patient in worse shape than before. It stands to reason that even a milder version of the earlier ailment would be enough to land the patient back in ICU.

Look at it this way. The UK banks' capital in market value terms is now a mere £140.6 billion, but the Big Five banks' losses from the GFC were likely over £500 billion, well over three and a half times as much as their current market cap. Therefore, a GFC repeat that inflicted similar losses on the banks would wipe out their capital more than three and a half times over. UK banks are not nearly sufficiently capitalised to withstand a shock on anything close to the same scale as they experienced then and still emerge solvent,

let alone in good shape and able to operate normally. Or, to put the argument the other way round, a shock mild enough to inflict a loss of £140.6 billion on the banks would be enough to wipe out their capital. UK banks might be able to withstand a mild cold, but nothing more severe.

The projections being made suggest that the economic impact of the COVID-19 shock is much worse than the economic equivalent of a cold, however. The OBR projected a 35% fall in real GDP in the second quarter of 2020, a crash on a scale not seen in this country since the early 18th century, with an overall fall of almost 13% over the year, and that was on the optimistic assumption that the economy would quickly recover.[2] Other respected figures suggest worse scenarios:

> "The best-case scenario would be a downturn that is more severe than the GFC (in terms of reduced cumulative global output) but shorter-lived…" (Roubini, 2020).
>
> "We anticipate the worst economic fallout since the Great Depression…" (IMF head Kristalina Georgieva, 2020).
>
> "Forget 'recession': this is a depression. Although UK data lags behind the US, the evidence is mounting coronavirus makes 2008 look trivial" (Blanchflower & Bell, 2020).

Does the UK banking system have the resilience it needs to face the downturn and still be in good shape? It would appear not, but we shall soon find out.

Given the fragility of the UK banking system and the severity of the crisis now engulfing it, a new round of bank bailouts would seem inevitable. We are already seeing the early signs of that in terms of increased forbearance and plans afoot to reduce capital requirements.

[2] Office for Budget Responsibility, "Coronavirus analysis." [Retrieved from]. April 14th 2020.

Naturally, it would be unfair to criticise the BoE for failing to anticipate the COVID-19 crisis. Yes, we knew that a new pandemic was inevitable but no one could anticipate when it would strike or how severe it might be, and it is a basic proposition of financial economics, and no criticism of central banks, that they can't see shocks coming. To go back to the Vickers quote with which we started:

> *Failure to anticipate systemic fragility in the face of such shocks is an altogether different matter. … Banks' capital adequacy is a cornerstone of our economic system*." (Our emphasis)

It *is* reasonable to criticise the regulator for leaving the system frail when its mandate was to ensure systemic robustness. A more serious regulatory failure is difficult to imagine, and it's not as if we haven't all seen this movie before. The BoE's stewardship of the banking system has turned out to be a disaster, again.

Credible experts have been warning the BoE for years that the UK banking system was far from being adequately capitalised. But instead of taking measures to ensure banks raised *actual capital levels*, the BoE focussed on raising *regulatory capital ratios* and those are not the same thing. In effect, the BoE took the easy way out, window dressing instead of fixing the under-capitalisation problem, let alone tackling its underlying causes, that is, the multiple incentives to excessive bank risk-taking that the BoE and its overseas counterparts were largely responsible for creating in the first place.

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Appendices

A1. A Primer on Bank Capital

This Appendix sets out a primer on bank capital

Equity Capital (aka shareholder equity) is defined as the difference, if positive, between the estimated value of all assets held by the firm, and the estimated value total non-equity capital issued by the firm. It is broadly equivalent to the sum of called-up share capital, share premium (the difference between the par value of a company's shares and the total amount a company received for shares recently issued), capital redemption reserve (a statutory, non-distributable reserve following the purchase of a company's own shares, see section 733, Companies Act 2006), and retained earnings (net income left over after the firm has paid out dividends to shareholders).[1]

The key points are these: (1) a bank *issues* liabilities and it *holds* assets; (2) a bank's liabilities are a source of funding and include equity capital issued to shareholders; therefore (3) equity capital is a source of finance to the issuing bank; (4) a bank's assets are a source of income to the bank and include, e.g., bank loans; and (5) a bank's equity or shares are held by shareholders and are an asset to them, because they provide a source of income to them (i.e., dividends).

It is important to avoid the commonly held 'holds capital' fallacy, which maintains that capital is an asset that the bank 'holds.' Equity capital is a liability or source of finance to the issuing bank, *not* an asset that the bank '*holds*.' Therefore, it is not and cannot be treated as a sum of money *held* in reserve by a bank, like a liquidity fund or a rainy day fund. We address this fallacy in more detail in Appendix 12.

Loss Absorbency is a property of ***Equity Capital*** which follows from its definition as the difference between the estimated values

[1] Equity capital is not to be confused with **Share Capital**, which is a specific amount (of cash) raised by a company on date when it issues shares, and is in that respect a reserve like a pot or fund. Share capital is generally irrelevant to the issue of **Capital Adequacy**.

of its assets and its non-equity liabilities.[2] A bank's liabilities can be broken down into debt liabilities and equity liabilities. The former are fixed in value because the bank owes their holders a contractually fixed amount. The assets fluctuate in value. Because the bank's balance sheet has to balance (i.e., because total liabilities must equal total assets), then changes in the value of assets are reflected pari passu by changes in the value of the bank's liabilities. If the value of assets goes up, then the value of the equity capital goes up. If the value of the assets goes down, then the value of the equity capital goes down. So it is equity capital that absorbs losses, up to the point where the equity is entirely wiped out. Beyond that point, the losses are borne by creditors. But until the point where losses on the bank's assets wipe out its equity capital, it is its equity capital alone that absorbs losses.

There are three ways of estimating the value of equity capital: **Market Capital**, **Book Value** and various measures of **Regulatory Capital**. None is perfect.

Market Capitalisation (or market cap for short) is the number of shares outstanding multiplied by the currently prevailing share price. The main advantages of market cap are that it (a) gives the market's view of what a bank is worth from the perspective of an investor, the interpretation of which is underpinned by the Efficient Market Hypothesis, i.e., the idea that market prices reflect available information; (b) is more timely and based on later information than is provided by book value estimates. The main disadvantage of market cap is that it can be excessively volatile due to its being dependent on the psychology of 'shareholder sentiment.'

[2] There is a linguistic confusion here in that 'liability' is often used to refer to any liability that is not equity, but that is a linguistic issue only. Clearly if net assets were the value of all assets minus the value of all liabilities, then net assets would always be zero, at least on the assumption that 'balance sheet' means what it suggests. Such a definition of liability is not especially helpful here, however. Hence we define 'liabilities' as all items on the opposite side of the balance sheet to assets.

Book Value equity capital is the value reported in a bank's periodic financial statements (e.g., its annual report and interim financial statements). Book value is estimated by accountants using recognised standards such as IFRS or GAAP. The main advantage of book equity is that it is less volatile than its market cap. Its main disadvantages are its proneness to manipulation (e.g., in Level 3 'fair value' valuations; more on that in the main text and in Appendix 10n) and its lack of timeliness.

Regulatory Capital Measures include **Common Equity Tier 1 Capital, Additional Tier 1 Capital** and **Tier 1 Capital**.

Common Equity Tier 1 Capital (CET1) is defined by the PR as [including] "paid-up capital and its associated share premium accounts, retained earnings, accumulated other comprehensive income, other reserves, and funds for general banking risk. CET1 capital must be available to the institution for unrestricted and immediate use to cover risks or losses as soon as these occur."[3] This slightly long-winded definition approximates the traditional notion of common equity as the value of common shares, retained earnings, additional paid-in capital and related bits n' pieces. In essence, however, CET1 includes only perpetual capital instruments whose dividend payments are fully discretionary.

Additional Tier 1 Capital (AT1) capital includes perpetual subordinated debt instruments, which must have conversion or write-down features. Contingent convertible or 'CoCo' bonds are the most common type of AT1 instrument.

Tier 1 Capital is the sum of CET1 and AT1. Under the Basel bank capital regulatory system, Tier 1 capital is supposed to give an estimate of a bank's loss absorption capacity whilst remaining a going concern.

There are three **'Exposure'** or **'Total Amount at Risk'** measures. The first is **Total Assets (TA)**, discussed in the main text and

[3] [Retrieved from].

further in **Appendices 5** and 6), which is the bank's total assets as set out in its financial statements. Then there are two regulatory exposure exposures, the **Risk-Weighted Assets (RWA)** measure and the **Leverage Exposure (LE)** measure, which the PRA now refers to as the **Total Exposure**. All three of these measures are discussed in the main text and further in Appendices Five and Six),

The **Capital Ratio** is the ratio of equity capital to some 'amount at risk' or exposure measure. We are interested in three main capital ratios. These are the **Market-Based Capital Ratio**, the ratio of market cap to TA, and two main regulatory capital ratios (but there are a number of others!), i.e., the **CET1 ratio**, the ratio of CET1 capital to RWA, and the **Tier 1 Leverage Ratio**, the ratio of Tier 1 capital to LETE.

Capital Adequacy is a view on whether a bank's equity capital is sufficiently high to conclude that the risk of insolvency is acceptably low. For present purposes, we interpret capital adequacy in terms of the bank's capital ratio, the ratio of its equity capital to some estimate of its total amount 'at risk.' A bank is deemed to be capital adequate if its capital ratio equals or exceeds some recommended threshold or regulatory required minimum.

For our preferred market-based capital ratio, the ratio of market cap to total assets, we would recommend the **Admati Standard** i.e., at least 15%. In that case, a bank would be considered capital adequate if its ratio of market cap to total assets is at least 15%.[4]

The two main regulatory minimum capital requirements are those that apply to the CET1 ratio and the Tier 1 Leverage Ratio. Under Basel III as has been transposed into UK law, the minimum required CET1 ratio is 4.5% and the minimum required Tier 1 Leverage Ratio is 3.25%.[5]

[4] Admati *et al.*, 2010.

[5] There are also other capital measures including Tier 2 capital, which equals Tier 1 plus certain subordinated capital instruments, and Total Capital, which is the sum of Tier 1 capital and Tier 2 capital, with their associated minimum requirements (of 6% and 8%) respectively. For more details see [Retrieved from]. In addition there are various buffers:

Solvency/Insolvency: A bank is considered legally solvent when it is able to meet its obligations as they are due and payable; it is otherwise legally insolvent.

Technical Solvency/Technical Insolvency: A bank is considered to be technically solvent if the value of its equity capital is greater than or equal to zero, and is otherwise considered to be technically insolvent.

the capital conservation buffer (CCB), the countercyclical capital buffer (CCyB), the systemic risk buffer (SRB) and the global systemically important institution buffer (G-SII buffer), Pillar 1, Pillar 2A, Pillar 2B, PRA buffers vs. CRD IV buffers, buffers for the CET1 ratio and buffers for the leverage ratio, and we have the Basel III leverage ratio vs. CRD IV leverage ratio vs the leverage ratio now used by the BoE, and much else besides. The system might not work, but it sure is complicated.

A2. Market Values vs. Book Values

Book values are those reported for accounting purposes in banks' annual reports and interim financial statements. Or as a former City analyst explained to one of us, "book values are the values that the accountants made up. When I was working in the City, we never paid any attention to them." Market values are those given or implied in market prices, e.g., stock prices.

So which is better?

Arguments for Market Values

The answer is that there should be a presumption in favour of market values especially when market values are lower than book values, and more so in a prudential context where it is the downside (i.e., what might go wrong) that we are concerned about.

Suppose that a bank has an asset with a specified book value, e.g., a branch office or a financial asset, and the bank wishes to sell that asset. In these circumstances, the book value is irrelevant and what matters is what it can get for the asset, i.e., the market value. Similarly, suppose a bank wishes to issue shares and to make the example concrete, suppose that the book value of the share is £1 but the market value is 50p. If the bank issues a new share, then it gets no more than 50p for it and the book value is irrelevant. More generally, when it comes to buying or selling an asset, the book value is usually irrelevant and it is the market value that matters.

It is often also the case market values are to be preferred because they are more timely and more informative. From this perspective, one might go as far as to say that as a general though not universal rule,[6] market values are more appropriate because market values

[6] However, there are occasions where book values might be more convenient. For example, suppose a financial institution holds a AAA-rated bond that it intends to hold to maturity. The price of this bond will fluctuate from day to day in response in changes in interest rates, but as

reflect information not in the book values, such as the impact of news or market participants' perceptions of problems that are not reflected in the book values. Most financial economists would agree with this claim. Whilst not all subscribe to the strong-form Efficient Markets Hypothesis (EMH) belief that share prices are *fully* informative, it is also true that few subscribe to the polar opposite extreme and claim that share prices are completely *un*informative.

Objections to Market Values

Objections to the Efficient Markets Hypothesis

These considerations undermine an objection sometimes made against the use of market values: namely, that a belief in the informativeness of market values presupposes a belief in strong-form EMH. This objection is a straw man, however. Skepticism about strong-form EMH does not imply that market values or share prices must be totally uninformative. Weaker forms of EMH have merit.

Excessive volatility

A second concern about market values is that there are circumstances in which market values – including bank share prices – can fluctuate excessively. This concern is a valid one. Banks' market values were clearly too high in the run-up to the GFC and they can undershoot in the heat of a crisis. For example, the UK merchant bank Hill Samuel experienced a period of excessively low share prices in the highly volatile environment after the Herstatt Bank failure in 1974. At one point, its market value fell to about a quarter of its par value before bouncing back.

far as the financial institution is concerned, these short-term fluctuations are noise, as the stream of payments promised by the bond is (more or less) known, assuming no big adverse credit shock. In such circumstances, it might be more convenient for the bank to value the bond using some accrual, i.e., book-value, method – unless it might become necessary to consider selling the bond, in which case we are back to market values.

Hill Samuel was a sound bank that was caught up in a storm, but it does not follow that any bank experiencing a low share price is another Hill Samuel. Some banks experience low share prices for good reason: because the market correctly perceives them to be at risk of insolvency, and we address such cases a little further below.

Forecast performance: market values vs book values

Another objection to the use of market values was made by Alex Brazier in his evidence to the Treasury Committee on January 11th 2017:

> …if you had [relied on market cap values] before the crisis, you would have been led completely astray… You would have been led to the conclusion that the British banking system was remarkably resilient, and, as forecasting errors go, that would have been quite a good one (Treasury Committee, 2017).

Andrew Bailey made the same point in his opening remarks to the Committee on May 20th this year:

> had you done a stress test in the run-up the financial crisis on the market value, you would have been doing it on the market values that were trading well in excess of book values, so … that would of course have severely misled you. You would have concluded *there was no problem and you would obviously have been badly wrong*. (Our emphasis)

It's an important point, but it is wrong.

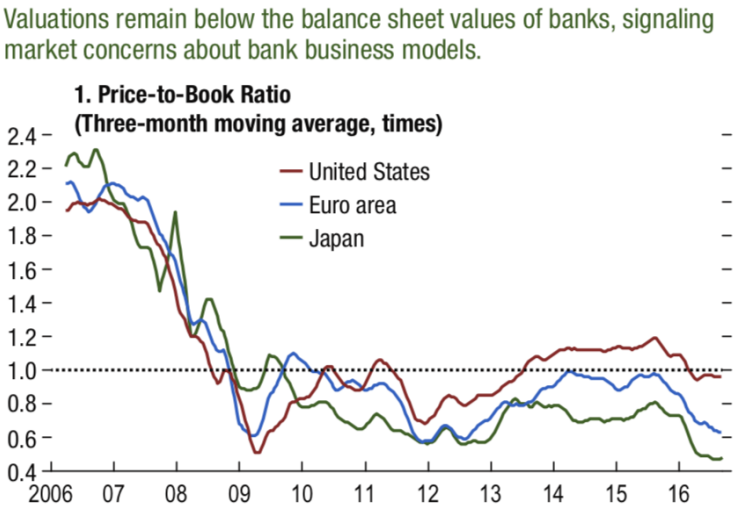
It's a shame that none of the MPs challenged it.

Now we can well believe that a BoE stress test would have missed the impending problems in the run up to the last crisis, but the fact is that the markets did not.

Let's look at the evidence.

Exhibit 1 is the following chart, which shows how the PtB ratios of international banks fell the before crisis.

Price-to-Book Ratios of Banks Internationally

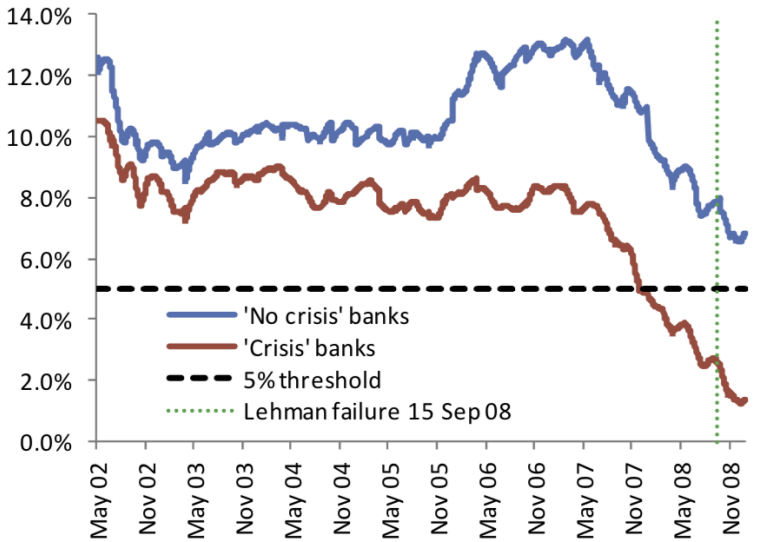


Source: IMF (2016). Figure 1.11, panel 1.

The PtB ratios for UK banks are similar. Market values and PtB ratios started falling sharply in April 2007, well before the GFC.

Then consider the next chart, which shows the ratios of market capitalisation to the book value of assets for two sets of international banks, the "crisis" ones that failed, required assistance or were taken over in distressed conditions, and the "non-crisis" ones that weathered the storm.

Market Capitalisation to Book-Value of Assets[(a),(b)]



Notes to Chart:

(a) "Crisis" banks are a set of major financial institutions which in autumn 2008 either failed, required government capital or were taken over in distressed circumstances. These are RBS, HBOS, Lloyds TSB, Bradford & Bingley, Alliance & Leicester, Citigroup, Washington Mutual, Wachovia, Merrill Lynch, Freddie Mac, Fannie Mae, Goldman Sachs, ING Group, Dexia and Commerzbank. The chart shows a 30-day moving average of market capitalisation.

(b) The "no crisis" institutions are HSBC, Barclays, Wells Fargo, JP Morgan, Santander, BNP Paribas, Deutsche Bank, Crédit Agricole, Société Générale, BBVA, Banco Popular, Banco Sabadell, Unicredit, Banca Popolare di Milano, Royal Bank of Canada, National Australia Bank, Commonwealth Bank of Australia and ANZ Banking Group. The chart shows an unweighted average for those banks in the sample for which data are available on the given day.

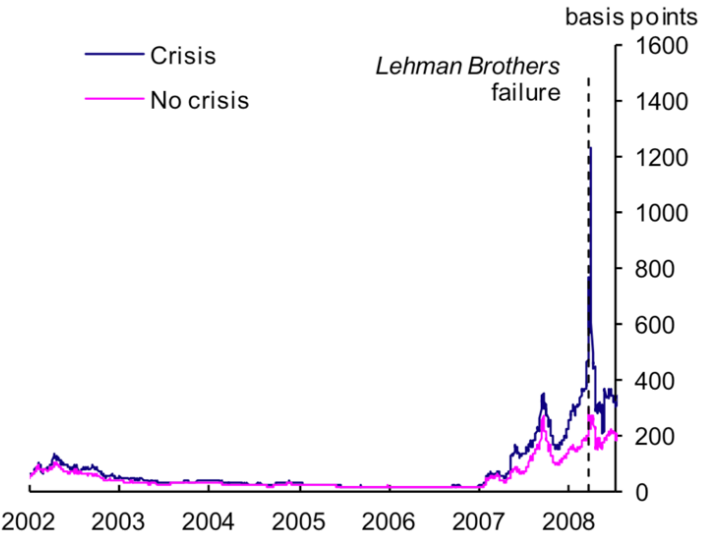
Source: Haldane, (2011). Chart 8.

It is, thus, clear that markets were signalling problems with the banks and they correctly identified the weakest banks too. In the

UK case, they also correctly identified in advance the two biggest UK problem banks, HBOS and RBS.[7]

CDS premia were also signalling problems in advance. The following chart plots CDS premia for a sample of 33 large international banks over the period 2002 to 2011. The sample is again partitioned into "crisis" and "no crisis" banks:

CDS Premia for "Crisis" and "No Crisis" Banks



Source: Haldane, (2011). Based on Thomson Reuters Datastream and Bank calculations.

From early 2007 on the spreads of the "crisis" banks start to rise above those of the "no crisis" banks and in the run-up to the Lehman crisis the former were sending much stronger signals than the latter.

As Jonathan Ford put it to one of us:

> Look at the crisis. Market values started sliding in April 2007, 18 months before Lehman collapsed. If you relied on accounting values, many of the doomed banks were still solvent at the end of 2008![8]

[7] See also, e.g., Chart 2.73 on p.153 of the FCA/PRA report *The Failure of HBOS plc*.

[8] Email from Jonathan Ford to Dean Buckner, December 4th, 2018.

In the case of HBOS, markets were signalling problems in March 2008. "Stock market speculators nearly brought down HBOS that month, the bank's head of risk at the time has told a parliamentary hearing. Peter Hickman, group risk director of HBOS in 2007-8, said assurances from the Financial Services Authority over rumours of the bank being in trouble helped to restore confidence. Referring to 20 March 2008, when the bank's shares plunged almost 20%, Hickman said there appeared to have been a "deliberate attempt" by short-sellers – who sell shares they do not own in the hope of making a profit from buying them back at lower prices – to spread rumours about the bank being in financial difficulty." Or to put it another way, the bank was in difficulty and the markets correctly signalled that fact, and then the regulators wanted to prosecute them for it.[9]

Exhibit 4 is a quote from a careful analysis of this issue by the Bank's chief economist:

> *market-based measures of capital offered clear advance signals of impending distress*. …Replacing the book value of capital with its market value lowers errors by a half, often much more. Market values provide both fewer false positives and more reliable advance warnings of future banking distress.
>
> …market-based solvency metrics perform creditably against first principles: they appear to offer the potential for simple, timely and robust control of a complex financial web (Haldane, 2011).

So market values *did* signal impending problems and that should be the end of the matter.

Mssrs. Bailey and Brazier also omit to mention that the Bank was relying on Basel regulatory balance sheet values that completely missed the impending meltdown and they do not offer any alternative that would have worked better. The same applies to the Bank's crystal ball. Not only did the Bank itself have no inkling of the impending crisis before it hit, but in the early stages of the GFC and as late as January 2008, the Bank was *still* reassuring us that there was little to worry about and that the UK banking system was more than adequately capitalised. To quote Governor King at that time:

[9] [Retrieved from].

> I do not believe that in a year's time people will look and say that there was any lasting damage to the British banking system. It is very well capitalised, it is very strong… (s.291).

As forecasting errors go, that is quite a good one too.

Vickers on market versus book values

John Vickers also raises some good points on this issue:

> The regulation of banks is based on accounting measures of capital. A major source of risk to financial stability is that capital is mis-measured by the accounting standards used in regulation. In that case, bank regulation that allows high (e.g. 25 times) leverage relative to accounting (or 'book') measures of capital is more fragile than may appear.
>
> An instance of this point is that stress tests based on book values are themselves vulnerable to erroneous measurement of capital, because those measurements are their starting point. Furthermore, bank regulation nowadays counts convertible debt instruments such as CoCos as akin to equity capital, but the conditions in which they convert to common equity (or are written down) are also dependent on accounting measures of capital. In short, a lot is riding on book values being reasonably accurate…
>
> None of this is to say that markets necessarily value assets accurately. Rather, the point is that low price-to-book ratios, especially when below one, signal a serious possibility that book values are inaccurate, and hence that the basis for regulation (not just in stress tests) is open to question (Vickers, 2017).

Market values are not always reliable, but when [market values] are low, systematic attention should be paid to them, and transparently so. (Vickers, 2017) (Our emphasis).

A non-EMH defence of market values

We can predict eclipses, the reaction of hydrogen and oxygen to a flame, the acceleration due to gravity and so forth, but science hasn't found a way to predict the path of market prices. The problem is that the market price of an asset *itself* involves a forecast, by the market, of future cashflows, so in trying to predict where the market will be in a year's time, we are trying to forecast a forecast. Instead of trying to predict the result of the next

election, it is like trying to predict what the *Times* will predict it to be. Good luck on that.

Also, either the market price is the best forecast, or it is not. If the former, we can't improve on it. If the latter, we have to forecast what the bad forecast will be in a year's time. But which bad forecast do we choose and how we select it?

To go to the heart of the matter, we can be pretty confident *that* the market price will change all the time, but the problem is that we don't know *how* the market price will change from one time to the next. The market valuation might not be very good, but it's the best we have.

Even if we had perfect foresight, such as God might have, we would still have no leave to mark the value of an asset to anything other than the current market price. It may be that the market is in some sense 'wrong'. It is, in any case, certainly changing all the time. Even so, if we mark an asset on a firm's books at higher than the market on the grounds that we have perfect foresight, or better judgment than the market, then we are defrauding *prospective* shareholders of the firm, because they would pay more for shares than they would have paid had we marked the shares to market. If we mark the value at lower than the market price, because our flawless judgment values it at less, then we are defrauding *existing* shareholders, because their shares would be valued at less than they would have been had we marked the shares to market. If God were an accountant, He would not value an asset differently from its market value, despite being omniscient, for God is also Perfectly Good and would not get involved in false accounting.

Well clearly, if even God would not superimpose His Judgement over that of the market, then there isn't much of a case for anyone else to superimpose his or her judgement over that of the market either.

The last word

We leave the last word on the subject to former Fed legal official Walker Todd:

> From time of Abraham to 1938 in the USA and the traditions that preceded it, banks were supposed to keep their books using market-value accounting. The Finance

> textbooks say that market value is, after all, real value, while book is historic cost, which is not real value. In 1938, the Fed led an effort, blessed by FDR, to impose book value accounting on the banking system to enable the authorities to dispose of failed banks' assets without triggering automatic markdowns throughout the rest of the banking system.…
>
> Now here we are. Jamie Dimon argued in 2008 that his bank (and probably Goldman Sachs and Wells Fargo), did NOT need the capital provided by TARP. My argument is that, using market value accounting, they all needed the capital, even JP Morgan, Chase, Goldman and Wells. It's a tough fight, but I think market value is worth defending.[10]

[10] Personal correspondence.

A3. Low Price-to-Book Ratios

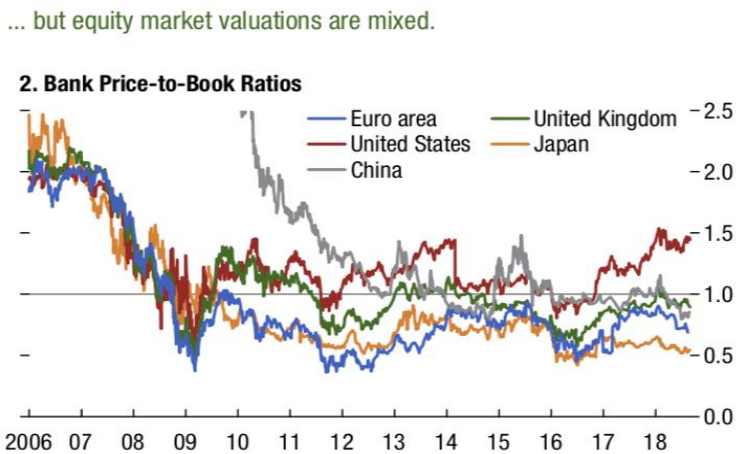
1. IMF highlights banks' low price-to-book ratios

The importance of low price-to-book ratios was highlighted by the International Monetary Fund in its October 2018 *Global Financial Stability Report A Decade After the Global Financial Crisis: Are We Safer?*

> …market measures point to some concerns about banks. In the euro area, China, Japan, and the United Kingdom, bank aggregate price-to-book ratios are less than one … (IMF *GFSR* October 2018 p.26).

It then refers to their Figure 1.20, panel 2 shown below:

IMF October 2018 GFSR Figure 1.20. *Banking Sector Resilience - Panel 2*

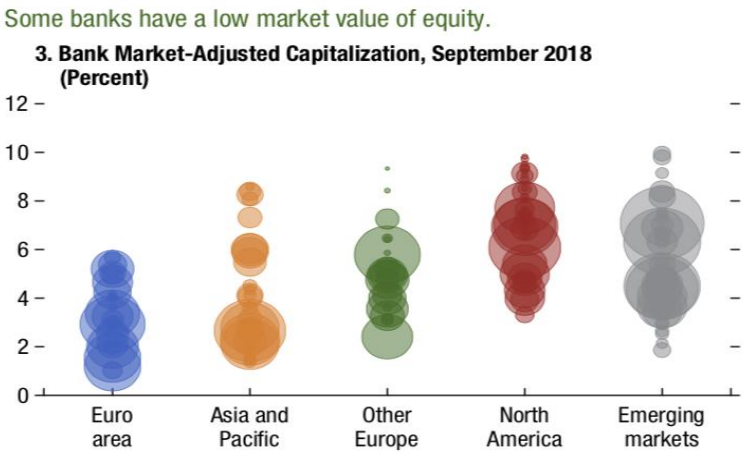


It goes on to state:

> This [PtB<1] means that the market value of equity is less than the amount of capital booked on bank balance sheets. If market valuations are used to calculate capital ratios—in place of the balance sheet value of capital used in the regulatory ratios—a number of banks would have a market-adjusted capitalization of less than 3 percent, the minimum level in the Basel III framework … (*loc. cit.*)

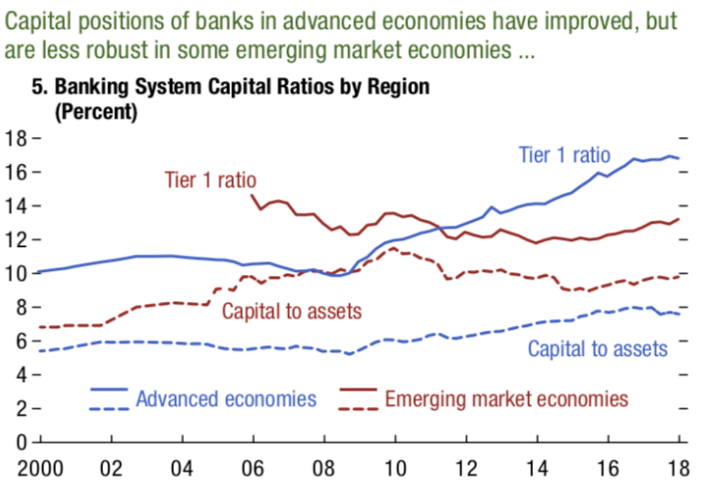
It then refers to Figure 1.20, panel 3, which shows *market-value capital-to-asset ratios*, the very creatures whose name the Bank refuses to utter:

Banking Sector Resilience - Panel 3



For those who find this blobs chart visually hard to digest, one gets a similar picture if one looks at their capital-to-asset ratios in Figure 1.6 panel C:

IMF October 2018 GFSR Figure 1.6 Banking Sheet Vulnerabilities - Panel C



The dashed blue line gives the developed countries capital-to-asset ratios. Multiply those by the PtB ratios in Figure 1.20 panel 2 above (shown below) and you see the low capital-to-asset ratios in market value terms.

The importance of market values and the significance of low PtB ratios was also highlighted by former US Treasury Secretary Larry Summers in a May 2017 article in the *Washington Post*. Let me quote it at some length:

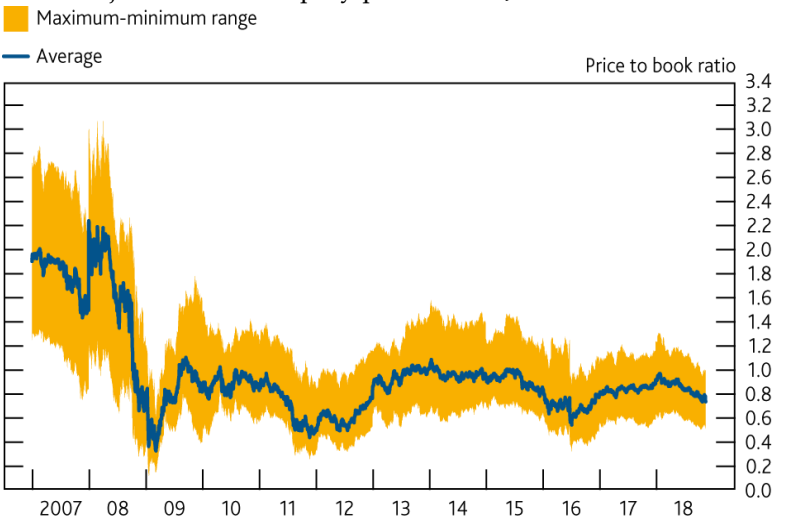
> There's a widespread view that banks are now safer because they are better capitalized, but that argument – popular though it is – needs more scrutiny. Specifically, I continue to be puzzled by the gap between what is widely believed and my reading of market evidence. … Current experiences in Europe where some institutions have a price-to-book ratio of barely 0.35 and have not yet been forced to raise capital are not encouraging about lessons learned (Summers, 2017).

2. Why are Price-to-Book Ratios So Low?

Turning to the UK, the BoE's November 2018 *FSR* (p.24) observes that "Major UK banks' price to book ratios … have been low since the crisis (Chart B.3). And they have fallen further in recent months reflecting movements in bank equity prices."

Chart B.3 Price to book ratios have been low since the crisis

Major UK banks' equity prices since June 2018 [a][b][c][d]



Sources: Bloomberg Finance L.P., Datastream from Refinitiv and Bank calculations.

(a) UK banks are Barclays, HSBC, Lloyds Banking Group and RBS.

(b) Relates the share price with the book, or accounting, value of shareholders' equity per share.

(c) HSBC's price to book ratio is adjusted for currency movements.

(d) The underlying data have been sourced from Thomson Reuters Datastream up to 2013, and from Bloomberg from 2014 onwards.

The issue is what to make of these low PtB ratios. As we explain in the text (see pp. 11-12), these must reflect *some problem* with the banks, otherwise these ratios would be (considerably) higher than 100%. A natural interpretation is that they reflect impaired asset values, i.e., hidden losses not reflected in the accounting book values.

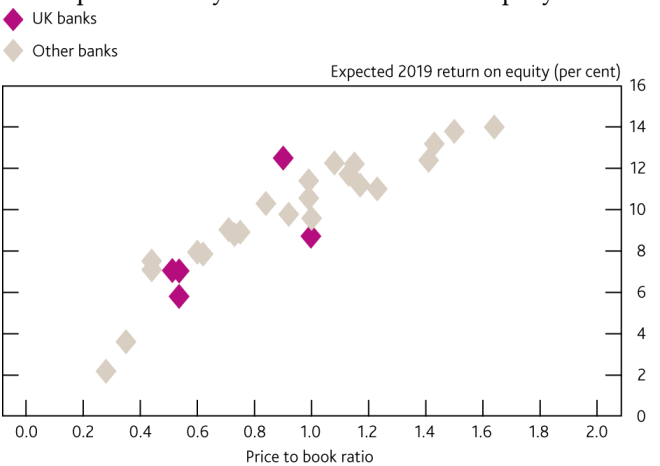
The Bank does not share that interpretation, however. It prefers instead to interpret low PtB ratios as reflecting poor expected profitability:

> The FPC continues to judge that UK banks' low price to book ratios are consistent with market *concerns over expected future profitability rather than concerns about existing asset quality*. Their market valuations remain consistent with the relationship internationally between price to book ratios

and expected future returns on equity (Chart B.4). (November 2018 *FSR*, pp.24-25, our emphasis).

Chart B.4. There is a positive correlation between banks' price to book ratios and expected returns on equity

Price to book ratios for major global banks compared with expected one year ahead returns on equity [a][b]



Sources: Bloomberg Finance L.P., Datastream from Refinitiv and Bank calculations.

(a) The price to book ratio relates the share price with the book, or accounting, value of shareholders' equity per share.

(b) UK banks are Barclays, HSBC, Lloyds Banking Group, RBS and Standard Chartered.

The FPC's explanation is fatuous. The expected book-value return is PtB times the expected market-value return as a matter of arithmetic, so the positive correlation in the chart proves nothing.[11] The Bank's chart B.4 might be 'consistent' with the Bank's preferred low expected future profitability hypothesis, but by the same logic it is also consistent with the 'impaired assets' hypothesis that the Bank is seeking to dismiss. The Bank's chart supports neither hypothesis over the other.

[11] The chart says 'expected return on equity' but does not say whether that is market or book. We have interpreted it as book because the alternative explanation leads to a negative correlation that contradicts the positive correlation in the chart.

The Bank also says that it has other evidence to support its position:

> Other market indicators corroborate this judgement. If this trend were caused by deteriorating asset quality, bank funding costs should reflect that. However, market indicators of bank credit risk, including spreads between yields on AT1 capital instruments and risk-free rates and credit default swap (CDS) premia, remain within the range they have occupied over the past two years (Chart B.5).

Chart B.5 Bank funding costs reflect their resilience

UK banks' indicative long-term funding spreads[a]

Sources: Bloomberg Finance L.P., IHS Markit and Bank calculations.

(a) UK banks are Barclays, HSBC, Lloyds Banking Group and RBS.

(b) Option-adjusted spreads. Refers to non-financial euro-denominated investment-grade corporate bonds issued in Eurobond or euro member domestic markets.

(c) Simple average of secondary market spreads over government bonds.

(d) Constant maturity unweighted average of secondary market spreads to mid-swaps for the major UK lenders' five-year euro-denominated senior unsecured bonds issued by the holding company or a suitable proxy when unavailable.

(e) Unweighted average of five-year euro-denominated senior CDS premia for the major UK lenders.

(f) Constant maturity unweighted average of secondary market spreads to mid-swaps for the major UK lenders' five-year euro-denominated senior unsecured bonds issued by the operating company or a suitable proxy when unavailable.

We disagree. Chart B.3 shows a big dip in 2011 and a smaller dip in 2016. Chart B.5 shows a big peak in 2011 and a smaller peak in 2016. Chart B.3 also shows that the PtB ratio has declined over 2018 whilst Chart B.5 shows that spreads have risen over 2018. These co-movements are *what we would expect* if low PtB ratios reflected impaired assets. This evidence, such as it is, does not corroborate the FPC's judgement that low PtB ratios are not due to impaired assets. Instead, it undermines that judgement.

The FPC view that low PtB ratios can be explained by low expected returns is also undermined in another way: it is not possible to come up with plausible calibrations of a Dividend Discount Model that would support it. This subject is a bit involved, however, so we defer a longer discussion to Appendix Four.

The Bank's 'low profitability hypothesis' also misses the main point, which is that low PtB ratios signal *some* problem that is not reflected in the banks' book values. Whether that problem is impaired assets or low expected future profitability is beside the point: market values can be low for either reason. Either way there is a problem that the Bank's 'low expected profits' hypothesis does not explain away.

The BoE has been in denial on this issue for some time. Consider this passage from a letter from Vickers to Carney of December 5th 2016:

> …market-to-book ratios for some major UK banks are well below 1. That indicates market doubt about the accuracy of book measures. To the extent that such doubts are correct, stress tests based on book values are undermined.
>
> The Bank appears to take the view that low market-to-book ratios [for UK banks] are down to dimmed prospects of future profitability rather than problems with current asset books. But such a view is hard to sustain for banks with [price-to-book] ratios below 1. There is, at the very least, a serious possibility that low market-to-book ratios

> are signalling underlying problems with book values. This certainly cannot be dismissed, especially when one is examining the ability of the system to bear stress – an exercise that calls for prudence.[12]

To us this statement is self-evidently correct, so we were surprised that in his reply Governor Carney attempted to challenge it: he continued to defend the Bank's earlier position that low market-to-book is due to low future profitability and dismissed Vickers' concerns about the *possibility* that markets *might* be signalling problems with the book values.

One also has to ask how the Bank of England can be *so sure* (and prudently so!) that its interpretation is entirely correct and Vickers' has no merit.

Carney's response does not address Vickers' concerns and in any case raises further issues, e.g., that dimmed future earnings prospects to some extent reflect the Bank's own low interest rate policy, which has the effect of making banks' core business model unprofitable, because that model depends on the Net Interest Margin that low interest rates pull down.

There is also another problem. As Tim Bush observed:

> there is a circularity in Dr. Carney's reference to low future profitability being the drag down of price/book. …
>
> "Low future profitability" implies banks will be knowingly writing sub-standard business going forwards, which is irrational. And if it were true, the Bank should stop it.
>
> I think the low future returns are the unwinding of currently overstated positions. Be it loans, be it derivatives.[13]

Then consider Vickers' (March 3rd 2017) response to Carney:

> The regulation of banks is based on accounting measures of capital. A major source of risk to financial stability is that capital is mis-measured by the accounting standards used in regulation. In that case, bank regulation that allows high (e.g. 25 times) leverage relative to accounting (or 'book') measures of capital is more fragile than may appear.
>
> An instance of this point is that stress tests based on book values are themselves vulnerable to erroneous

[12] "Supplementary market-based stress test results," letter from Sir John Vickers to Governor Mark Carney, December 5th 2016.

[13] Personal correspondence.

> measurement of capital, because those measurements are their starting point. Furthermore, bank regulation nowadays counts convertible debt instruments such as CoCos as akin to equity capital, but the conditions in which they convert to common equity (or are written down) are also dependent on accounting measures of capital. In short, *a lot is riding on book values being reasonably accurate*. …
>
> None of this is to say that markets necessarily value assets accurately. Rather, the point is that *low price-to-book ratios, especially when below one, signal a serious possibility that book values are inaccurate*, and hence that the basis for regulation (not just in stress tests) is open to question.

Market values are not always reliable, but

> when [*market values*] *are low, systematic attention should be paid to them, and transparently so*. (Vickers, 2017). (Our emphasis)

The BoE then came up another objection to the use of market values in its March 2017 submission to the Treasury Committee's capital enquiry:

> Low market valuations can reflect a number of things, all of which lead to weak expected profitability. But, crucially, different reasons for weak profitability can have quite different implications for a bank's resilience. This is because they have different impacts on the value of the bank's assets if it needed to sell them to pay for losses elsewhere in the business.[14]

The Bank illustrated this point by comparing two hypothetical banks with the same cash flows – one is efficient but has poor assets, the other is inefficient but has good assets and could sell some if needs be.

Vickers demolishes this argument in his April 26th 2017 letter to Alex Brazier:

> A holder of the BoE view, if I may put it that way, can however respond by noting … that the inefficient bank with good assets can sell some. If such a bank alone faced difficulties – so in the absence of systemic stress – this would be a reasonable answer.
>
> But it is harder to see how asset sales could be a

[14] Quoted from Vickers' letter to Alex Brazier, April 26th 2017.

> satisfactory response in conditions of *systemic* stress, a typical feature of which is precisely the inability of banks to sell assets except at distressed prices. This is the well-known 'fire sale' problem …

The gist of this problem that a bank that suffers a large loss might be forced to reduce its asset holdings by selling assets at fire-sale prices. If other banks must revalue their assets at these temporarily low market values, then the first sale can set off a cascade of fire sales that inflicts losses on many institutions and thereby creates a systemic problem.

> This kind of risk, I suggest, should be central to thinking about financial stability, and to stress tests. Financial stability policy should take a prudent approach as a general matter. In particular, it should not place reliance on banks being able to sell assets in crises at good prices. While that might cope with an idiosyncratic shock affecting one bank, it will not do in a systemic crisis. But systemic crisis risk is the principal risk that regulation should guard against. The prudent stress test question, then, is whether the bank can meet its obligations without resorting to asset sales. It is not whether it can do so on the assumption that assets can be sold at good prices.

And, one might add, the prudent response by the BoE would be to raise its capital requirements.

> In sum, low market valuations imply less resilience even when the possibility of asset sales is allowed for. Tests of resilience that rely on resort to asset sales are flawed because, as experience shows, in a systemic crisis it may well be impossible to realise full value from asset sales.

Tim Bush also makes an appropriate observation:

> Essentially, from the perspective of a shareholder providing capital, the BoE's second example (good current balance sheet, poor future returns) is really an admission that a bank as a whole is one big impaired asset. Nothing resilient about that. Particularly, no incentive to refinance it if it incurs unexpected losses for example. New investment won't achieve an appropriate return.
>
> The BoE's line is a bit like saying British Leyland was resilient if the factories were brand new. [15]

[15] Personal correspondence.

So why does the Bank continue to insist that low PtB ratios reflect low expected profitability rather than impaired assets? Does the Bank have some stake in denying the impaired assets hypothesis?

Perhaps it does.

Acknowledging impaired assets would undermine its 'banking system fixed' narrative. The banking system is fixed, you see, but it's also still carrying these whacking great impaired assets.

Its preferred explanation is much easier to sell politically. The banks are fixed, but it's just that their long-term profit outlook is low. Now that doesn't look nearly as bad and is also harder for outside analysts to unpick.

Hold on though! Hasn't the BoE been telling us elsewhere that banks could expect *high* profits?

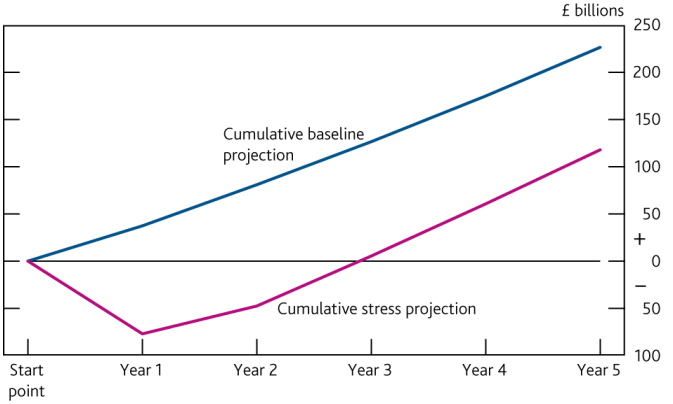
Er, yes.

In explaining away the awkward implications of the impaired assets explanation for low PtB ratios, the Bank has to insist that banks' expected future profits must be low. That makes no sense. If we accept it, then banks must be poor investment prospects. Who wants to invest in businesses with low profitability? That makes it hard for banks to raise new share capital. Also if banks' profits are low, then banks' retained earnings will be low too, and that makes it difficult for banks to increase their capital through retained earnings. And since raising share capital and retaining earnings are the two main ways for banks to increase their capital, the implication is that increasing capital will be a painfully long and slow process.

Worse, the assumption conflicts with the Bank's own assumptions. Elsewhere, in its stress test modelling, the Bank has been projecting that expected future profits will surge after the initial impact of a severe stress, and would grow strongly absent the stress (see, e.g., Chart A4 from the December 2019 *Financial Stability Report*:

Chart A3.1. *Banks' profits are projected to decrease by half uring the stress*

Cumulative profit before tax in baseline and stress projections (a)



Sources: Participating banks' STDF data submissions, Bank analysis and calculations.

(a) For HSBC and Standard Chartered, annual profits are converted from US dollars to sterling using exchange rates consistent with the baseline and stress scenarios, respectively.

The Bank can't have it both ways, however. Either the Bank believes that future profits will be weak or it believes that future profits will be strong. If it believes that that future profits will be weak, then it undermines its own projections that purport to show the banks performing well in future years, with or without a stress. But if it believes that future profits will be strong, then it should abandon its view that low PtB ratios must be due to low profits and acknowledge the implication, i.e., that low PtB ratios must be due to impaired assets whose impairment is still not reflected in the book values. So which is it to be? But either way, the Bank's repeated claims, that the stress tests show that the banking system is fixed, are not defensible.

A4. Roe versus Coe: Can a Low Price-to-Book Ratio be Explained by Low Expected Returns?

The BoE maintains that a low Price-to-Book ratio reflects low expected returns as opposed to impaired asset values, but is this claim credible?

We suggest not.

Our understanding is that the Bank believes that a justification for a such a connection can be made using some form of the Dividend Discount Model (DDM).[16] The obvious first choice version of this model would be the following:

$$PtB = (roe - g) \,/\, (coe - g) \tag{A4.1}$$

where: PtB is the value of the PtB ratio; roe = projected return on equity; coe = projected cost of equity, which is typically taken as the required rate of return, i.e., the rate of return that investors 'require' to invest in the share, which is equal to the risk-free interest rate plus the assumed Equity Risk Premium (ERP); and g = the assumed growth of the first dividend, which is classically assumed to be the growth rate of all dividends in perpetuity. We would also expect both numerator and denominator terms to be positive, so we would expect $g < roe$ and $g < coe$. We would also expect that $g < r$ for the stock price to be finite, where r is the discount rate and we gloss over any distinctions between the discount rate and the risk-free rate.[17] Therefore, g is constrained to be less than any of r, roe or coe. This model is based on a number of questionable assumptions (e.g., in the standard version, that

[16] The seminal article on the DDM is Gordon (1959).

[17] The stock value per share is $D/(r-g)$, where D is the dividend. As g approaches r from below, the stock price approaches infinity.

dividends and g are constant, whereas both are volatile and highly uncertain going forward), is sensitive to the calibration of its parameters and is known to be particularly tricky when applied to financial institutions. It should therefore be handled with care.

To form some intuition, set $g = 0$. We then obtain

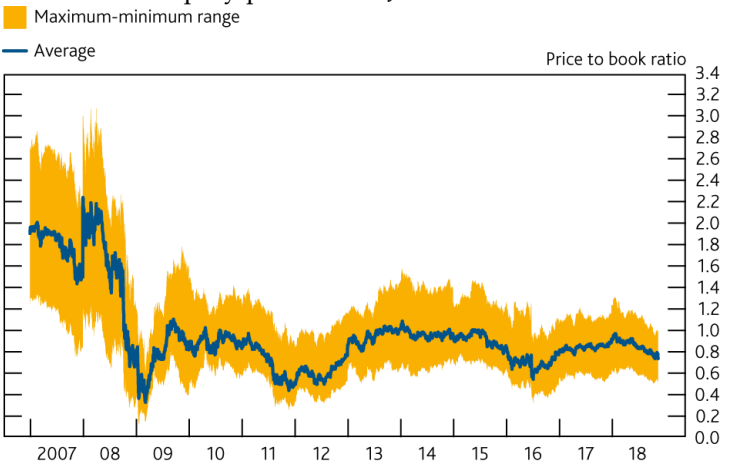
(A4.2) $$PtB = roe / coe.$$

The PtB is then the ratio of roe to coe. In the normal course of events (think pre-GFC), $roe > coe$ so $PtB > 1$.

However, since late 2008, the PtB has been well below 1 as shown in the BoE's chart B.3 from its November 2018 *Financial Stability Report*:

Chart B.3 Price to book ratios have been low since the crisis

Major UK banks' equity prices since June 2018 (a)(b)(c)(d)



Sources: Bloomberg Finance L.P., Datastream from Refinitiv and Bank calculations.

(a) UK banks are Barclays, HSBC, Lloyds Banking Group and RBS.

(b) Relates the share price with the book, or accounting, value of shareholders' equity per share.

(c) HSBC's price to book ratio is adjusted for currency movements.

(d) The underlying data have been sourced from Thomson Reuters Datastream up to 2013, and from Bloomberg from 2014 onwards.

Carney's December 2016 letter to Vickers

On 5 December 2016, Vickers wrote to Governor Carney expressing concerns about book values and the significance of *PtB* ratios under 1. We quote at length from Carney's response:

> In your letter, you expressed concern around book measures of capital for major UK banks, suggesting that price to book ratios below one were evidence of market participants doubting the accuracy of those measures. There are many reasons why valuations of a bank's equity may fall, and when we examined this issue in the November 2016 Financial Stability Report (FSR)[Footnote: See pages 26-30] we found little evidence to suggest that investors should be concerned about poor asset quality for UK banks. … We are therefore of the view that current low price to book ratios reflect investors' concerns about low long-term profitability for UK banks - with return on equity of the major UK banks averaging just 2% in 2015. …
>
> This analysis suggests that low price to book ratios do not necessarily imply that banks' capital positions are mismeasured or threatened by imminent large losses.

A little later he continues:

> As part of our stress testing approach, we construct a central projection of a bank's capital position over a five year period, and then calculate how that capital position would change in response to a severe stress scenario. We use a baseline forecast of a bank's profitability to construct the projection of its capital position. [Footnote: See Chart 4, page 17] It is possible to back out an implied price to book ratio from this forecast, after making an adjustment for misconduct costs.[Footnote: see below.] We find that our baseline projection for the four largest UK banks equates to a price to book ratio of between 0.7 and 0.8, consistent with the actual price to book ratio at the time the stress tests were published. [Footnote: See Table B.1 on page 27 of the FSR.] This is not a coincidence - *we look at the prevailing price to book ratios as one cross-check of our base line forecasts for bank profits*. (Our italics)

The footnote after "misconduct costs" is also significant:

> Using a Dividend Discount Model (DDM), we calculate the implied price to book ratio using a projection of a bank's return on equity, the cost of equity and an assumption about the dividend payout ratio. We take the profits in the baseline (shown in Chart 4, page 17 of the 2016 Stress Test results

> document) and make an adjustment for misconduct costs based on equity analysts' forecasts, since the baseline includes no additional provisions for misconduct costs. Using a Capital Asset Pricing Model (CAPM) *we calculate the cost of equity to be 13%* - in line with survey estimates of banks' perceptions of the required rate of return. We assume that beyond the five year horizon, expected return on equity is equal to the cost of equity. We assume a dividend payout rate of 0.5. (Our italics)

There is a lot in here.

First let's be clear about the game that the Bank is playing. It has one observed value (PtB) and up to four explicitly identified unobserved parameters – the roe, the coe, g and the dividend payout ratio whose values it must assume/forecast/project/guess etc. It is then trying to triangulate the one observed value that it has in order to get a cross-check for its profit and roe forecasts based on a model (the DDM) that is dependent on questionable calibrations of parameters (esp. the coe) that are themselves dependent on other assumptions, parameters etc. and on at least one other model (the CAPM) that has similar issues of its own and is notoriously difficult to calibrate in any precise way, e.g., think of the difficulties of calibrating the beta or risk premium.[18]

We don't approve of this type of game – it is unreliable and open to manipulation – but let's play along.[19]

[18] See also this speech by FPC member Martin Taylor in (2016), in which he says "measuring equity risk premia (ERP) and thus the cost of equity capital is a slippery business." He then gives four ways of measuring it all of which are wide open to criticism (historical estimates, broker estimates, investor questionnaire, company questionnaire) and concludes that the "ERP and the cost of equity are slippery because they appear to occupy a space that *is part-objective, part-emotional*." (His emphasis.) This is not an exact science. See M. Taylor "Banking in the tundra," speech given by Martin Taylor, External Member of the Financial Policy Committee, Bank of England Official Monetary and Financial Institutions Forum City Lecture, London Wednesday May 25th 2016.

[19] Nor do we approve of Governor's Carney's use of the term 'calculated'. The term 'calculate' connotes accuracy and objectivity, but the 'calculation' is actually a guesstimation based on a bunch of subjective assumptions and perceptions.

The main points of immediate interest are that the BoE uses its in-house projections of future profits to obtain the projected *roe* and its in-house calculation of the *coe* (i.e., 13%) to obtain a *PtB* value in the then prevailing range of 70% to 80%.

Since we are not privy to the details of the Bank's DDM, the best we can do is to use our reconstruction of their DDM model to reverse engineer the main calculations.

If we now use (A4.2) as a starting point and set *PtB* equal to the middle of the target *PtB* range, then we can back out our *roe* as follows:

$$75\% = roe \,/\, 13\% \quad \Longrightarrow \quad roe = 13\% \times 75\% = 9.75\% \tag{A4.3}$$

and we would imagine that the Bank's *roe* would not be that far away from this estimate.

We might first note that a projected *roe* of 9.75% is not especially low and the Bank's 'calculated' *coe* looks very high.

Now we can't help feeling that the BoE's high 'calculation' for the *coe* has led it to undermine the case it is trying to make, because the high *coe* calculation forces the Bank to use an implausible high 'low' *roe* to obtain the targeted *PtB*. Had the Bank gone for a lower *coe*, then it could have gone for a lower *roe* and still hit the *PtB* target.

So why didn't the Bank go for a lower *coe*, lower *roe* combination?

The answer would appear to be that whilst insisting on low expected returns to explain the low PtB without acknowledging impaired assets, the Bank had also committed itself to a strong projected profit surge to enable the banks to weather the stress in good shape. It therefore needed a *roe* that was low enough for the first purpose but high enough for the second. The only way to square these conflicting needs was to obtain a high 'low' *roe*, and to do that, the Bank selected – nay, 'calculated' – a *coe* towards the high end of what it thought was a plausible *coe* range.

The Bank's projected *roe* of 9.75% or somewhere close to that level implies that the Bank was projecting a major surge over recently-prevailing returns on equity which were only 2% as Carney notes. This surge in projected *roe* is associated with a

corresponding surge in projected profits and we would assert that these surges in *roe* and profits were implausibly over-optimistic even at the time. Moreover, as Dean Buckner's "Stress fest" posting points out (Buckner, 2018), the Bank's profit projections from its previous stress tests have since *been shown* to be wildly over-optimistic.

Turning to the *coe*, the Bank's DDM model depends on the assumption that investors are discounting by *coe* and the Bank's attempted reconciliation of low *PtB* with low expected returns going forward depends on a high *coe*. Even if we accept the Bank's analysis, a high *coe* must reflect a high risk premium demanded by shareholders. But why would investors demand a high risk premium unless the perceived risk is that of imminent large losses? Therefore we must conclude that the imminent large losses *are still there*, but buried in the core of the high *coe*.

The Bank then runs into another problem. Let's take the Bank at its word when it talks about low expected returns. If we then input a genuinely low *roe*, say, 5%, we would get an implied *PtB* = 5%/13% = 38%, which well undershoots the target. Call this Choice *A*. If we stick with the earlier high *roe* of 9.75%, we hit the target *PtB*, but then the Bank would have the problem just mentioned, namely, that the high *coe* hides the prospect of imminent large losses and we don't want those. Call this Choice *B*. If we keep the higher *roe* but reduce the *coe* to some tolerable level, say 7%, that does not imply imminent large losses, then the implied *PtB* becomes 9.75%/7% = 139%. Choice *A* gives an uncomfortably high *coe* and undershoots the target, Choice *B* gives an implausibly high *roe* and an uncomfortable high *coe* but hits the target, and Choice *C* gives an implausibly high *roe* and overshoots the target.

However we tweak the calibrations, we cannot get a problem-free calibration that fits.

Carney's unlucky 13%

But how credible was Carney's 13% coe 'calculation' in the first place?

Well, the Carney 'calculation' is certainly consistent with other BoE evidence. Dison and Rattan's 2017 *BEQB* article suggests an Equity Risk Premium (ERP) of about 8% for 2016. Apply a bank

beta of 1.5, and you get a bank ERP of about 12% and are close to the Carney 13% coe 'calculation'.[20] Also, the Bank's 2017 stress test reports that UK banks expect roes of at least 10% and the aggregate cost of equity for major UK banks is estimated to be 9% to 14% with a central estimate of 11.5%. However, the first article merely confirms that Carney and Dison and Rattan are using much the same model, and the numbers in the stress test report are about banks' claimed *expectations* of expected returns, which are hardly reliable *evidence*. Banks are not well known for providing reliable profit forecasts.

However, other evidence suggests that the ERP is lower than Carney *et alia* suggest. Working backwards from Carney's 13% *coe* and the same calibrations for other variables, a 13% bank *coe* implies a market ERP $= (13\% - 1.5\%) \div 1.5 = 7.67\%$, which is very high. Many expert judgments of the ERP come in at 4% to 5% and a BoE study from 2010 also comes in at about 4% (Inkinen *et al.*, 2010). In Kevin's PensionsMetrics studies (Blake *et al.*, 2001) with David Blake and Andrew Cairns, he had long ago worked on an assumed ERP of maybe 5% but had gradually revised that number downwards to about 3%, and were keeping an eye on ERP estimates in the actuarial literature that they felt were plausible. They were also aware that these estimates had to be long-term to have any value, i.e., they couldn't shift around too much if they were to be plausible.

Applying an ERP in the range 3% to 5% with a bank beta = 1.5 then gives us the coes in the next table, all of which are well below the Carney 'calculation':

Table A4.1: *Equity Risk Premia and Banks' Cost of Equity*

Equity Risk Premium	Bank Cost of Equity
3%	6%
4%	7.5%
5%	9%

Notes: Calculations assume a risk-free rate = 1.5% and a bank beta = 1.5.

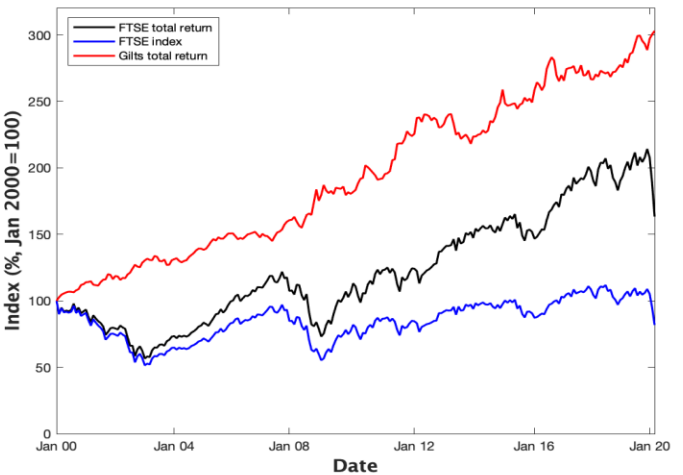
[20] The assumption here is that bank ERP = bank beta times market ERP, using the Capital Asset Pricing Model, then add the risk-free rate to obtain the coe.

But even these estimates of the ERP are too high. Recall that the idea underlying the *coe* is that markets 'demand' a premium for taking on risk over risk-free, but as Dean recently observed:

> The empirical evidence for [this idea] used to be strong, [but] it should be noted that the *premium seems to have disappeared* since the high of the dotcom boom in the late 1990s (Buckner, 2018a).
>
> The main point is that the assumption of an equity risk premium, i.e. total return on equities exceeding the total risk free return, does not hold in the short term, where 'short term' means periods less than 20 years (Buckner, 2018b).

He then gives a chart, the updated version of which is shown here:

Figure A4.1: Total Returns: FTSE vs Gilts



The green line is the value of the FTSE (Jan 2000 = 100) and is somewhat lower, currently [= 31 Mar 2020] 81.84, than when it started more than 20 years ago. The blue line is FTSE with reinvested dividends and the red line is the hypothetical return on 10 year gilts, which exceeds the return on stocks.

Nor is this stocks vs bonds experience unusual. To quote a recent study that looked at the relative performance of stocks and bonds over 210 years of US history:

> There are also almost a dozen cases of negative equity premia, lasting for as long as forty years. Collectively, these periods of rough equivalence (between stocks and bonds) cover about two-thirds of the 210 years. … The best one sentence summary of the 210 year record would be that sometimes, stocks outperformed bonds, but at other times, bonds out-performed stocks; while much of the time, stocks and bonds performed about the same. (McQuarrie, 2017, pp.29, 32; Robertson, 2018).

One might then conclude that the equity risk premium underlying Carney's high coe has disappeared *and* that this disappearance should have been clear even when Carney wrote his letter. Carney's cost of equity should have been based on an equity risk premium of about zero, i.e., so the coe should have been about equal to the return on gilts (e.g., around 1.5%), *not* the 13% 'calculated' by Carney's advisors.

In that case, the only roe consistent with low PtB ratios would have been (and still is) one below the risk-free rate and the rug is well and truly pulled from under the Bank's projected profit surge. If we then take the coe as 1.5%, update the PtB to 39.2%, to reflect its latest value, we get the following roe:

$$39.2\% = roe \,/\, 1.5\% \implies roe = 1.5\% \times 39.2\% \approx 0.6\% \tag{A4.4}$$

Oh dear!

Now it seems to us that the most natural explanation for this low roe is that it reflects the impact of impaired assets on banks' balance sheets, in which case the appropriate policy implication would be that the BoE should be pushing banks to raise capital and it could do that by increasing minimum capital requirements. In this case, the banks have a big problem. But if one insists on the Bank's unimpaired-assets-cum-low-expected-returns hypothesis, then those low expected returns would indicate that banks are over-capitalised and capital should be exiting the industry to raise expected returns. We find this explanation less plausible given the other indications that banks are under-capitalised rather than over-capitalised, but even if one accepts it, then there is potentially a bigger problem for the Bank and the banks, because it implies that banks have a poor business model and the sector should shrink.

The BoE seems oblivious to these implications of its own position.

Finally …

Just when you thought it couldn't get any more weird:

In his letter Carney says that the Bank *assumes* after 5 years the *roe* and *coe* will be equal to each other, but by (A6.1) this assumption implies that the PtB will have increased to 100% by December 2021. With under 20 months to go, the PtB currently stands at 42.7%. Therefore, the Bank is implicitly assuming that the PtB will rise to 100% after 5 years. This 'projection' is not based on any underlying forecast of anything, but is *just assumed*, and would appear to be not just implausible, but well on the way to being falsified too.

If you look at (A4.1), you would innocently presume that the g on the top and the g on the bottom must refer to the same entity. Not so. The g on the top is the rate of growth of dividends over the 5 year period, but the g on the bottom refers to the growth of dividends in perpetuity. The same symbol represents two different entities in the same equation!

So what should we make of the Bank's imaginative attempts to explain low PtB ratios in terms that avoid having to acknowledge any lingering impaired assets problem?

Beam me up, Scottie.

A5. Risk-Weighted Assets

The amount at risk or exposure measure long favoured by bank regulators is the 'Risk Weighted Assets' (RWAs) measure.

The way RWAs work is simple. Every asset is given an arbitrary fixed 'risk weight' that is usually between 0% and 100% but in unusual cases more. The 'risk-weighted' asset is then equal to the 'risk weight' times the size of the position.

The first point to note is that this approach makes no sense. If you think that these 'risk weights' have no relationship to any reasonable sense of the riskiness of these assets, you would be right: the methodology is unsound in principle. You also have to bear in mind that the 'risk weights' themselves are pulled out of thin air by committees of regulators under political pressures to pull the risk weights in particular directions, mainly down.

In the most egregious case, EU government debt – including Greek or Italian government debt[21] – is presumed to be riskless and therefore attracts a risk weight of zero; bank holdings of such debt then attract a zero capital requirement. The debt of OECD governments would then be given a zero risk weight on the presumption that it is riskless whereas commercial debt would be given the full risk weight of 100%. Risk weights on mortgage loans

[21] The PRA document 'The PRA's methodologies for setting Pillar 2 capital, February 2020Quoting page 5: "To note, these SA risk weights would not apply to EU sovereign exposures which benefit from a 0% risk weight irrespective of their external credit rate (or CQS)." The PRA document 'GENERAL GUIDANCE ON THE PRA'S TRANSITIONAL DIRECTION: "2. For example, if HM Treasury found the EU equivalent under Article 114(7) of the onshored CRR, UK banks on the standardised approach to credit risk would be able to continue to 0% risk weight their exposures to EU sovereign debt. The transitional direction will allow firms to continue to treat EU exposures, including sovereign exposures, preferentially until 30 June 2020. Therefore, firms would be able to 0% risk weight these exposures until this date either as a result of the EU being found equivalent by HM Treasury or as a result of the PRA's transitional direction. A positive equivalence finding would have to be made for firms to continue to 0% risk weight these exposures after 30 June 2020."

were also very low. These zero or low risk weights encouraged banks to load up on such assets and were a key aggravating factor in both the U.S. subprime and the European banking crises – a classic case of political expediency leading to predictable disaster.

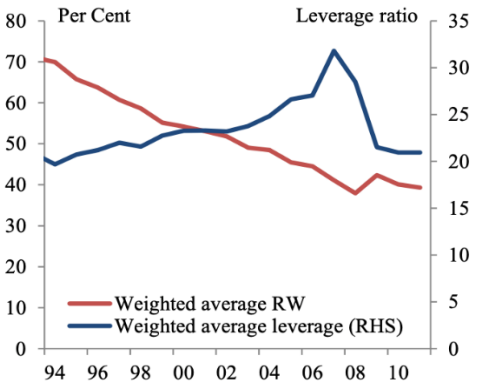
The result is to create artificially low 'Risk Weighted Asset' measures that are much lower than total assets: for the big 5 banks, the latest available (i.e. end-2019) average risk weight, the ratio of total RWA to TA, is 28.7% Therefore, 71.3% of the total assets of the Big Five banks is deemed by the regulatory 'risk weighting' system to have zero risk, which point confirms our point that the approach makes no sense.

Such problems have been known about for a long time. It is then hardly surprising that, to quote Andy Haldane:

> Surveys of investors suggest a fairly deep-seated scepticism about risk weights, with only a small fraction regarding them as trustworthy… From a low base, investor faith in these risk weights has continued to fall fast (Haldane, 2013).

He presents the following chart comparing RWAs with the simpler metric of bank risk, bank leverage or the ratio of bank assets to capital:

Average Risk Weights and Leverage [a][b]



Source: The Banker and Bank calculations.

(a) Sample consists of Deutsche Bank, HSBC, BNP Paribas, Barclays, Citigroup, UBS, BAML, BONY, Commerzbank, ING, JPM, LBG, RBS, Santanders, State Street, UniCredit, Wells Fargo. Data are not available for the remaining G-SIBs.

(b) Leverage ratio is defined as Total assets / Tier 1 capital.

The shapes of the two plots are virtually mirror images of each other. In the period from 1993 up to the crisis, average risk weights fell from 70% to 40%, whilst average leverage rose from about 20 to well over 30. The leverage ratio picked up the growing riskiness of the banking system, but the average RWA was a *contrarian* indicator of banking risk. He then observed:

> In the pre-crisis boom, bank leverage rose steadily to reach historically unprecedented levels. This signalled high and rising bank risk. Indeed, bank leverage and bank risk weights moved in opposite directions over this period… While the *risk traffic lights were flashing bright red for leverage, for risk weights they were signalling ever-deeper green.*
>
> The subsequent financial crisis has made clear which traffic light signal was at fault. The boom was leverage-fuelled and so too has been the subsequent bust (Haldane, 2013). (Our emphasis).

The explanation is that the lower risk weights do not reflect reduced riskiness, but instead reflect the increasing ability of bankers to game the risk-weighting system to hide the risks they were really taking. Thus, ironically, a *lower risk weight* usually reflects *greater risk taking* and we can reasonably conclude that the RWA measure is, to say the least, counter-productive.

There is also the point that estimates of required capital to RWA ratios based on a boom period *cannot* give us sensible expected loss numbers in a crash. To quote James Ferguson:

> When calculating the required capital to risk weights, banks estimate both the probability of default and the expected loss given default. Since they use recent (non-crisis) history to 'calculate' these probabilities, the higher the leverage that drives the credit boom pre-crisis, the lower both the estimated probability of default (which is a function of recent default figures) and the expected loss given default because the LTV falls. However, we all know that the best (only) way to create a crash is to inflate a boom first, making this risk weight methodology truly insane.[22]

RWAs fall as the boom intensifies, so aggravating both the boom and the subsequent bust, i.e., RWAs operate procyclically.

[22] Personal correspondence.

The inadequacy of the RWA measure (and that of the Tier 1 capital measure too) was also demonstrated in the GFC. As Sir Jon Cunliffe observed in 2014:

> In early 2009, around the height of the financial crisis, the market valued the combined equity of the major UK banks at less than 2% of their total assets. … [Yet on] a risk weighted basis, the banks had 6.7% common equity capital – well above the 2% minimum. Tier 1 capital [to RWA] ratios were almost 9%.

That is, banks were well capitalised according to the standard regultory RWA metrics. To continue:

> This was of course the time when fear was at its peak. The message was crystal clear. When it mattered most, the market did not at all believe the published numbers for bank capital adequacy. …
>
> This episode tells us two things. The first is that *financial reporting matters. It matters at all times. But it matters most in times of stress* …
>
> The second thing this episode shows us is that, *when push came to shove, how little confidence investors had in the regulatory capital framework. In essence, markets discounted all types of capital except pure equity*. And as they distrusted the risk-weighted numbers, they wrote down the value of the equity to reach the numbers I mentioned earlier.
>
> And, in many cases, they were right to do so. *Capital adequacy turned out to be an illusion.* …
>
> When the crisis struck, not only did a significant portion of the assets turn out to be far riskier than estimated. *Market confidence in the risk-weighted capital adequacy framework as a whole pretty much evaporated.* (Cunliffe, 2014). (Our emphasis)

Part of the explanation for the failure of the RWA measure is that banks were loading up on assets with low RWAs to reduce their capital requirements. RWAs tailor-made for gaming: a bank loads up on low-weighted assets and is rewarded with a lower capital requirement because it is deemed to have low risk. In the limit, it could load up entirely on zero-weighted assets: it would then be deemed to have zero risk and incur a zero capital requirement.

The banks were also gaming the system aggressively. To quote the FSA's report into the failure of RBS:

> The capital regime was most deficient, moreover, in

> respect of the trading books of the banks, when required capital for many instruments was estimated using value-at-risk (VaR) approaches. The acquisition of ABN AMRO meant that RBS's trading book assets almost doubled between end-2006 and end-2007. The low risk weights assigned to trading assets suggested that only £2.3bn of core tier 1 capital was held to cover potential trading losses which might result from assets carried at around £470bn on the firm's balance sheet.

£2.3 billion divided by £470 billion is less than 0.5%: In fact, in 2008, losses of £12.2bn arose in the credit trading area alone (a subset of total trading book assets).

Note too that the RBS's credit risk models would have given this £12.2 billion loss a probability of about zero: such losses were effectively impossible according to the models.

> A regime which inadequately evaluated trading book risks was, therefore, fundamental to RBS's failure. This inadequacy was particularly significant for RBS, given that the purchase of ABN AMRO significantly increased RBS's trading book assets. RBS was allowed by the existing regulations massively to increase its trading risk exposure counterbalanced only by a small increase in capital buffers available to absorb loss (Bailey, 2020).

When the higher Basel III capital standards were first announced in 2011, bankers' first instincts were to comply by gaming the system. To quote an article by Tom Braithwaite in the *Financial Times*:

> Jamie Dimon, JPMorgan's chief executive, said last week that he intended to "manage the hell out of RWA" to reach the higher levels. Morgan Stanley revealed that its risk-weighted assets had ballooned by $44bn after the Fed said the bank was managing the hell out of its assets too much and told it to stop.
>
> A senior executive at a third bank told me that it was scouring its balance sheet, looking for assets that could be structured differently to achieve lower risk weights. …
>
> A senior regulator tells me officials are fully expecting various nefarious schemes to circumvent the rules, including structured transactions that do not reduce their risk but do reduce their RWA (Braithwaite, 2011).

Banks were (and still are) engaging in vast financial engineering transactions to move assets from high to low weight classifications in order to reduce their capital requirements. This game even has a name – Risk-Weight 'Optimisation' (RWO) – and RWO really means risk-weight *minimisation*. RWO was the main driving force behind the enormous growth in derivatives trading and securitization in the years running up to the GFC – and in so far as it led to (much) greater risk taking and (enormous) capital depletion, RWO was also a major contributing factor to the GFC as well.[23]

Nor can there be any doubt that banks are still gaming the risk weights, perhaps more than ever. If one looks at the 'Haldane cross' diagram, reproduced above as Figure A5.1, the average risk weight for the banks in Haldane's sample was about 40%. Then compare this number to the average risk weight of the Big Five UK banks, which is 28.7%. Some banks are brazen about it too. For example, Lloyds Banking Group in their 2019 *Annual Report* (p.38) boast about how "in challenging market conditions, [the bank] maintained a strong focus on risk-weighted asset (RWA) optimization and actively addressed low-return client relationships, delivering a significant reduction in RWA of over £9 billion," as if this were something to be proud about. The phrase "actively addressed low-return client relationships" doesn't look too good either. We read that phrase as suggesting that the bank's pursuit of risk-weight optimization is having an adverse impact on some of its client relationships, a nice instance of the Law of (Not So) Unintended Consequences.

[23] A good example is the 'how to destroy' securitisation co-invented by Gordon Kerr in 2001. This little beauty used financial alchemy to game the Basel capital rules to transform a bog standard (big) bond portfolio held by a major UK financial institution into a (supposedly) almost risk-free credit derivative that warranted only one sixteenth of its previous capital requirement. However, the risk reduction was only cosmetic and the bond portfolio remained as risky as it had been before. The transaction reduced the bank's required regulatory capital by fifteen sixteenths. This securitization was widely copied and Gordon was left wondering afterwards why it took so long for the banking system to fall over. See Kerr (2010).

Returning to the main topic, zero or low RWAs do not mean that the assets involved are actually zero or low risk; instead, they merely mean that Basel allows them to assign zero or low risk status to the positions so designated, which is an altogether different matter. Examples include not just Greek or Italian government debt but also carry-trade positions, which have zero risk weights, and many credit derivatives, securitizations and mortgaged-backed positions, which have very low risk weights. What these positions have in common is that they are all highly risky, but the Basel system operates to make those risks virtually invisible.

It was widely acknowledged that RWAs were flawed. The solution, it was claimed, was to make the capital requirements more risk-sensitive – and the way to do that was to allow banks with approved risk-modelling capabilities to use their risk models to help determine their capital requirements. This principle was first enshrined in the Market Risk Amendment to Basel I (1996): this Amendment allowed banks to use their risk models to help determine their capital requirements for their market risks. The use of risk models to help determine capital requirements for credit and operational risks was then the central feature of Basel II, which was rolled out to great fanfare in 2004. However, supplementing RWAs with risk models to determine capital requirements only made matters worse, as the risk models themselves are highly problematic:

- They are based on unreasonable assumptions (such as Gaussianity[24]) and poor risk measures (such as Value-at-Risk) that

[24] In August 2007 Goldman's CFO David Viniar famously explained that their flagship GEO hedge fund was being bit by 25-standard deviation (or 25 sigma) moves, several days in a row. It was then being said that Goldman must have been unlucky, as a single 25 sigma event was a once in a 100,000 year event. Unlucky is not the word. The expected waiting time to observe a single 25 sigma daily event under the Gaussian distribution, the one normally used in finance, is 1.309e+135 years, i.e., about 1.3 with the decimal point moved 135 spaces to the left, a number that so vast that it dwarves cosmological numbers (e.g., the number of particles in the universe is believed to be no more than 10e+84). The Gaussian distribution, the most popular distribution used in risk

give enormous scope for creative traders and financial engineers to hide risks: traders can stuff risk into the VaR tails and so on (Dowd, 2008).

- They are based on huge numbers of parameters, many of which cannot be estimated with any reasonable precision, and involve a great deal of model risk and just plain guesswork, all of which gives plenty of further scope for creative game-playing to drive the risk numbers down.
- They use probability of default (PD) and loss given default (LGD) models that are by their nature pro-cyclical and in practice impossible to calibrate properly.[25]
- There is an abundance of evidence from recent empirical studies to suggest that simpler models out-perform more complex ones (Demirgüç-Kunt *et al.*, 2010; Mayers & Stremmel, 2012; Berger & Bouwmna, 2013; Blundell-Wignall & Roulet, 2014; Hogan *et al.*, 2013; Acharya & Steffen, 2014).

At a deeper level, Basel II created a model monoculture in which everyone was trying to do the same thing – to model risks the same way to play the system – but what none of the risk models could measure were the risks created by all the banks acting as a herd of lemmings, which is exactly how they then behaved.

There is also a version of Goodhart's Law operating by which risk models break down when used for control purposes, i.e., no model can take account of the ways in which it will be gamed. This interaction between the risk managers, the models they use to control risks and the responses of those being controlled by these models means that markets are not mathematizable. Risk modelling is then just a game: the bankers pretend to model risks, but they are really gaming the risk numbers – and the regulators openly encourage them to do so.

What then happened was that the banks hijacked the system and used it to ensure that their capital requirements became ever lower. The Basel system, which was meant to prop up banks' levels of capital, had become the means by which the banks were decapitalised by the bankers themselves. It was no coincidence

management, is useless in the face of the big risks that matter. See (Dowd, *et al.*, 2008).

[25] We discuss this problem further in Appendix 10.

that the financial crisis hit soon afterwards and much of the international banking system collapsed.

In short, the real (though seldom explicitly acknowledged) purpose of risk modelling is to use capital regulation to decapitalise the banks. The cybernetic POSIWID principle applies here: the purpose of a system is what it does, not what some regulator says it does. When the banks later go bust, the bankers play dumb and lobby for a bailout; the banks then get recapitalised at public expense and the game repeats itself until the public eventually refuse to put up with it any more.

It is therefore no wonder that the models don't work: they were not intended to.

To give just one example of the inadequate performance of regulatory risk models, calculations performed by the Bank of England showed that for the four biggest UK banks, cumulative trading losses over the height of the crisis were up to *six times* the value of the model-determined capital set aside to cover against such losses (Haldane, 2011, chart 3).

In each case, the risk models and resulting capital charges were signed off as compliant by regulators. The banks appeared to be capital adequate, but the model-based risk-weighted metrics disguised how weak the banks really were.

The upshot is that banks shouldn't be assessed by the ratio of capital (however measured) to RWA. They should be assessed against a capital ratio that uses a much broader exposure measure that does not presume to assign risk weights among asset classes, is more difficult to game and provides a clearer picture of a bank's ability to absorb loss regardless of source.

A natural such measure is Total Assets.

A6. Total Assets vs. Leverage Exposure

Long before Basel, the standard capital ratio was capital to total assets, with no adjustment in the denominator for any risk-weights. The inverse of this ratio, leverage, was regarded as the best available indicator of bank riskiness: the higher the leverage, the riskier the bank.

These older metrics then went out of fashion. Over 30 years ago, it became fashionable to base regulatory capital ratios on RWAs because of their supposedly greater 'risk sensitivity'. Later the risk models came along, which were believed to provide greater risk sensitivity. The old capital/assets ratio was passé, dismissed as primitive because of its risk insensitivity.

However, the incentives created by the RWA approach turned Basel into a game in which banks loaded up on low risk-weighted assets and most of the risks they took became invisible to the Basel risk measurement system. These problems were starkly revealed during the GFC and the credibility of both RWAs and risk models took a hit, though not as big a hit as they deserved. In the process, the risk insensitivity of the total assets measure was no longer the disadvantage that it had earlier seemed to be.

On the contrary.

The old capital to assets ratio is making a comeback under a new name, the leverage ratio: what is old is new again. The introduction of a minimum leverage ratio is one of the main principles of the Basel III international capital regime.

Strictly speaking, Basel III did not give the old capital-to-assets ratio a new name. Instead, it created a new leverage ratio measure in which the old denominator, total assets, is replaced by a new denominator measure called the leverage exposure. The leverage exposure is meant to take account of the off-balance-sheet positions that the total assets measure fails to include.

So which denominator is better: total assets or the leverage exposure?

Total Assets

Traditionally, the total 'amount at risk' was taken to be the total assets of the bank. This exposure measure worked fairly well when off-balance sheet items were fairly small and/or safe and accounting standards were fairly reliable. In these circumstances TA is a good proxy for the most that the bank can lose. However, for many years now the on-balance-sheet amounts at risk have been overshadowed by the amounts at risk off the balance sheet in derivatives (such as Credit Default Swaps) and certain securitizations. These off-balance-sheet risks have long since made total assets highly inadequate as a measure of total exposure, even leaving aside the fact that the TA is itself gameable.

So is there a better 'amount at risk' measure?

The Leverage Exposure Measure

An alternative measure is the 'leverage exposure' measure introduced by Basel III. This measure (ostensibly) makes an attempt to incorporate some of the off-balance-sheet risks that do not appear in the total assets measure.

One problem is that large derivatives positions in the banking book can remain excluded from the leverage exposure because of rules that allow them to be excluded if they are offset by other positions, the theory being that the net position is hedged. Unfortunately, some hedges are very poor and none is perfect. Hedges are imperfect for several reasons:

First, few if any hedge instruments are exact matches to the underlying position being hedged, which compensate exactly for losses on that position. Any *ex ante* assessment of the performance of a hedge instrument in an adverse scenario is dependent on a lot of assumptions, especially in very adverse scenarios (i.e., the ones that matter). There is always some slippage – known as basis risk – and some hedges involve a *lot* of basis risk. So even when a hedge might look good on paper, we often have little idea of how well it would perform in a crisis.

To give an example, over the period 2005 to 2009, it transpired that Deutsche Bank had a large – at one point, a $130 billion large – position in leveraged super senior trades, 'super senior' or quadruple A meaning theoretically safer than AAA bonds. The

bank was hedging these positions with S&P put options and there was a real danger that in a crisis both the original position and its supposed hedges could take massive hits at the same time.[26] Indeed, this seems to have been what happened. This gross-becomes-net outcome may well have proven fatal for Deutsche – had the bank allegedly not hidden the problem until (some of) the truth emerged in 2012 (Braithwaite, 2012).

Second, most hedges involve contracts with counterparties and therefore create an exposure to counterparty credit risk. As we saw with AIG, if a key counterparty fails, the netting breaks down and the gross position can become net with miserable consequences for the party relying on the hedge. Such problems could then create cascade effects. Suppose Bank A has some credit exposure to Bank B and institutes what appears to be a good hedging strategy to manage that exposure. Bank B, in turn, is exposed to Bank C, and institutes what appears to be a good hedging strategy to manage *that* exposure. Bank C then goes belly-up and Bank B experiences a gross-becomes-net disaster that is transmitted to Bank A, which was unaware of its indirect exposure to Bank C. Concerns about such counterparty cascade effects were a key feature in the AIG fiasco.

On paper, the leverage exposure is meant to take account of off-balance sheet items that would not show up in total assets. However, the regulatory leverage exposure measure is also a highly compromised measure that is the product of a lot of behind the scenes lobbying by banks keen to keep their measured exposures down in order to minimise their capital requirements. Given (a) that off-balance-sheet items can be large relative to on-balance-sheet ones and (b) that accounting netting rules tend to hide a great deal of financial risk, then we would expect any reasonable exposure measure to be considerably larger than reported total assets.

But they are not, at least not for UK banks. In fact, as of 31 December 2019, the total Leverage Exposure for the Big Five UK

[26] They would have been assuming that the Merton default model, which calibrates equity volatility to credit risk, was a good hedge, but there is plenty of evidence that the model, while a fair approximation, is a less than perfect hedge. Moreover it is famously difficult to calibrate.

banks was 96.5% of their Total Assets. Consequently, the leverage exposure measure that takes account of (some) off-balance sheet items is usually less than the total assets measure that does not take account of any of them. Get your head around that one.

What seems to have happened is that the problems posed by hidden off-balance-sheet risks and inadequate RWA measures led to regulatory pressure to find a new denominator that could be used as a basis for additional capital requirements. This response started as a worthy effort to patch up some of the more glaring loopholes in the Basel system. However, the banking industry soon piled in to lobby against a broader denominator that could be used to increase their capital requirements – which was, of course, one of the objectives of the regulators in the first place.

Naturally, the banking lobby did not openly oppose the leverage exposure measure on the grounds that it would have led to higher capital requirements – that would have been too obvious. Instead, the banks emphasised level playing field issues – which are fundamentally irrelevant, but that is another story (Admiti & Hellwig, 2013) – relating primarily to the differences between US Generally Accepted Accounting Principles (GAAP) accounting standards and the IFRS accounting standards that apply in many countries outside the United States. The key point here is that the latter produce notably higher asset values and lower capital ratios than the former, other things being equal.

It appears that this US GAAP vs. IFRS issue provided a useful smokescreen to divert the reform discussion towards harmonisation for the purposes of agreeing how to measure the denominator in the new regulatory leverage ratio. The banks had hijacked the reform effort and the result was peddled as a solution to the off-balance-sheet problem when the reality was that it was not.

So why is the leverage exposure of similar or less magnitude to total assets under IFRS? The answer seems to be that US GAAP allows much more generous netting arrangements than IFRS, so from an IFRS perspective, leverage exposure equals IFRS total assets + plus OBS add-ons + less generous netting, and these latter two offset each other. From the US GAAP perspective, leverage exposure equals US GAAP total assets + plus OBS add-ons + more

generous netting, and so leverage exposure is somewhat, perhaps about 40 percent, higher than US GAAP total assets, and may or (probably) may not be a good measure of true exposure.

Well, you might say, at least the leverage exposure gets us away from the evils of RWAs. It does not even do that, however. Instead, it reintroduces them through the backdoor under a different name. The relevant Basel Committee document (Basel Committee, 2014) handles counterparty credit exposures by means of a system of 'Credit Conversion Factors', add-on factors that are arbitrary, low and frankly senseless. For example, for standard interest-rate, FX, equities and commodity derivatives there are a series of add-on factors that vary from 0% to 15%, and for more exotic Total Return Swaps and Credit Default Swaps there are add-ons of 5% or 10%. The resulting numbers for OBS positions are low and bear no relationship to the true risk exposures. And so these add-ons reintroduce the equivalent of new risk weights and take us back to the RWA problems that the broader exposure measures were supposed to escape from.

The LE is also vulnerable to gaming by the central bank. Since 2017, the BoE has taken to departing from the previous Basel III leverage exposure or in its EU variant, the CRD IV leverage exposure. It does so by subtracting banks' reserves held at the central bank from the earlier leverage exposure measure. The result is to reduce the leverage exposure and thereby push up the reported Tier 1 leverage ratios, which just so happens to make those numbers look better.[27] The Bank made this change quietly almost no-one noticed it. Kevin complained about it in No Stress III, but no-one noticed that either.

Fast forward to April 2020, the Fed adopts the same trick to boost banks' leverage ratios and the Furies are unleashed. To quote Nicolas Véron:

> The financial shock surrounding the COVID-19 pandemic has prompted the Federal Reserve to temporarily loosen an important capital-to-asset ratio requirement for US banks.

[27] Another slightly bizarre twist. In the latest version of the PRA Rulebook, the PRA has taken to referring to the Leverage Exposure as Total Exposure. The latest (December 2019) stress tests still use the term Leverage Exposure, however.

> In so doing, it is walking away from a decade-long commitment to global financial reforms forged in the wake of the global economic meltdown of 2008–10 [and breaching the Basel III Accord].
>
> On April 1, the Federal Reserve announced a temporary change to a regulatory requirement on banks known as the supplementary leverage ratio (or simply the leverage ratio). The leverage ratio, calculated as regulatory capital (or own funds) divided by unweighted assets, supplements the more refined ratios of capital to risk-weighted assets, which are the mainstay of bank capital regulation. While a crude measure of capital strength, the leverage ratio is an apt response to the banks' incentives to underestimate risk-weights; it acts as a simple sanity check, thus the epithet "supplementary."
>
> The new change, which the Fed adopted unanimously, exempts banks' holdings of US sovereign debt (Treasuries) and deposits at the Fed from the assets total in the ratio calculation until end-March 2021. This exemption reduces the denominator, making it easier for banks to meet their minimum-ratio requirements during that period. …
>
> By breaching G20 standards, these decisions contribute to institutional erosion not only at the global level but also domestically. The breaches of Basel III are especially galling since [Fed governor] Quarles now chairs the Financial Stability Board, an umbrella body whose permanent secretariat is located in the same building in Basel as the Basel Committee (Veron, 2020).
>
> Mind you, Basel III unravelling might not be a bad thing.
>
> So all in all, it is probably better to stick with the total assets measure.

A7. How High Should Minimum Capital Requirements Be?

Many prominent experts have called for substantially higher minimum capital requirements and/or much higher levels of capital than those currently prevailing.

John Allison (retired president and CEO, Cato Institute; and retired chairman and CEO, BB&T Bank) calls for "substantially more capital… at least 20 percent shareholders' equity in relation to risk-weighted assets" (Allison, 2013). He elaborates in correspondence to us: "pure tangible capital [should] be 20% [of RWA]. However, it is critical that practically all other regulations be eliminated. Banks cannot operate with strong capital and huge regulatory cost. I believe most bankers would support stronger capital if they really believed that the vast majority of regulations would be eliminated. The problem is bankers do not trust that the regulations would be eliminated."

James Ferguson (The MacroStrategy Partnership) proposes "Tangible leverage ratio (accounting definition) of tangible, loss-absorbing equity to total assets of 7.5% (sufficient to absorb a 10% loss after all recoveries from the up to 75% of total assets that are not default-risk-free).[28]

Sir John Vickers (former chair, Independent Commission on Banking): "Globally I'd say we are out by a factor of two [in terms of capital levels], so in short would say "at least 8%" in terms of common equity. Caveats are (i) low PtB ratios (which argue for a

[28] Personal correspondence, April 13th 2020. He also adds "Some sort of concurrent RWA rule, alongside the leverage ratio, but RWA to be kept under constant review and adjustment by the BoE (reintroduce the Governor's eyebrow?) as well as some sort of sensible (global?) approach to the accounting treatment of derivatives necessary for hedging products."

higher ratio relative to book) and (ii) what a single country should do when the world is at 3 or 4%. The latter was the ICB problem."[29]

In his book, *The End of Alchemy*, former BoE governor Mervyn King suggested that a 10 percent ratio of capital to assets would be "a good start, compared with the 3-5 per cent common today" (King, 2016).

Thomas M. Hoenig (former Kansas City Fed president and former vice chairman, Federal Deposit Insurance Corporation) wrote in a letter to the *FT* in 2012:

> So what level [of capital] would be sufficient? Before deposit insurance was introduced, the tangible equity capital [to assets] ratios for US banks of all sizes averaged above 10 per cent. Depositors insisted on these levels if they were to trust the bank with their money. Now, instead of capital, the public relies on deposit insurance for protection, leaving other banks and taxpayers to backstop a failed financial institution. To protect well-run banks, to protect the taxpayer and to ensure that an economy has access to reliable credit, we should insist on strong capital for all banks.
>
> We can establish a simple but stronger capital base by replacing the unmanageably complex Basel risk-weighted standards with a tangible equity capital ratio of around 10 per cent…. (Hoenig, 2012).

Others suggest also minima that are well above Basel requirements.

A 2019 survey by the Bank of Finland on experts' views on bank capital requirements reported that the modal (most common) answer to a question about the recommended minimum leverage ratio was 10%, although there was considerable variation around that number. This question was answered by 106 respondents (Bank of Finland, 2019). A 10% minimum leverage ratio is about three times the Basel minimum.

A now famous letter, "Healthy Banking System is the Goal, not Profitable Banks," published in the *Financial Times* on November 9,

[29] Personal correspondence October 16th 2019.

2010 (Admiti, 2010) and signed by Anat Admati and nineteen other distinguished financial economists, recommended a minimum ratio of at least 15 percent:

> The Basel III bank-regulation proposals that G20 leaders will discuss fail to eliminate key structural flaws in the current system. Banks' high leverage, and the resulting fragility and systemic risk, contributed to the near collapse of the financial system. Basel III is far from sufficient to protect the system from recurring crises. *If a much larger fraction, at least 15%, of banks' total, non-risk-weighted, assets were funded by equity, the social benefits would be substantial. And the social costs would be minimal, if any.* (Our emphasis)

The signatories were:

Anat R. Admati, Stanford Graduate School of Business
Franklin Allen, The Wharton School, University of Pennsylvania
Richard Brealey, London Business School
Michael Brennan, Anderson School of Management, UCLA
Markus K. Brunnermeier, Princeton University
Arnoud Boot, University of Amsterdam
John H. Cochrane, University of Chicago Booth School of Business
Peter M. DeMarzo, Stanford Graduate School of Business
Eugene F. Fama, Chicago Booth School of Business (and subsequent Nobel laureate, 2013)
Michael Fishman, Kellogg School of Management, Northwestern University
Charles Goodhart, London School of Economics
Martin F. Hellwig, Max Planck Institute for Research on Collective Goods, Bonn
Hayne Leland, Haas School of Business, UC Berkeley
Stewart C. Myers, Sloan School of Management, MIT
Paul Pfleiderer, Stanford Graduate School of Business
Jean Charles Rochet, Swiss Banking Institute, University of Zurich
Stephen A. Ross, Sloan School of Management, MIT
William F. Sharpe, Stanford Graduate School of Business (Nobel Laureate, 1990)
Chester S. Spatt, Tepper School of Business, Carnegie Mellon University
Anjan Thakor, Olin School of Business, Washington University

Some of these signatories have suggested minimum required ratios of more than the 15% mentioned in their letter:

Charles Goodhart writes: "My general understanding is that the optimal capital ratio for banks should probably generally be of the

order of somewhere between 15 and 20% of total assets, though the measurement of the latter is dodgy, because of issues relating to netting particularly of derivatives divisions. Subject to that, I would probably go for a minimum 15% normally, but with a CCYBR [countercyclical capital buffer] of plus or minus 5%, so that the minimum would go down 10% in crises as the present, but could be raised to 20% in periods of extreme Minsky-type optimism."[30]

Admati and Hellwig recommended a minimum "at least of the order of 20-30 percent." (*The Bankers' New Clothes, p.179).*

Cochrane later recommended that the capital requirement should be whatever it takes: "Enough so that it doesn't matter! Enough so that we never, ever hear again the cry that "banks need to be recapitalized" (at taxpayer expense)!" (Cochrane, 2013).

Fama suggested 40 percent to 50 percent in a CNBC interview in May 2010 (*The Bankers' New Clothes, p.179).*

Other authors have also suggested minimum capital ratios of 15% and in some cases more:

Jim Dorn (vice president Cato Institute): "15 percent sound about right to me."

Martin Hutchinson (Bear's Lair journalist[31] and co-author of *Alchemists of Loss*) suggests 15 percent.[32]

Morris Goldstein (former IMF deputy research director) suggests that the optimal leverage ratio should be in the region of 15 percent overall, somewhat less for the smaller and non-systemic banks and somewhat more for the systemic ones (Goldstein, 2017).

Gerald P. O'Driscoll (former vice president Dallas Fed) suggests "15-20 percent capital to assets. Not risk-weighted assets."[33]

[30] Personal correspondence, April 21st 2020.
[31] [Retrieved from].
[32] Personal correspondence.
[33] Personal correspondence.

James R. Barth (Auburn University) and Stephen Matteo Miller (Mercatus Center, George Mason University) suggest on the basis of a careful analysis that the optimal ratio of capital to assets is 19 percent (Barth, & Miller, 2018).

Martin Wolf: "Banking remains far too undercapitalised for comfort: Leverage ratios closer to 5:1 will help give creditors confidence in liabilities" (Wolf, 2017).

Allan Meltzer (Carnegie-Mellon University, chair of the International Financial Institution Advisory Commission aka the Meltzer Commission) recommended 20 percent for the largest banks (*The Bankers' New Clothes*, p.311).

Walker Todd (former Cleveland Fed assistant general counsel) recommended a minimum of 20 percent for the largest banks: "Start with 20 percent on a leverage basis, not risk adjusted, for the big boys, and then we'll talk."[34]

Kevin Dowd and John Skar [35] (former Chief Actuary at MassMutual and AIG Life) suggest at least 20 percent.

Neel Kashkari (Minneapolis Fed president) suggests something in the region of 25 percent.[36]

Simon Johnson (MIT Sloan School of Management and former chief economist of the IMF) has recommend a minimum of the order of 40 percent to 50 percent (*The Bankers' New Clothes*, p.311).

Does a leverage ratio encourage banks to load up on the riskiest assets?

[34] Personal correspondence, May 21st 2017.

[35] Personal correspondence.

[36] "I don't have a number in my head. I've seen some proposals for a 25% capital requirement. So leverage ratios, effectively, just to keep it simple, you know, 4:1. You know, I think that's a place we could discuss. I don't have that – I don't have a magic number yet." "Fed's Kashkari: 25% Capital Requirement May Be Right for Banks." *Wall Street Journal*, 17 February 2016.

A common objection to a minimum required leverage ratio (or minimum capital to total assets ratio, we ignore any distinction between the two here) is that it would encourage banks to load up on the riskiest assets because the leverage ratio ignores the riskiness of individual assets. One could give many examples. To give one, Haldane & Madouros (2011, p.2) write:

> The case against leverage ratios is that they may encourage banks to increase their risk per unit of assets… (Haldane & Madouros, 2011).

Similarly, an editorial in the *Financial Times* – entitled "In praise of bank leverage ratios" – published on July 10th 2013 stated:

> Leverage ratios… encourage lenders to load up on the riskiest assets available, which offer higher returns for the same capital.

But hold on there! If the banks *were* to load up on the riskiest assets, we first need to consider *who* would bear those higher risks.

Claims that a leverage ratio minimum would encourage banks to load up on the riskiest assets are not true as a general proposition and false in the circumstances that matter, i.e., where what is being proposed is a *high* minimum leverage ratio that would internalise the consequences of bank risk-taking. It is false in those circumstances *precisely because* it would internalise such risk-taking.

Consider the following two cases:

In the first, imagine a bank with an infinitessimal leverage ratio based on the thinnest sliver of equity. This bank benefits from the upside of its risk-taking but does not bear any downside. If the risks pay off, it gets the profit; but if it makes a loss, it goes bankrupt and the loss is passed to its creditors. Because the bank does not bear the downside, it has an incentive to load up on the riskiest assets available to maximize its expected profit.

In the second case, imagine a bank with a high leverage ratio. This bank benefits from the upside of its risk-taking but also bears the downside if it makes a loss. Because the bank bears the downside, it no longer has an incentive to load up on the riskiest assets. Instead, it would select a mix of low-risk and high-risk assets that reflected its own risk appetite, i.e., its preferred trade-off between risk and expected return. In this case, the bank would *not* load up on the riskiest assets possible.

Our point is that the impact of a minimum required leverage ratio on bank risk-taking depends on the minimum leverage ratio itself. It is only in the case of an extremely low leverage ratio that banks will load up on the riskiest assets. If the minimum is high enough, then far from encouraging excessive risk-taking as is widely believed, the minimum leverage ratio requirement would internalise (almost all) risk-taking incentives and lead to healthy rather than excessive risk-taking.

A8. UK Banks' Losses During the Global Financial Crisis

The Local Authority Pension Fund Forum *Post Mortem* report written by Tim Bush states that UK banks' shareholder capital losses over 2008-2010 were at least £98.4 billion excluding investment banking losses, and that £98.4 billion is 183% of the banks' shareholder capital as reported in their 2007 *Annual Reports* (or in the case of Northern Rock, in its 2006 *Annual Report*).[37]

The same report also mentions that UK and Irish banks' capital losses exceeded £150 billion. The £150 billion number includes €47 billion euros. We can value the latter at (approximately) £41.9 billion using the end 2019 exchange rate of €1 = £0.89. Subtracting the Irish banks' losses, the UK banks' losses are £108.1 billion. We then multiply 183% by 108.1/98.4 to obtain 201% and can conclude that UK banks' capital losses were at least 201% of their starting capital.

James Ferguson also provides some GFC-related bank loss estimates:

> In addition to the more than £200bn in cumulative loan loss provisions UK banks have had to deal with, there have been roughly £100bn in securities and restructuring (goodwill, etc) losses and at least £60bn in PPI, LIBOR and other legal redress to deal with. These sums overwhelmed the starting 2007 sector shareholder capital, which totalled about £180bn at the time (Ferguson, 2018).

So he is saying that UK banks made losses of one form or the other of at least £360 billion and in subsequent email correspondence, he clarifies that the losses for the big five over the decade from June 2007 to June 2017 are £500 billion.[38] Dividing the latter figure by £180 billion, losses are 278% of their 2007 shareholder capital.

If we apply the latter loss estimate to our estimate of the big 5 banks' 31 December 2006 book value shareholder capital, which is £143.2 billion, then the ratio of losses to capital is 500/143.2 or 349% of their capital at that date.

If we apply the same loss estimate to the corresponding market value of the banks' 31 December 2006 shareholder capital, which is

[37] See Local Authority Pension Fund Forum, *UK and Irish Banks Capital Losses - Post-Mortem*, p. 3.

[38] James Ferguson email to Kevin Dowd, April 19th 2017.

£360.9 billion, then the ratio of losses to capital is 500/360.9 or 139% of their capital.

Both the LAPFF/Bush and Ferguson loss estimates should be regarded as authoritative. The main difference between them is that the former apply to the period 2008-2010 whereas the latter apply right up to mid 2017.

In sum, we have a 'best' total bank losses estimate of £500 billion, and estimates of the ratio of losses to capital that vary from 139% to 349% depending on estimates of the starting capital.

It is then safe to say that the GFC losses more than wiped out the capital of the UK banking system and arguably did so over three times over.

A9. HSBC's Exposure to Hong Kong

A *Zero Hedge* article, "Hong Kong Violence Sends Home Prices Tumbling Over 20%, Puts HSBC In The Crosshairs," on October 6th last year had some interesting observations on HSBC's exposure to Hong Kong.

> Oct. 1 might be remembered as an important turning point for the Hong Kong property market. In the wake of riots that saw an unprecedented escalation in violence (police shot a teenager with live fire for the first time), SCMP reports that the Hong Kong property market has seen prices reduced by as much as 20%.[39]
>
> That HK property prices have been hit hard by the protests is hardly news. It's a theme we've covered before.
>
> But as protests threaten to drag on into a fifth month despite a police crackdown and a new attempt by the city's executive council to discourage protesters by banning masks - something that has, so far, only served to infuriate the protesters and encourage more violence - it's going to be difficult to call a bottom in the Hong Kong property market, formerly one of the most unaffordable markets in the world, as many Hong Kongers flee to places like Taiwan and Malaysia. …
>
> [These falls in property prices are] a particularly serious problem for HSBC, which has underwritten many of the mortgages on Hong Kong homes. That's right: The protests could seriously destabilize the 6th-largest bank by assets in the world.
>
> Our friends at the Strategic Macro Blog recently took a look at the cockroaches in HSBC's basement and laid out how vulnerable the bank truly is to the economic shock brought on by the protests.

The article *ZH* refers to is "HSBC's exposure to Hong Kong real estate," published by Strategic Macro on August 5th 2019. The article states

> So conventional wisdom is that post-Basel III the banks hold a lot of capital against loans and are run

[39] To clarify, the SCMP article referred to (Ka-sing, 2019) gave examples where homeowners had slashed prices, in one case by over 20%. It also gave some local indices, which showed falls from peak varying from 15.3% to 27.9%, falls that are considerable larger than those reported in our Figure 2 on p. 23.

> conservatively. And in a normalised market this is very true I think.
>
> However when you are calculating LTVs and RWAs and PDs against bubble valuation levels, are they still appropriate? If you calculated it against replacement costs, the LTVs would go through the roof, and so would RWAs and the banks would be left with an CET tier 1 equity deficit to be covered by a rights issue. Any losses and higher RWAs on impaired loans would further cost equity.
>
> So Hong Kong real estate which yields 1-3% rental yields in many cases, vs a Prime lending rate which is 5.15% is an enormous, negatively carrying bubble, propped up by speculation and Chinese capital flows.

The point being is that anyone who borrows at 5.15% in order to invest at 1-3% rental yield is speculating on the property growth outweighing the carry cost (5.15%).

> HSBC is the 800lb gorilla in a banking system where M3 is >5x GDP.

The article then proceeds to give a more detailed analysis of HSBC's HK property exposures based on its 2018 financial statements.

Using their analysis as a template, we provide our own comments below based on HSBC's 2019 *Annual Report* and *Pillar 3 Disclosures* and applying to the end of December 2019.

To give these numbers a sense of scale, HSBC's latest market cap is $64.4 billion.

The first point (*AR*, p.64) to note is loans and advances to customers: $307 billion for HK, $43.4 billion for China:

Table A9.1: *HSBC Loans and Advances to Hong Kong and China*

Reconciliation of reported and adjusted items (continued)

	Footnotes	2019 UK $m	Hong Kong $m	Mainland China $m	US $m	Mexico $m
Revenue	1					
Reported		13,538	19,412	3,101	4,638	2,555
Significant items		23	26	1	66	8
– customer redress programmes		162	–	–	–	–
– disposals, acquisitions and investment in new businesses		–	–	–	59	–
– fair value movements on financial instruments	2	(139)	26	1	7	8
Adjusted		13,561	19,438	3,102	4,704	2,563
ECL						
Reported		(714)	(459)	(129)	(170)	(491)
Adjusted		(714)	(459)	(129)	(170)	(491)
Operating expenses						
Reported		(16,157)	(6,935)	(2,111)	(4,033)	(1,390)
Significant items		1,795	64	6	93	20
– costs of structural reform	3	101	4	–	–	–
– customer redress programmes		1,281	–	–	–	–
– restructuring and other related costs		405	61	6	93	20
– settlements and provisions in connection with legal and regulatory matters		8	(1)	–	–	–
Adjusted		(14,362)	(6,871)	(2,105)	(3,940)	(1,370)
Share of profit/(loss) in associates and joint ventures						
Reported		(12)	31	2,016	–	13
Adjusted		(12)	31	2,016	–	13
Profit/(loss) before tax						
Reported		(3,345)	12,049	2,877	435	687
Significant items		1,818	90	7	159	28
– revenue		23	26	1	66	8
– operating expenses		1,795	64	6	93	20
Adjusted		(1,527)	12,139	2,884	594	715
Loans and advances to customers (net)						
Reported		303,041	306,964	42,380	63,588	20,426

Then consider the projected central scenario (AR, p.93):

Table A9.2: *HSBC Central Scenario*

Central scenario (average 2020–2024)

	UK %	France %	Hong Kong %	Mainland China %
GDP growth rate[1]	1.6	1.3	1.9	5.6
Inflation	2.0	1.6	2.2	2.4
Unemployment	4.4	7.8	3.1	4.0
Short-term interest rate	0.6	(0.6)	1.1	3.8
10-year Treasury bond yields	1.7	1.0	2.4	N/A
House price growth	3.0	2.9	3.8	4.6
Equity price growth	2.8	3.4	5.1	7.9
Probability	55.0	80.0	50.0	80.0

and the downside stress scenario (AR, p.94)

Table A9.3: *HSBC Stress Scenario*

Downside scenario (average 2020–2024)

	UK	France	Hong Kong	Mainland China
	%	%	%	%
GDP growth rate[1]	1.0	1.0	1.4	5.6
Inflation	1.7	1.3	1.9	2.1
Unemployment	4.8	8.2	3.3	4.0
Short-term interest rate	0.1	(0.9)	(0.1)	3.6
10-year Treasury bond yields	0.8	0.2	1.2	N/A
House price growth	1.6	1.9	2.3	3.9
Equity price growth	(1.1)	(2.3)	(0.7)	1.1
Probability	0	10	10	0

which both look optimistic, e.g., average house price growth over the 5 year scenario horizon is 2.9% for the central scenario and 1.9% for the stress scenario. There is no sense here of a possible real estate downturn, let alone a severe one. The stock market growth assumptions also look optimistic.

Remember that after the East Asian crisis, HK residential prices fell by almost 70%.

The next table (*AR*, p.108) looks at wholesale lending:

Table A9.4: *HSBC Wholesale Lending*

Wholesale lending – distribution of financial instruments to which the impairment requirements of IFRS 9 are applied by credit quality

	Gross carrying/nominal amount							
	Strong	Good	Satisfactory	Sub-standard	Credit impaired	Total	Allowance for ECL	Net
	$m	$m	$m	$m	$m	$m	$m	$m
By geography								
Europe	57,340	69,427	74,143	9,895	4,799	215,604	(2,399)	213,205
of which: UK	*35,838*	*53,046*	*51,355*	*7,023*	*3,420*	*150,682*	*(1,658)*	*149,024*
Asia	145,450	106,313	86,685	2,158	1,553	342,159	(1,505)	340,654
of which: Hong Kong	*82,053*	*67,541*	*55,379*	*1,263*	*721*	*206,957*	*(793)*	*206,164*

The points that jump out here are $207 billion in wholesale loans, of which $55.4 billion in loans classified as 'satisfactory' (implying they are one step away become sub-standard) and a rather optimistic 0.73/207 = 0.35% expected credit losses (ECL) rate.

A slide of these barely 'satisfactory' loans into 'sub-standard' or 'credit-impaired' could then see a jump in the expected loss (and actual) loss rates.

Next is a table on CRE, see end column:

Table A9.5: HSBC Commercial and Real Estate Lending

Commercial real estate lending

	Europe	Asia	MENA	North America	Latin America	Total	Of which: UK	Of which: Hong Kong
	$m	$m	$m	$m	$m	$m	$m	$m
Gross loans and advances								
Stage 1	25,017	76,832	1,507	10,938	1,653	115,947	*17,953*	*60,632*
Stage 2	3,988	2,673	18	508	41	7,228	*2,953*	*1,696*
Stage 3	1,115	21	208	33	27	1,404	*948*	*17*
POCI	1	–	–	–	–	1	–	–
At 31 Dec 2019	30,121	79,526	1,733	11,479	1,721	124,580	*21,854*	*62,345*
– of which: renegotiated loans	*788*	–	*195*	–	–	*983*	*782*	–
Allowance for ECL	(372)	(78)	(170)	(17)	(7)	(644)	*(305)*	*(40)*

So there is $62.3 billion in CRE loans, of which $60.6 billion (i.e., 97.3%) is classed as Stage 1.

Any significant reclassification (e.g., due to deterioration) of the Stage 1 loans would then produce a notable 'cliff edge' reporting and provisioning effect with serious knock-on effects on the bank's capital.

The next table shows wholesale lending broken down by stages:

Table A9.6: *HSBC Wholesale Lending by Stage Distribution*

Wholesale lending – commercial real estate loans and advances including loan commitments by level of collateral for key countries/territories (by stage)

(Audited)

	Total		Of which: UK		Hong Kong		US	
	Gross carrying/ nominal amount	ECL coverage	Gross carrying/ nominal amount	ECL coverage	Gross carrying/ nominal amount	ECL coverage	Gross carrying/ nominal amount	ECL coverage
	$m	%	$m	%	$m	%	$m	%
Stage 1								
Not collateralised	61,820	0.1	7,266	0.1	32,478	–	541	–
Fully collateralised	89,319	0.1	18,535	–	41,798	–	4,722	–
LTV ratio:								
– less than 50%	46,318	0.1	7,018	0.1	28,776	–	1,703	0.1
– 51% to 75%	32,583	0.1	9,349	–	10,815	0.1	2,854	–
– 76% to 90%	5,018	0.1	1,649	0.1	1,436	0.1	96	–
– 91% to 100%	5,400	0.2	519	–	771	–	69	–
Partially collateralised (A):	6,563	0.2	682	–	1,627	0.1	–	–
– *collateral value on A*	3,602		535		1,142		–	
Total	157,702	0.1	26,483	0.1	75,903	–	5,263	–
Stage 2								
Not collateralised	3,040	1.2	1,857	1.2	440	0.2	–	–
Fully collateralised	5,184	1.1	1,419	1.2	1,501	0.6	354	1.4
LTV ratio:								
– less than 50%	2,167	1.1	615	1.8	955	0.3	62	–
– 51% to 75%	1,986	0.9	712	0.6	497	1.0	292	1.4
– 76% to 90%	333	2.1	16	6.3	29	–	–	–
– 91% to 100%	698	1.1	76	1.3	20	–	–	–
Partially collateralised (B):	500	0.6	296	0.3	42	–	–	–
– *collateral value on B*	203		56		25		–	
Total	8,724	1.1	3,572	1.1	1,983	0.5	354	–
Stage 3								
Not collateralised	315	57.8	66	92.4	–	–	–	–
Fully collateralised	557	14.9	404	12.9	17	11.8	–	–
LTV ratio:								
– less than 50%	87	16.1	42	7.1	6	16.7	–	–
– 51% to 75%	90	7.8	69	4.3	10	–	–	–
– 76% to 90%	89	15.7	72	4.2	–	–	–	–
– 91% to 100%	291	16.5	221	19.5	1	–	–	–
Partially collateralised (C):	773	41.5	507	27.8	–	–	–	–
– *collateral value on C*	380		166		–		–	
Total	1,645	35.6	977	26.0	17	11.8	–	–
POCI								
Not collateralised	–	–	–	–	–	–	–	–
Fully collateralised	1	–	–	–	–	–	–	–
LTV ratio:								
– less than 50%	1	–	–	–	–	–	–	–
– 51% to 75%	–	–	–	–	–	–	–	–
– 76% to 90%	–	–	–	–	–	–	–	–
– 91% to 100%	–	–	–	–	–	–	–	–
Partially collateralised (D):	–	–	–	–	–	–	–	–
– *collateral value on D*	–		–		–		–	
Total	1	–	–	–	–	–	–	–
At 31 Dec 2019	168,072	0.5	31,032	1.0	77,903	0.1	5,617	0.1

There is $77.9 billion in wholesale lending, of which $75.9 billion (or 97.4%) is classified as Stage 1, and of that $45.5 billion is either not collateralised or has an LTV > 50%.

Then there is personal loans:

Table A9.7: *HSBC Personal Lending by Stage Distribution*

Total personal lending for loans and advances to customers at amortised cost by stage distribution

	Gross carrying amount				Allowance for ECL			
	Stage 1	Stage 2	Stage 3	Total	Stage 1	Stage 2	Stage 3	Total
	$m	$m	$m	$m	$m	$m	$m	$m
By portfolio								
First lien residential mortgages	312,031	7,077	3,070	322,178	(39)	(68)	(422)	(529)
– of which: interest only (including offset)	*31,201*	*1,602*	*376*	*33,179*	*(6)*	*(15)*	*(91)*	*(112)*
– affordability (including US adjustable rate mortgages)	*14,222*	*796*	*514*	*15,532*	*(3)*	*(3)*	*(3)*	*(9)*
Other personal lending	101,638	8,674	1,781	112,093	(544)	(1,268)	(793)	(2,605)
– other	77,031	4,575	1,193	82,799	(229)	(451)	(491)	(1,171)
– credit cards	22,285	3,959	524	26,768	(310)	(801)	(284)	(1,395)
– second lien residential mortgages	750	84	55	889	(1)	(6)	(10)	(17)
– motor vehicle finance	1,572	56	9	1,637	(4)	(10)	(8)	(22)
At 31 Dec 2019	413,669	15,751	4,851	434,271	(583)	(1,336)	(1,215)	(3,134)
By geography								
Europe	186,561	6,854	2,335	195,750	(112)	(538)	(578)	(1,228)
– of which: UK	*153,313*	*5,455*	*1,612*	*160,380*	*(104)*	*(513)*	*(370)*	*(987)*
Asia	173,523	5,855	717	180,095	(223)	(339)	(170)	(732)
– of which: Hong Kong	*117,013*	*2,751*	*189*	*119,953*	*(90)*	*(220)*	*(44)*	*(354)*
MENA	5,671	247	299	6,217	(50)	(58)	(189)	(297)
North America	41,148	1,930	1,238	44,316	(56)	(119)	(141)	(316)
Latin America	6,766	865	262	7,893	(142)	(282)	(137)	(561)
At 31 Dec 2019	413,669	15,751	4,851	434,271	(583)	(1,336)	(1,215)	(3,134)

Total personal lending is £120 billion with an ECL of $354 million, implying an ECL rate of 0.3%. Of the $120 billion total, $117 billion (or 97.5%) is Stage 1, and the ECL on that is $90 million, implying a very low ECL rate of 0.08%.

The following table summarises the main takeaway points from the last three tables:

Table A9.8: *HSBC Hong Kong Stage 1 Loans*

Loan	Stage 1	
	Size	% of total
HSBC HK CRE	$60.6 bn	**97.3**
HSBC HK wholesale	$75.9 bn	**97.4**
HSBC HK personal	$117.0 bn	**97.5**
Big Five UK	£2,108 bn	90%

Over 97% of HSBC's HK loans are classified as Stage 1, in comparison to 'only' 90% of the loans of the Big Five UK banks as a whole. It is highly likely that some of these have been misclassified and any significant reclassification to Stage 2 (e.g., because of a deterioration in conditions) would lead to 'cliff edge' jump in expected credit losses.

Turning to HSBC's 2019 *Pillar 3 Report*, Table 45 reports key parameters in the bank's IRB models:

Table A9.9: *HSBC's Hong Kong IRB Mortgage Models*

Table 45: IRB models – estimated and actual values (retail)[1]

	PD		LGD		EAD	
	Estimated %	Actuals %	Estimated %	Actuals %	Estimated %	Actuals %
2019						
UK						
– HSBC residential mortgage	0.33	0.29	9.17	0.32	0.29	0.28
– FD residential mortgages	0.42	0.34	7.42	1.85	0.93	0.74
– HSBC credit card	1.06	1.05	91.29	88.58	1.51	1.48
– HSBC personal loans	2.54	2.19	83.61	61.79	2.26	2.10
– Business Banking (Retail SME)	2.95	2.92	78.23	55.48	2.54	2.31
Hong Kong						
– HSBC personal residential mortgage	0.60	0.03	1.58	1.21	0.02	0.02
– Hang Seng personal residential mortgage	0.37	0.10	4.52	1.03	0.07	0.07
– HSBC credit card	0.53	0.20	89.06	78.37	0.38	0.40
– HSBC personal instalment loans	2.13	1.31	88.92	84.70	1.06	0.92

For HK mortgages, estimated PSs (Probabilities of Default) vary from 0.37% to 0.6%, and EADs (Exposures at Default) vary from 0.02% to 0.07%.

Table 70a reports parameters for the bank's wholesale IRB approach:

Table A9.10: *HSBC's Hong Kong Wholesale IRB Advanced Approach*

Table 70.a: PD, LGD, RWA and exposure by country/territory – wholesale IRB advanced ap

	Wholesale IRB ad			
	All asset classes			
	At 31 Dec 2019			
	Exposure-weighted average PD %	Exposure-weighted average LGD %	Exposure value $bn	RWAs $bn
Europe	1.88	35.3	236.7	96.1
UK	1.87	35.8	186.9	76.5
France	2.31	30.2	39.3	17.5
Asia	0.65	42.9	573.8	176.4
Hong Kong	0.64	39.0	317.0	87.6

PD = 0.64% and the ratio of RWA to exposure is 87.6/317 = 27.6%.

Table 70c reports parameters for the bank's retail IRB approach:

Table A9.11: *HSBC's Hong Kong Retail IRB Approach*

Table 70.c: PD, LGD, RWA and exposure by country/terri

	All asset classes At 31 Dec 2019			
	Exposure-weighted average PD	Exposure-weighted average LGD	Exposure value	RWAs
	%	%	$bn	$bn
Europe	**1.56**	**28.1**	**234.7**	**30.4**
UK	**1.35**	**31.2**	**200.3**	**26.9**
France	**3.42**	**13.1**	**26.5**	**3.3**
Asia	**0.88**	**28.9**	**192.3**	**36.1**
Hong Kong	**0.76**	**33.7**	**150.4**	**31.7**

PD = 0.76% and the ratio of RWA to exposure is 31.7/150.4 = 21%.

The PDs here are very low and typical of pre-downturn conditions. In a typical downturn, we might expect a loss rate of 10% and in a severe downturn we might expect loss rates of 15% or more.

It is only by IRB derived models and applying low PDs and low LGD rates has the bank been able to book these loans at 20% or 30% RWA levels and as such 'Category 1 loans'. Category 3, 4 or 5 loans carry 100% or 150% RWA charges, however. So any large falls in property prices will likely cause large rises in PDs and RWAs and have a serious adverse impact on capital.

One can draw one's own conclusions, but to our way of thinking, there is an awful lot of optimism here.

A10. The Unreliability

of Level 3 Valuations: The Case of Enron

The Enron case provides an extreme example of the vulnerability of Level 3 valuations methods to abuse.

The following provides a precis from an excellent analysis of the Enron case by Haldeman (2006). The emphasis is ours.

"The earliest revelations about Enron indicated that the *company's financial statements were seriously misleading*. When the company announced massive write-offs and restatements in October and November 2001, it seemed that fraud must have been involved. As the Enron story unfolded, it was revealed that the company had pursued *so many accounting artifices* in its financial reporting that *"its financial statements bore little resemblance to its actual financial condition or performance"* ["Third Interim Report of N. Batson (2003, Chapter 11, Case No.01-16034]. It could even be argued that *Enron resembled an organized crime syndicate*; efforts to mislead investors required the coordinated efforts of many people. As a result of their combined efforts, equity losses to Enron shareholders were $65 billion and losses to creditors will be $51 billion."

"Lay and Skilling had a unique strategy in preparing for their criminal trial. The *Wall Street Journal* carried a page-one story titled "An Audacious Enron Defense: Company's Moves Were All Legal" (Emshwiller, 2006). A principal contention of the prosecution was that Enron hid losses through improper and misleading use of special-purpose entities (SPE) and outside partnerships; however, the defense was prepared to argue that '*Enron's use of the entities met all necessary accounting and legal criteria.*'"

"Effectively, [former CEOs] Lay and Skilling were willing to admit that they fully understood the accounting rules, they understood the picture of Enron that these rules presented to investors, and they (and their subordinates) intentionally *applied the accounting rules to their logical conclusion*."

"The most frequently criticized accounting issue at Enron was the company's use of off–balance- sheet financing. Regarding

Enron's use of 'SPEs and aggressive accounting practices,' Neal Batson, the court-appointed examiner-in-bankruptcy for Enron, concluded the following in his report:

> "Although evidence suggests that Enron's financial engineering began years earlier, the Examiner focused on 2000, the last year for which Enron issued audited financial statements. That year, Enron's use of six accounting techniques produced 96% of its reported net income and 105% of its reported funds flow from operating activities, and enabled it to report *$10.2 billion of debt rather than $22.1 billion of debt*."

"Enron's balance sheet also included current and noncurrent accounts captioned "price risk management assets" (PRMA). These were Enron's [Level 3] fair value accounting assets. Skilling and Enron persuaded the SEC in January 1992 that Enron should be able to use mark-to-market accounting to value long-term gas contracts and derivatives (McLean & Elkind, 2013). Thus, the SEC handed Enron the tools to *abandon traditional principles and introduce the bookkeeping analogue of financial engineering into nonfinancial companies. Enron eagerly applied the tools* and soon began discounting to present value as much as 29 years of income from customer contracts. The *result, after considerable manipulation, was instantaneous increases in assets and offsetting equity and, of course, income*. By 2000, Enron's PRMA amounted to $21 billion (31% of reported assets), quadruple their 1999 carrying value ($5 billion, or 15% of reported assets)." [DB/KD: A red flag.]

"Not only did fair value accounting probably contribute more to Enron's collapse than SPEs did, but it was also partially responsible for Enron's decision to use them [in the first place]."

"The accounting profession increases its own vulnerability as its standards progress toward the increased application of Level 3 fair value accounting. It drives *itself* toward ever greater subjectivity! [Level 3] Fair value accounting is turning corporate financial reporting into speculation about future events and forcing independent accountants to speculate about whether a corporation's speculations are 'reasonable.'"

"In the end, increasingly subjective financial statements, combined with insulation from liability, will make it nearly

impossible to hold anyone accountable for the inevitable opportunistic bookkeeping."

"Enron *invented whole businesses*—including trading desks, fixed assets, and capitalized software— in order *to create and maintain Level 3 PRMA*. These businesses never had any real business purpose, and never created tangible cash benefits for shareholders. Their *purpose was to manipulate into current years as much speculative future income as they could, so that management could profit from their incentive compensation agreement***s**. It would have been nearly impossible for any outsider to call these businesses, employing thousands of workers, worthless, especially because the SEC said it was all legal."

"*Judging by Enron's asset recovery experience, it is likely that Enron's PRMAs were worthless from the day their use was approved and should never have been permitted at all*."

Andy Fastow's Mea Culpa

Former Enron CFO Andy Fastow spent more than five years in federal prison for his crimes at Enron. After he was released he gave a talk to the Association of Certified Fraud Examiners. To quote from a Fortune article (Elkind, 2013) about his talk:

> "Why am I here?" he asked. "First of all, let me say I'm here because I'm guilty... I caused immeasurable damage...I can never repair that…."
>
> "The last reason I'm here," Fastow continued, "is because, in my opinion, the problem today is 10 times worse than when Enron had its implosion... The things that Enron did, and that I did, are being done today, and in many cases they're being done in such a manner that makes me blush — and I was the CFO of Enron." He cited the continuing widespread use of off-balance-sheet vehicles, as well as inflated financial assumptions embedded in corporate pension plans.
>
> Fastow said he was prosecuted "for not technically complying with certain securities rules" — but that wasn't "the important reason why I'm guilty." The "most egregious reason" for his culpability, he said, was that the transactions he spearheaded "intentionally created a false appearance of what Enron was — it made Enron look healthy when it really wasn't."

> "Accounting rules and regulations and securities laws and regulation are vague," Fastow explained. "They're complex ... What I did at Enron and what we tended to do as a company [was] to view that complexity, that vagueness... not as a problem, but as an opportunity." The only question was "do the rules allow it — or do the rules allow an interpretation that will allow it?"
>
> Fastow insisted he got approval for every single deal — from lawyers, accountants, management, and directors — yet noted that Enron is still considered "the largest accounting fraud in history." He asked rhetorically, "How can it be that you get approvals... and it's still fraud?"
>
> Because it was misleading, Fastow said — and he knew it. "I knew it was wrong," he told the crowd. "I knew that what I was doing was misleading. But I didn't think it was illegal. I thought: That's how the game is played. You have a complex set of rules, and the objective is to use the rules to your advantage. And that was the mistake I made."

As he elaborated in a later talk:

> "What I am talking about are people who technically follow the rules but undermine the principles of those rules. Is a loophole a good thing or a bad thing?
>
> "Most people say it's a good thing, especially when it comes to paying taxes. At Enron, I found every loophole in the finance and accounting area. My title was chief financial officer but I should have been called chief loophole officer. I undermined every principle possible," he said.
>
> Never when I did these transactions did I think about the ethics. I simply said we have a rulebook, it's amoral, just a bunch of rules (Coonan, 2016).

To return to the *Fortune* article:

> After speaking for about 20 minutes, Fastow took questions. …the final question: "This is on a lot of people's minds. Many people vilify you for what you did at Enron, and the resulting effect on other companies, pensions, market share, people's fortunes. How do you grapple with that? How do you react to that condemnation?"
>
> "Um, well, first of all," said Fastow, looking down, "I deserve it. It's a very difficult thing to accept that about yourself. I didn't set out to commit a crime. I certainly didn't set out to hurt anyone. When I was working at Enron, you know, I was kind of a hero, because I helped the

> company make its numbers every quarter. And I thought I was doing a good thing. I thought I was smart. But I wasn't."
>
> That over, the former Enron CFO departed for his flight back to Houston, carrying a tote bag he'd been given bearing the logo of the Association of Certified Fraud Examiners.
>
> "Quite a bit of irony in that," Fastow remarked.

Enron is far from being the other case where Level 3 valuations turned out to be unreliable. We saw many others in the GFC: Bear Stearns, Deutsche Bank, Monte de Paschi, etc.

A Post Script

Enron is often used by critics of fair value accounting to criticise the concept itself. We would disagree. The principle of fair value accounting is to use the value that a market participant would use to value a book, and for level 3, the key point is that "unobservable inputs shall reflect *the assumptions that market participants would use* when pricing the asset or liability." There was no way that a market participant would have valued Enron's positions in the way that Enron valued them.

This said, the Enron case shows that on its own, and without careful safeguards, then Level 3 accounting is dangerous. The solution to that problem lies in a combination of better governance and the better reserving.

The former would involve more effective mechanisms to expose abuse of Level 3 valuations and hold those responsible to account.

The latter involve reserving against uncertain inputs, by keeping uncertain mark to market profits as retained earnings or by use of some other cautionary reserve account on the liability side of the balance sheet.

Accounting standards bodies have however been resistant to a more expanded (i.e., effective) governance role, and many accountants and, indeed, the IASB, have resisted reserving on the grounds that judgments about risk are not for the accountant. The accounting standards have no concept of capital adequacy and few accountants want the responsibility of judging a firm's capital adequacy. But we would argue that the accountant's job is to 'give

an account' or reckoning of a firm's business position, and making judgments about risk is part of that reckoning, or should be.

Thus, the problem is not so much Fair Value as such, but, rather, that the Fair Value project still has a way to go.

A11. Regulatory Credit Risk

Modelling

Credit exposures on the trading book are marked to market on the assumption that the market price reflects all information on credit risk. However, there is typically no market information on the credit risk of a bank's *loan* book and banks traditionally relied on valuations based on the expertise and subjective judgments of their internal credit teams.

Then along comes Basel which then allowed banks to use valuations based on its 'internal ratings based' (IRB) approach. This approach relies on the credit team giving an internal rating similar in form to that given by public ratings agencies, which can then be mapped to an imputed probability of default. Banks using the IRB approach are then given calibrations based on a default model calibrated by the Basel Committee.

Then along comes The Approach Formerly Known as the 'Advanced Ratings Based' (AIRB) Approach, which allows qualifying banks (i.e., the big ones) to produce the calibrations themselves using a regulatory capital model, designed by Federal Reserve Board official Michael Gordy (2003). Gordy adapted the credit default model originally devised by Oldrich Vasicek, a gifted Czech mathematician and probability theorist who had worked with the legendary Fischer Black and Myron Scholes at Wells Fargo Bank. At the time, the Federal Reserve Board was the leading voice for capital model reform, and Gordy's paper supported their contribution to the Basel II consultative process. Here is the Vasicek formula as modified by Gordy:

$$K = LGD.[\text{probability of unexpected default} - \text{probability of expected default}]$$
$$= LGD.[\Phi(\text{sqrt}(1/(1- R)).\Phi^{-1}(pd) + \text{sqrt}(R/(1-R)).\Phi^{-1}(0.999)) - pd]$$

where K is the capital *requirement* for an individual credit, LGD the loss given default, Φ the cumulative normal distribution function, Φ^{-1} its inverse, pd is the probability of default and R is the 'dependence on the economy in general,' as Vasicek called it. The hard-wired number 0.999 represents the 1 in 1,000

year probability. The appeal to regulators was that the capital requirement for each credit (or book of similar credits) could be aggregated to give an overall capital requirement for an entire credit book, not to forget the benefit that the resulting capital requirements would be high enough to ensure that the bank would likely not default for another five hundred years.

There are many problems with this approach. One problem is that the formula subtracts the *expected* loss based on the assumption that the expected loss has already been incorporated by accountants into a provision or impairment for expected loss (see Appendix 11 on IFRS 9).

But we *don't know* whether the accountants have done so, even though they are required to: the accountancy operation of a bank is typically miles away from its capital management function, moreover it is run by accountants. So we have a disconnect between the regulatory balance sheet assumed by the model and populated by the risk managers, and the statutory balance sheet manned by the accountants.

Another problem is the assumption about the dependence R on the 'economy in general'. But (a) what is this R? (b) how do we measure it? and (c) how do we know that the dependence we have measured in the past, typically through a period of low defaults, is going to resemble the dependence realised during a period of catastrophe?

A third problem is the estimation of the probability of default. If the probability of default is small, then capital *available* will be *large*. By the same token, the unexpected loss will also be small, so the capital *required* will be *small*. The solvency ratio (the capital available divided by capital required) will then look healthy. But if the probability of default goes up, then the available capital goes down and the required capital goes up, reinforcing the impact of the probability of default on the solvency ratio.

The probability of default has a significant effect on the solvency ratio of a bank, because it affects both capital available and capital required. Yet, for something that has so much of an impact, it is notoriously hard to estimate. Vasicek assumed that the effect of newly available information on asset value could be modelled by a geometric random walk and this assumption is a standard one in

modern financial theory. The underlying premiss is that the market valuation of a credit portfolio does not so much depend on the judgment of some internal credit committee or skilled person, but on the market's own valuation of all the information coming through. It is not that the judgments of committees or experts are unimportant, for they are not. The point, rather, is that the judgment that really matters is that made by the market, based on *all currently available information* about the company's assets, and is already reflected in the company's market value. This fact does not mean that the market judgment is accurate in the sense that its implicit forecasts of default will be realised, but rather that no judgment by any person, committee or institution is likely to be superior (Vasicek, 2002). This is a classic formulation of the *Efficient Markets Hypothesis* that emerged in the 1960s and 1970s.

However, it is far from certain that markets do reflect available information in this way. There can be information in the public domain (e.g. buried in a regulatory report) that investors and analysts simply haven't noticed. There can also be information in the *private* domain which could have an important impact on the company's share price but which has not reached the public.

In the case of HBOS, one such secret was a book of Irish loans by the oddly named Bank of Scotland (Ireland). Not only was the risk of this book hidden from the market and the regulators, it was hidden even from the bank's own head of credit risk:

> An urgent meeting was called on the morning of Sunday 5 October 2008 attended by the Corporate Risk function and representatives of both Corporate and Group senior management to go through the impairment forecasts on a loan by loan basis. *There are no minutes for this meeting* and the Head of Group Credit Risk at HBOS has told this Review that he was 'completely excluded' from all decisions about Corporate impairments because of the concerns he had previously raised (PRA, 2015).[40]

It was loan books like the Irish one that sunk HBOS. Up to 2013, 86% of losses totalling £39.6bn were written off as irrecoverable (PRA, 2015, p.764).

[40] Note that the cumulative gross losses due to impairment are different from the net losses, which benefit from interest and other forms of income.

Returning to the question of why a bank using a model that ensured a one-in-a-thousand-years probability of default managed to fail *in the same year* it was implemented, it seems that the primary problem was the data fed into the model. The implicit assumption here is that the information available to the market comes from free flows of information such as assumed by Vasicek. The problem with any such assumption is the way that vested interests (and regulators) like to keep things secret. Information may *want* to be free, but it is often a hostage locked up a high security block. What is the probability, over one thousand years, that there won't be a similar event such as HBOS, at any bank or insurance company, where information about potential losses is carefully protected from the market by those who have a commercial interest in doing do?

Quite low, wouldn't you think?

Yet the Gordy/Vasicek formula and its 'one year in a thousand' capital requirement is *still* a pillar of the Basel system, albeit well disguised under a pile of trifling adjustments introduced by a succession of subsequent regulators. The Pillars of Basel are indeed built on feet of clay.

A12. The 'Hold Capital' Fallacy

It is commonly claimed, especially by bank CEOs, that banks 'hold' capital and, moreover, that higher capital requirements would be bad for the economy because it would restrict banks' ability to lend.

Consider the following quotes:

> "Britain's biggest banks will warn the chancellor that up to £1tn is poised to be drained from the financial system, hampering economic recovery and depriving households and businesses of loans and other forms of credit. …
>
> The banks have also calculated that demands by international banking regulators in Basle that they bolster their capital will require the UK's banking industry to hold an extra £600bn of capital that might otherwise have been deployed as loans to businesses or households." (Treanor, 2010).
>
> "Higher capital requirements "would restrict [banks'] ability to provide loans to the rest of the economy. This reduces growth and has negative effects for all." (Josef Ackermann, then CEO of DB, 2010).
>
> "The FPC was concerned that banks could respond to these developments by *hoarding capital and restricting lending*." (Carney, 2016, our emphasis; Bank of England, 2016).

These and similar arguments are a recurring theme in banks' PR offensive against higher capital requirements.

That there must be a flaw with such arguments is clear when you put them on their head by a reductio ad absurdum counter argument. If higher capital requirements are bad because they restrict lending and growth, then lower capital requirements must be good for the economy because they foster lending and growth. If so, why not keep reducing capital requirements to the point where they disappear so we can maximise bank lending and economic growth? But hold on. Doesn't reducing capital requirements increase leverage? Yes. Doesn't reducing them as much as possible maximise leverage? And isn't maximising leverage going to lead to excessive leverage? Yes. And isn't excessive leverage a bad thing. Er, yes. Ergo, there must be something wrong with the bankers' argument.

Let's deconstruct it.

For the sake of argument let's first accept that less bank lending is a bad thing. In truth, such a claim does not always hold. For example, if bank lending is already excessive, then less bank lending is a good thing.

Now consider the case where a bank holds two assets: asset 1 is loans and asset 2 is cash (or, equivalently for our purposes, bank deposits at the central bank). If we force a bank to hold more of asset 2, cash, then other things equal, the bank must hold less of asset 2, i.e., it must reduce lending, which ex hypothesi, is undesirable.

This argument would have some merit if we were discussing a policy of making banks hold more cash reserves or holding more deposits at the central bank.

As an aside, it is curious that US bank CEOs do not rail against the Fed's policies of paying interest on excess reserves, which have the effect of holding back bank lending and are explicitly intended to do just that. That might have something to do with the payments that banks receive simply for holding those reserves. John Cochrane agrees:

> Banks today are sitting on a trillion and a half dollars of reserves beyond what they are legally required to hold. They are paying dividends, and some are buying back shares. So are banks anxious to lend, as some claim, but pesky regulators forbid it because banks just don't have enough capital? Not on this planet. Lending is anemic, but not because of capital requirements (Cochrane, 2011).

But it is a fallacy to apply any such argument to a policy of increasing banks' minimum capital requirements. The reason is that bank capital is not an asset to a bank, but a form of liability. To repeat: banks hold assets and issue liabilities. Since capital is a liability rather than an asset, it is fallacious to suggest that banks 'hold' capital or to rely on arguments that presuppose that capital is an asset to a bank.

This 'hold capital' fallacy is both basic, because it betrays an elementary misunderstanding of a bank's balance sheet, and profound, because it is widely used to promote the bankers' self-serving propaganda.

Therefore, those who make the 'hold capital' argument either (a) do not understand balance sheet basics or (b) are using the

argument to give a superficially respectable cover to some agenda that they would prefer to be discreet about. We find it difficult to believe that top bank CEOs don't understand balance sheets, so (a) sounds implausible, although we can never entirely rule it out.

But if (b) is correct, what could that hidden agenda be?

One possibility is this: CEOs get paid based on return on equity; higher capital requirements reduce return on equity. That means that bank CEOs are incentivised to reduce capital, which means that they are incentivised to promote higher leverage. As Cochrane observes

> Now you know why banks love leverage. High leverage maximizes the value of government guarantees, effectively letting banks borrow at subsidized rates. It's also a tax dodge. The bank's interest payments are tax deductible; its dividend payments are not.

The banks promoting higher leverage means the banks promoting excessive leverage, and excessive leverage periodically crashes the financial system, leading to one economic disaster after another and repeated taxpayer bailouts.

So yes, we could understand why the bankers might want to be discreet about that.

Back to the 'hold capital' fallacy.

The definitive authority on this subject is Anat Admati. Her and Martin Hellwig's book *The Bankers New Clothes* has this to say:

> The confusion between equity and reserves is reflected in the language of public debate. In many news reports as well as official writings, banks are said to "hold" or to "set aside" capital as if it were an asset. The *capital* itself contributes to the confusion because in other contexts it does refer to assets. For example, when economists say that a firm's production is capital intensive, they mean that the firm has lots of machines that help it save on labor. In the world of banking and banking regulation, however, *capital* refers to equity. The equity is held by the investors who fund the bank, its shareholders. To say that the bank "holds capital" is an inappropriate and confusing use of language. The bank is not holding its equity, the part of its balance sheet that represents unborrowed funds; the bank holds loans and other assets *funded* by equity and debt. Similarly, Apple and Wal-Mart are not said to "hold" their equity.

> This is not a silly quibble about words. The language confusion creates mental confusion about what capital does and does not do. This confusion helps bankers, because it creates the false impression that capital is costly and that bankers should strive to have as little of it as regulators will allow.
>
> For society, there are in fact significant benefits and essentially no cost from much higher capital requirements. By contrast, reserve requirements have costs, and their benefits in reducing the risks in banking are limited. Unless reserve requirements are so high that banks face virtually no risks, they do not actually address the solvency problem that results from banks' using borrowed money to make risky investments (Admati & Hellwig, 2013, p.98).

The following passage from Admati elaborates further on the fallacy and its baleful consequences for intelligent public debate on bank capital:

> Many believe that bank capital is analogous to cash reserves or a rainy day fund, and that capital requirements force banks to 'set aside' or 'hold in reserve' idle cash that cannot be used to make loans or other investments. This suggestion is patently false. Capital requirements do not require banks to hold anything; they only concern the source of funding banks use and the extent to which investments are funded by equity (or other forms of 'loss absorbing capital', as discussed below). Corporations do not 'hold' their own funding; rather, investors hold (own) claims such as common shares that are paid from cash flows the firm generates.
>
> If capital is falsely thought of as idle cash, the discussion of capital regulation is immediately derailed by imaginary trade-offs. Nonsensical claims that increased capital requirements prevent banks from making loans and 'keep billions out of the economy' may resonate with media, politicians and the public just because the jargon is misunderstood. In light of this confusion and its ability to muddle the debate, it is disturbing that regulators and academics, who should know better, routinely collaborate with the industry to obscure the issues by using the misleading language and failing to challenge false statements. If, instead, the language that is used focused attention properly on funding and indebtedness, the debate

> would be elevated and more people would be able to understand the issues" (Admati, 2016).

In this context (apropos Carney's earlier "FPC… concerned that banks could respond… by *hoarding capital and restricting lending*"), it is particularly unfortunate that former BoE Governor Carney saw fit to endorse the fallacy so explicitly, thereby giving false legitimacy to the banking industry's logically unfounded PR campaign against higher capital requirements.[41]

Or consider the following quote from Vickers:

> Let me take a case in point – RBS, a bank of great systemic importance in the UK. In its [2019] Q3 results RBS reported CET1 of £32.5bn and total assets of £720bn, more than twenty-two times CET1. When, earlier this month RBS was removed from the FSB's list of G-SIBs, the Financial Times (16 November) reported that the resulting cut to the bank's capital requirements "could heighten expectations it will boost payouts next year". RBS, it said, "has a significant pile of excess capital" and is reportedly considering a "targeted share buyback" and an "additional special dividend".[7]

In his footnote 7, Vickers drily comments:

> Capital being a funding source for the bank rather than an asset it is not clear how you can have a "pile" of it.

It is not clear how you can hoard a pile of it either.

He continues:

> RBS, however, currently has a price-to-book ratio of about 0.55 [DB/KD: Latest 31.4%]. ... This is hardly "excess capital" as far as the public interest is concerned.

Finally, John Cochrane has a nice take on this issue in his blog posting, "93 words, most of them wrong" (Cochrane, 2017). His piece is so good that we quote it in its entirety:

> In the WSJ, The 93 Words That Could Unlock $200 Billion in Bank Capital. This could be a great MBA final exam. Spot the errors:

[41] It is also unfortunate that no one in the BoE pointed him to a correct analysis on the BoE's own website. To quote his colleagues: "It can be misleading to think of capital as 'held' or 'set aside' by banks; capital is not an asset. Rather it is a form of funding – one that can absorb losses that could otherwise threaten a bank's solvency." See Farag, Harland, & Nixon, 2013).

"Tucked inside a nearly 600-page legislative proposal to overhaul U.S. financial regulations are 93 words that could provide a *windfall* for bank investors seeking heftier dividends and share buybacks."

"Bank analysts at Barclays BCS -6.08% PLC estimate $236 billion in capital *is tied up* in operational risk at the four biggest U.S. banks alone"

"Bankers ... want to free up capital that could be returned to shareholders *or used for more lending*."

"Mr. Dimon added that U.S. banks now *hold* about $200 billion in capital against operational risk."

(I made it easier with italics, all mine.)

Windfall? When a company pays out dividends, the stock price goes down exactly by the amount of the dividend payment.

Capital is not *tied up*. Capital is a source of funds, not a use of funds.

Capital is equity investment in the bank -- people give the bank money, in return for a stream of dividends. Capital is not reserves -- cash lying around the vault.

Capital is already *used for lending*! Banks get money from equity holders, bond holders, and deposits, and lend it out. Capital requirements are about the ratio of sources of money. (At best, lower capital requirements would allow banks to borrow more money without issuing more equity to lend. If they wanted to.) Capital is not reserves.

No bank "*holds*" capital, and I hope Mr. Dimon didn't actually say that, as much as he would like lower capital requirements. Capital is not "held" like reserves.

This article does reflect nicely the total level of confusion in the debate about banking regulations. Colleagues contemplating clever complex schemes, take note.

A13. Maximum Permitted

Leverage Under Basel III

Start with the PRA Rulebook:

3. Minimum Leverage Ratio

3.1

03/10/2017

A firm must hold sufficient tier 1 capital to maintain, at all times, a minimum leverage ratio of 3.25%.

3.2

01/01/2016

For the purposes of complying with 3.1, at least 75% of the firm's tier 1 capital must consist of common equity tier 1 capital.

3.1 implies that the maximum permitted leverage measured as TE divided by Tier 1 capital is 1 ÷ 3.25% = 30.7692

Section 3.2 of the *PRA Rulebook* then states that at least 75 percent of the firm's Tier 1 capital should consist of CET1 capital.

Now 25 percent of the 3.25 percent minimum Tier 1 leverage ratio is 0.8125 percent, so the minimum required leverage ratio expressed in terms of CET1 capital = 3.25 percent minus 0.8125 percent = 2.4375 percent.

This implies that the maximum permitted CET1 leverage = 1/0.024375 = 41.0256

However, Basel III also allows banks to include a 'sin bucket' of non-CET1 capital items as part of their reported CET1.

So let's distinguish between 'reported' CET1 (or CET1 including the sin bucket) and 'clean' CET1 (or CET1 purged of the sin bucket).

Under Basel III rules, the clean CET1 can be as low as 85 percent of reported CET1 (Huertas, 2014; Basel Committee, 2011).

Let's also assume that bankers make maximum use of the sin bucket so the clean CET1 = 85 percent × reported CET1.

This means that the Leverage Ratio using clean CET1 can be as low as 85 percent × 2.4375 percent = 2.0719 percent and still comply with the Basel III minimum required leverage ratio.

Inverting this number gives the maximum permitted leverage using clean CET1, i.e., 1/0.020719 percent, which equals about 48.3.

Bear in mind additional hidden leverage and the maximum permitted leverage (as measured by the TE/CET1 ratio) higher than 48.3.

And since Basel III does not impose any restriction on market-value leverage, the maximum permitted market-value leverage under Basel III is theoretically unbounded, as pointed out in the text.

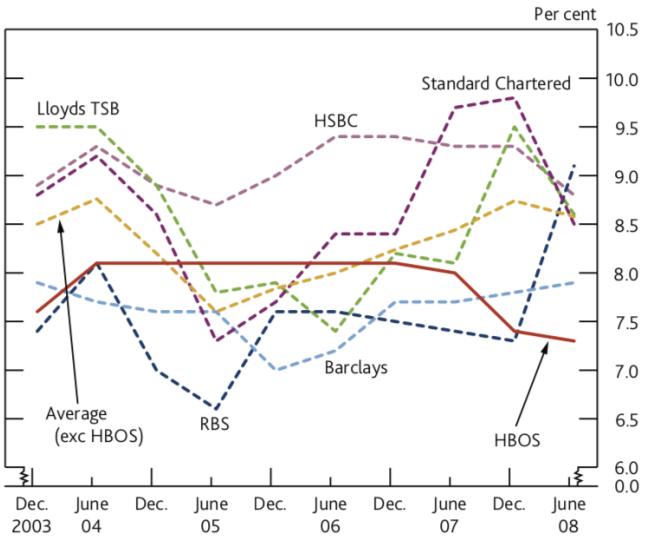
A14. Unreliability of

Regulatory Capital Ratios

Pre GFC

The following chart from the failure of HBOS report (Bank of England, 2015) shows the main UK banks' published Tier 1 capital ratios over 2004 to mid 2008:

UK Banks' Published Tier 1 Capital Ratios(a)



Source: Annual Reports and Accounts and interim Results.

All banks, including HBOS, had Tier 1 capital ratios that were comfortably above the then prevailing (Basel I) regulatory minimum of 4%.[42] As of June 2008, the average excluding HBOS was 8.6% and HBOS's Tier 1 ratio was 7.3%. There was no sign of impending trouble.

Table A14.1 gives a table of other UK and Irish financial institutions that posted respectable regulatory capital ratios before suddenly failing.

Table A14.1: *Failed British and Irish Banks that Reported High Regulatory Capital Ratios*

[42] Basel II became effective on January 1st 2008.

Institution	Tier 1 capital ratio (%)	Reporting date
	British	
Alliance & Leicester	9.4	End 2007
Bradford & Bingley	8.6	End 2007
Northern Rock	8.5	End 2006
	Irish	
Allied Irish Banks	7.6	End 2007
Anglo Irish Bank	8.3	End 2007
Bank of Ireland	8.2	End 2007

Notes: Tier 1 capital ratio = Tier 1 capital/RWA. Sources: Annual reports and 'Failure of HBOS' report.

There were also the big three Icelandic banks whose minimum required Tier 1 capital ratio was also 4%:

Table A14.2: *Failed Icelandic Banks that Reported High Regulatory Capital Ratios*

Bank	Tier 1 capital ratio (%)	Reporting date
Glitnir	8.1	End 2007
Kaupthing	9.6	End 2007
Landsbanki	10.1	End 2007

Notes: Tier 1 capital ratio = Tier 1 capital/RWA. Sources: Banks' 2007 Annual reports.

Post GFC

The following is a far from exhaustive list of banks that reported respectably high regulatory capital ratios post the GFC, but then got into difficulties afterwards.

UK

The Co-Op Bank reported a Tier 1 capital ratio of 9.4% in its 2012 *Annual Report*. It was put into resolution in June the next year.

Metro Bank reported a CET1 ratio of 15.3% in its 2017 *Annual Report*. In January 2019, capital adequacy problems came to light and its share price fell 75% over the next four months. The bank was rescued by a capital issue.

Dexia Bank

Franco-Belgian Dexia bank reported a Tier 1 ratio of 9.1% in its 2007 *Annual Report*. It was bailed out in September 2008. In July

2011, reconstituted Dexia reported a Tier 1 capital ratio of 12.1%, making it on paper one of Europe's safest banks. It was put into receivership the following October.

Italy

Monte dei Paaschi reported a Tier 1 capital ratio of 7.6% at the end of 2009. It was bailed out the next year. By the end of 2016, its CET1 ratio was 8.2% and the bank was bailed out again in the summer of 2017.

At the end of September 2018, the Italian bank average CET1 ratio was 11.5%. Banca Carige reported a 12.4% CET1 ratio and was put into receivership in January 2019.

Portugal

Banco Espirito Santo, once the second biggest bank in Portugal, reported a 10.3% Core Tier 1 ratio at the end of September 2013. It was bailed out the next August.

Spain

Bankia Bank, one of Spain's largest lenders, reported a Tier 1 capital ratio of 8.1% in its 2011 *Annual Report*. It was bailed out the next May.

Banco Popular was the sixth largest banking group in Spain. In its 2016 *Annual Report*, it posted a CET1 ratio of 12.1%. It was put into resolution in June 2017 and then sold to Santander.

To quote a 2017 letter in the *Financial Times*:

> In the EU alone, between September 2008 and the end of 2010, more than 300 banks went cap in hand to governments for support—in the form of capital injections, asset relief, liquidity aid or debt guarantees. Few banks [had been] identified as having insufficient capital [by, e.g., regulatory capital ratios] (Landell-Mills *et al.*, 2017).

Regulators' reliance on such ratios is misplaced.

A15. Are Bank Capital

Requirements Really Ten Times What They Were Before the Global Financial Crisis?

A major theme in Bank of England speeches on bank capital requirements has been the 'Ten Times' story: that bank capital requirements are now 10 times or more than 10 times what they were before the Global Financial Crisis (GFC). Here are some examples:

- "Capital requirements for banks are much higher … In all, new capital requirements are at least seven times the pre-crisis standards for most banks. For globally systemic banks, they are more than ten times" (Carney, 2014).
- "… the capital requirements of our largest banks are now ten times higher than before the crisis" (Carney, 2015).
- "Common equity requirements are seven times the pre-crisis standard for most banks. For global systemically important banks (G-SIBs), they are more than ten times higher" (Carney, 2016).
- "*The largest banks are required to have*[43] *as much as ten times more of the highest quality capital than before the crisis…* (Carney, 2017, his emphasis).

This latter claim is particularly significant because Carney was referring to the largest banks in the world and writing in his capacity as chairman of the Financial Stability Board (i.e., as the world's most senior financial regulator) to the leaders of the G20 countries. He could hardly have chosen a more conspicuous forum in which to make his point.

[43] Note the word 'have,' a nice illustration of the 'hold capital' fallacy discussed in Appendix 12.

The evidence for Carney's claims would appear to be the capital requirements in the following Table (Table B.2) from the Bank's July 2016 *Financial Stability Report*:

Table B.2. *Capital requirements have increased significantly*
Capital requirements of the largest UK banks[(a)(b)]

	Requirement (per cent)
Basel II CT1 minimum	2
Basel II CT1 minimum *using Basel III definitions*	1
Basel III CET1 minimum	4.5
+ capital conservation buffer	2.5
+ systemic buffers	1.0–3.5
+ countercyclical capital buffer[(c)]	1
Basel III CET1 minimum with buffers	9.0–11.5

Notes to Table B.2:
(a) Expressed as a proportion of risk-weighted assets. An additional 1.5% of risk-weighted assets must be held in at AT1 [Additional Tier 1 capital] as part of the Basel III Pillar 1 requirement. UK banks are also subject to Pillar 2A requirements.
(b) See Caruana, (2012) 'Building a resilient financial system'.
(c) in a standard environment.

This Table is the key to Carney's '10 times' claims. Line 1 tells us that the Basel II Core Tier 1 (CT1) minimum requirement is 2%. The phrase "Basel II CT1 minimum *using Basel III definitions*" refers to the Basel III definition of core capital which is Core Equity Tier 1 capital. Remember too that these ratios are expressed in terms of an RWA denominator. The second line then tells us that the Basel II equivalent minimum in CET1 ratio terms is 1%. The remaining lines discuss the Basel III minimum requirements, which sum to 9% to 11.5%, and we may as well say 10%. So Dr. Carney is correct when he says that capital requirements have increased by a factor of ten

At first sight, such an increase in capital requirements might appear impressive.

The starting base, i.e., a minimum required CET1 ratio (i.e., CET1/RWA) of 1%, is awfully low, however.

When calculating its supplementary leverage ratio buffers at about the same time, the Bank used a working assumption that the

ratio of RWAs to total assets is 35%.[44] Applying this ratio, a minimum CET1/RWA ratio of 1% implies that under Basel II, the equivalent minimum CET1/TA ratio is 1% times 35% or 0.35%. Therefore, a bank could operate on a leverage (=TA/CET1) of 1 ÷ 0.35% or about 285.6 and still be Basel II compliant.

Basel III comes along and the minimum CET1 ratio is multiplied by 10. The corresponding leverage (=TA/CET1) is then 285.6 ÷ 10 or about 28.6, i.e., so banks could operate at a TA/CET1 leverage level of 28.6 and be Basel III compliant.

Now fast forward to the present. The RWA/TA ratio is now 26.8%. Redoing the above arithmetic with 26.8% instead of 35%, banks can now operate at a leverage of 37.1 and still be Basel III compliant.

And we have not taken account of how UK banks could increase their leverage further by switching into assets with lower risk weights or by moving positions from their banking books to their trading books.

The bottom line is that a large *percentage* increase in capital requirements does not represent a large *absolute* increase in capital requirements if the base is low to start with.

And why was the base so low? Because Basel II imposed *extremely low* minimum capital requirements in the first place. Correctly interpreted, Carney's '10 times' narrative does not imply that banks now face *high* (as opposed to merely *higher*) capital requirements. It is, instead, a damning indictment of the inadequacy of both Basel II *and* Basel III.

Capital requirements might have increased by factor 10 but even so, capital requirements are *still too low*.

Martin Wolf got it right when he described Basel III as the mouse that did not roar (Wolf, 2010).

[44] See Bank of England (2015), box 1. Recall however from Appendix Five that the latest average RW across the big five UK banks is 28.7%.

A16. The Bank of England's Bank Stress Tests

A major plank in the BoE's 'Great Capital Rebuild' story is that the strength of the UK banking system is confirmed by its stress tests. But how is this even possible? UK banks are weak now, so it is impossible for a set of weak banks to go through a stress that is at least as severe or even multiple times more severe than the GFC and then come out strong. The only logical explanation for the UK banks' 'strong' performance in the BoE's stress tests is poor modelling and more detailed analyses confirm that that is the case (See the Dowd "no strees" report or Ferguson, 2016).

The many weaknesses of the BoE's stress tests include unreasonably demanding pass standards, insufficient numbers of adverse scenarios, reliance on unreliable and gameable metrics such as RWAs and Tier 1 capital, reliance on book value instead of market value numbers; the failure to address the PtB issue; and timeliness problems (i.e., they fail to take account of how market conditions can deteriorate suddenly, which is another reason to relyon market values). There is also the concern that the credibility of such exercises is undermined by the dreadful track record of regulatory stress tests elsewhere (of which more below).

Another weakness of the stress testing programme is that it creates new systemic risks because it (a) exposes the entire banking system to the weaknesses in the models approved by the central bank and (b) promotes standardisation across the industry when systemic stability requires diversity in risk modelling practices and risk management strategies. If everyone behaves the same way (e.g., selling in a crisis, then downturns are likely to become much more severe than they would be if other firms would otherwise buy the dip). In doing so, stress testing not only creates new systemic risks, but also creates ones that are invisible to everyone's risk management systems.

But perhaps the most glaringly obvious weaknesses of the tests involve the use of loss models that imply implausibly low losses, and by a long shot.

Consider the following example from the BoE's 2018 stress tests

> Large contractions in output combined with falls in asset prices and higher interest rates lead to significant credit impairments in the stress. In total, impairments amount to £143 billion over the five years of the stress, equating to a five-year impairment rate of 4.3%. …
>
> UK lending impairment charges amount to more than £70 billion in the test and are associated with a cumulative five-year impairment rate of 4.7%.

For a stress that is "more severe overall" than the GFC, these projected impairment charges are awfully low. Cumulative loss rates for the GFC were perhaps 10% for UK banks. For a typical bank crisis, loan loss rates might be 10%, but in a severe one it could be more: 15% and maybe even as high as 25%. The BoE would have us believe that a crisis more severe than the GFC would inflict on the banks a loan loss rate of under half of that inflicted in the GFC and under a half of the losses inflicted by a typical or typical-severe bank crisis.

Or consider another example from the same stress tests: the results suggest that the Bank's 'more severe than GFC' stress scenario would generate real estate losses of £20 billion. Given that the stress scenario posits huge falls in real estate prices – a 30% fall in residential house prices and a 40% fall in CRE prices – these projected impairment charts are literally incredibly low. As Victor Meldrew might say, "I just don't believe it!" He is not the only one either. To quote a private email from an analyst whom we respect:

> "What is so [deleted] about Carney's forecast is that if house prices fall by a third the UK banking industry will be bust, bust, bust."

Of all the incredible results in the 2018 stress tests, this result is the least credible of all. It suggests that UK banks have only a small exposure to real estate after a long bull market.

This assessment does not ring true from credible studies elsewhere (Kelly, 2007). In the Irish property collapse of over a decade ago, house prices fell around 55% and CRE prices fell over 70% – these are much more severe falls than those posited by the Bank of England – and the banking system collapsed.

There are also other factors that ring warning bells about banks' exposure to real estate. James Ferguson from the MacroStrategy

Partnership informed Kevin in mid 2017 that the risk weighting game had crowded into mortgage risk weights, which across Europe were by then averaging around 11-12 percent, having been 25 percent pre-crisis and 35 percent in the standardised Basel III framework. Only large banks are allowed to use their Internal Ratings-Based (IRB) models to manipulate their risk weights in this way, however. Pre-crisis the banks had half their RWAs in mortgage assets, but have about two-thirds in mortgage assets now, he wrote. They then use their IRB models to change their assumptions to make those assets as risky as they wish them to be. These considerations suggested that institutions such as Lloyds and the Nationwide would be highly exposed to a housing crisis and the fact that the stress tests had largely missed this exposure is further confirmation of their inadequacy.

These low projected losses are *in and of themselves more than enough* to discredit the entire exercise.

Contradictions

The credibility of the stress test programme is also undermined by an internal contradiction between its objectives. At one level, their supposed purpose is to investigate the financial health of the banking system. However, central bank stress tests also have a second objective – to promote public confidence in the banking system and, implicitly, to promote confidence in the central bank's policies towards the banking system. Indeed, this objective is stressed so frequently by central banks that one often gets the impression that the promotion of confidence must be the primary objective.

The problem is that these two objectives are often in conflict. If the banking system is weak then a bona fide stress test with a severe scenario and a rigorous pass standard should reveal that weakness. Unfortunately, revealing that weakness would undermine confidence in the banking system and undermine the second objective. In such circumstances, the only way to achieve the confidence-boosting objective is to water down stress tests to engineer undeserved pass results. Rumours from within the central bank would seem to confirm that suspicion: "it wouldn't do

to have stress tests too severe for firms to pass," and that sort of thing.

If the stress tests then give the banking system a clean bill of health, the clash between these two objectives gives the central bank a credibility problem: it needs to persuade potential critics that the test really was demanding, and it needs to *credibly* reassure them that it is not putting its confidence-boosting objective ahead of the integrity of the test itself.

This problem is heightened further by the fact that the central bank has a vested interest in the confidence-boosting objective: apart from anything else, for the central bank to suggest that the banking system is in poor shape would be to acknowledge that its own, e.g., capital-rebuilding, policies had failed.

A second contradiction arises in the context of the Bank's overall narrative. Recall (see Appendix Three) that the BoE maintains that banks' future profitability is poor. It presumably does so because the alternative way of explaining banks' low PtBs is to acknowledge that banks must still be carrying a lot of hidden losses from the GFC or earlier, and the BoE would prefer not to believe that. Fair enough, one might suppose, and let's gloss over the epistemic point (i.e., how could the BoE know?) and a second awkward point, spelt out in Appendix Four, that it appears to be impossible to produce a calibration of the Bank's Dividend Discount Model that would support the Bank's position that low PtBs are to be explained by low anticipated profitability and *not* by banks still carrying forward hidden losses from the GFC. And if banks are still carrying hidden losses, then the BoE's narrative about the banks being fixed post the GFC is seriously called into question.

'Worse than Global Financial Crisis'

A recurrent theme in the BoE's stress test PR is that the BoE's stress scenario is a lot more severe than the GFC, the point obviously being to emphasise that the stress is *very* severe. Since the GFC was bad, a scenario multiple times more severe is, well, Doomsday.

Let's consider as an example the Bank's statements about its 2016 stress tests. To quote Governor Carney, the adverse stress scenario

in this set of tests led to "system-wide losses of £44 billion over the first two years of the stress – five times those incurred by the same banks over the two years at the height of the financial crisis."[45]

This statement misled some commentators into thinking that the stress scenario was five times more severe than the GFC, but it wasn't.

Carney's statement implies that the system-wide losses over the two height years of the crisis were less than £44 billion/5 = £8.8 billion. Such an inference is clearly wrong: the system-wide losses were vastly greater than that. His £44 billion loss estimate is also inconsistent with the BoE's own estimates that HBOS alone experienced losses of £34.6 billion in 2008-2009 and losses of £52.6 billion in the period 2008-2011 (Bank of England, 2015). HBOS was not even among the big 4 banks. Among the big 4, RBS experienced a loss of £40.7 billion in 2008 alone (Financial Services Authority, 2011) and losses in excess of £51 billion over the period 2007-2010.[46] Governor Carney's claim about the losses banks experienced in the crisis is simply wrong.

James Ferguson from The Macro Strategy Partnership also had some interesting observations on the 2016 bank stress tests:

> The latest Bank of England stress test was apparently based on a 'Doomsday scenario' that the press at least thought was five times worse than the actual GFC. In fact, the net losses under the test were five times the (very small) net losses the banks reported during 2008-09 but this was because the banks had such thin capital bases back then that they didn't dare report their losses all at once but instead spread loss crystallisation out, as is their wont, over the next 7-8 years.
>
> Well, the press fell for it. Under the heading 'Don't panic - we're safer than we have been for years' the London Evening Standard's City Editor (pp.43, 30th November 2016) described the Bank of England's stress test as a

[45] Governor's remarks, p. 4. Strictly speaking, the £44 billion number is only the net loss, and it might have been more appropriate to have reported the gross loss (£63 billion) instead.

[46] See *UK and Irish Banks Capital Losses – Post Mortem*, Local Authorities Pension Fund Forum, September 2011, p.3.

> 'Doomsday scenario five times worse than the global financial crisis. …' (Ferguson, 2016).
>
> A number of other newspapers fell for the Doomsday ruse too. He continues:
>
> > Congratulations Mark Carney, job well done. At least job well done assuming that job was to assuage the concerns of the press and buy the banks more time (they've had close to a decade already) to firm up their balance sheets even more.
>
> *True stress, or misdirection?*
>
> How therefore did some in the press get the idea that this stress test 'Doomsday scenario' was five times worse than the GFC? Mainly because, in the Executive Summary, that's exactly what the Bank intimated: 'the stress scenario is estimated to lead to system-wide losses of £44 billion over the first two years of the stress, around five times the net losses incurred by the same banks as a group over 2008-09' (p.7 *Stress testing the UK banking system: 2016 results*, Bank of England 30th November 2016).

Mr. Ferguson then provides an expert dissection:

But, of course, the banks didn't really report [their real] net losses (because that would dangerously erode thin capital bases).

Nor for the same reason did they report their real gross losses, which are even larger.

> What banks do is control the rate at which they crystallise losses from securities and subsequently NPLs and control the impact on their capital bases by systematically and chronically absorbing losses by newly raised capital (a bit) and retained earnings (a lot). Out of the UK's Big 4 High St banks, only one (RBS) made [meaning here, 'reported'] actual net losses during 2008-09 of about £37bn. The other three made [reported] (very small) net profits totalling about £27bn (depending on exchange rate used for HSBC).

So Step One is where James notes that the banks smooth out the losses they report over a long period so they don't look so bad.

Step Two is where he reports the best estimate of the losses actually made:

How 1/10th became '5 times'

To put these figures in perspective though, these same four banks (HSBC, Barclays, RBS & Lloyds) made cumulative loan loss provisions over the 2007-2016 period of over £200bn and near double that once we include balance sheet reserves, securities losses, restructuring/ goodwill write-downs, legal and other redress.[47]

Step Three is to point out the bait and switch:

In other words, the 'Doomsday' stress test figure of £44bn for seven banks is barely a tenth of what the GFC actually cost the four big banks (not 'five times' more as implied).

Step Four, the why:

The only reason the Bank had for phrasing itself in the way that it did is that it wanted the press to believe that the stress test was harsher than it really was. The only reason a central bank needs to do that, is because it can't make the test truly harsh and still pass all or most of its candidates.

The trick is to pass off something (reported net losses, £44 billion) that sounds similar to something else (actual GFC losses, £500 billion plus, over ten times as much). And the more the banks misreport (or smooth) their losses, the better the effect, in terms of increasing the BoE's stress scenario loss/GFC loss multiplier, and so the Doomsday becomes ever darker.

Fortunately all this Doomsday stuff is just a bad fantasy concocted by a combination of modelling errors and statistical sleight of hand.

Post-Script: The Icelandic and European Stress Tests

To be fair to the BoE, few can doubt that its stress tests have been better than many others. The Icelandic and European experiences come to mind. These are remarkable in particular for the banking stresses that the stress tests completely failed to detect in advance, including no less than *three* cases where whole national banking systems – not just individual banks – suddenly collapsed shortly after having been signed off as sound by regulatory stress tests.

[47] James later revised the loss number to £500 billion, so we should now be talking of how less than 1/10th became '5' times', but that only strengthens his point.

The first of these was Iceland. By the end of 2007, the assets of the three biggest Icelandic banks – Glitnir, Kaupthing and Landsbanki – had grown to almost 900% of GDP. By this point, there were concerns about the banks' dependence on wholesale markets and CDS spreads were strongly suggesting that the banks were vulnerable. However, in 2008 a variety of stress tests by the IMF, the Icelandic central bank and the Icelandic financial regulator suggested that the system was resilient. The financial sector then unexpectedly collapsed in October.

There are also the stress tests conducted by the Committee of European Banking Supervisors (CEBS) and later by the European Banking Authority (EBA) and the European Central Bank (ECB).

The first of these was conducted by the CEBS in 2009 with results reported in October that year. The results suggested that none of the 22 large banks covered would see their Tier 1 capital/RWA ratios fall below the minimum threshold of 6%, and the accompanying press release proudly talked of how the exercise demonstrated the "resilience" of the banking system after recent difficulties. Critics suspected that the assumed stress was merely too weak to pick up any problems. Subsequent events were to prove them right.

The second exercise was conducted by the CEBS in 2010: this exercise covered 91 biggest European banks and the results reported in July showed that only seven banks failed to meet the 6% minimum capital level and even then their combined shortfall was a mere €3.5bn, about 0.15% of Eurozone GDP. Skeptics noted that this figure was a fraction of any of the estimates of independent analysts and pointed out that the stress test largely ignored the biggest risk of all – the risk of sovereign defaults – apparently because the EU were committed to ensuring that such defaults never happened, a classic case of policy make-believe undermining the credibility of the exercise before it had even started.

Four months later, it was revealed that the Irish banks – which had passed the stress test with flying colours – were in need of massive support to stay afloat and the Irish government was unable to cover their wholesale financing requirements: the

eventual cost of the Irish bailout package came to €85bn. The 2010 stress tests were now totally discredited.

About the same time, a new round of stress tests was announced: these were to be carried out the next year by the new European Banking Authority. The EBA promised that lessons had been learned etc. and the new stress tests were to be more rigorous than their predecessors. Using a slightly stronger capital definition (5% core Tier 1 instead of 6% Tier 1) and a slightly smaller but stronger sample of 90 banks, with a much greater awareness of the sovereign debt problem and its implications for European banks *and* with a pressing need to prove itself, the EBA then came out with an aggregate shortfall of €2.5bn, even less than it had been the year before!

Three months later, the big Franco-Belgian bank Dexia failed: Dexia had aced the stress test with a top-of-the-class core Tier 1 capital ratio of 10.4%, more than twice that of the 8 banks that failed the test. Meanwhile, in a frantic effort to shore up whatever credibility it imagined it still had, the EBA hurriedly redid its sums and eventually revised its aggregate shortfall to €114.7bn, over 45 times its best estimate of a few months earlier. Even this figure, however, was well below the estimates of €200bn-€300bn that others were getting. Then, the following May, 2012, the big Spanish bank Bankia failed: Bankia had also passed the stress test.

Amongst the banks that did well in the 2011 stress test were the Cypriot banks: the whole Cypriot banking system then collapsed out of the blue in March 2013. None of the agencies monitoring Cyprus – the EU, the EBA, the IMF, the BIS, etc. even had Cyprus on any kind of watch list.

The next major EU stress tests were conducted by the ECB in 2014 as part of its new mandate as Europe's super-regulator. Remember that a key driver behind the establishment of the Eurozone banking union and the Single Supervisory Mechanism to govern it was the argument that national regulators were prone to capture and therefore an independent and more demanding regulator was required: the ECB. The ECB promised that *its* stress tests really would be credible and it would not repeat the mistakes of the earlier stress test fiascos. The ECB stress test was also to be buttressed by an Asset Quality Review (AQR) to provide

assurance that the new stress tests would be based on sound data given the glaring data problems that had plagued earlier stress tests. The new tests were also to have a stronger capital standard, an 8% CET1/RWA hurdle ratio – the standard minimum of 4.5%, plus a 2.5% CCB plus a 1% G-SII requirement (Riecher & Black, 2013). Unfortunately, the 8% ratio soon attracted a lot of negative lobbying from interested parties – the banks and their national supervisors, who had been captured by them – and the hurdle ratio was eventually knocked down to an easier to pass 5.5%.

The 2014 stress test covered 130 Eurozone banks accounting for almost 82% of Eurozone bank assets, and results were published in October that year: 25 banks were failed with a combined shortfall of €25bn.[48] None of the biggest banks failed, and the banks that did fail were concentrated mainly in the southern fringe. For its part, the Asset Quality Review produced asset quality adjustments of an additional €48bn. The severity of the stress is apparent when one considers that the combined shortfall plus quality adjustment amounted to only about 0.3% of total bank assets – a number small enough to be rounding error.[49] A chorus of independent experts then pretty much dismissed the results on publication (Legrain, 2014; Meijer, 2014; Coppola, 2014; Goldstein, 2014; Onaran, 2014).

We could go on, but we have made our point.

[48] There was also a new set of stress tests carried out by the EBA over a slightly different sample, but we gloss over this exercise because their approach and results were not much different from the ECB's.

[49] The fact that the AQR produced a correction of 0.2% of total asset values then tells us one of two things. Either the assets were accurately estimated in the first place, i.e., so those earlier data problems had now been sorted – this happened to be the ECB's interpretation – or the exercise was so weak as to be pointless: take your pick.

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Dean Buckner

Dean Buckner worked at the FSA and then the Prudential Regulation Authority and Bank of England for nearly 20 years, specialising in derivative and asset valuation and capital modelling in both the banking and life insurance sector. He is now retired from the Bank.

Kevin Dowd

Kevin Dowd is professor of finance and economics at Durham University.

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