

Maintaining Confidence

By

David Murphy

SPECIAL PAPER 216

LSE FINANCIAL MARKETS GROUP PAPER SERIES

December 2012

David Murphy is founder and principal of rivast consulting, a leading financial risk management and regulatory consulting firm. He specialises in financial stability issues, regulatory capital and risk management, and has published extensively on these topics. His prior roles include Global Head of Risk at ISDA, where he was responsible for all of ISDA's activities relating to capital, risk management and accounting standards as well as leading ISDA's research effort. Before that, he was the Chief Operating Officer at Merrill Lynch's Reinsurance Group. Prior to his time at Merrill Lynch, he served as a Global Risk Manager at Banque Paribas and was earlier employed at the UK's Securities and Futures Authority. He held an SERC Research Fellowship, and was a Lecturer at the University of Birmingham. He holds a PhD in theoretical computer science, an MSc. in computation and an MA in Physics. Any opinions expressed here are those of the author and not necessarily those of the FMG. The research findings reported in this paper are the result of the independent research of the author and do not necessarily reflect the views of the LSE.

Maintaining Confidence

Understanding and preventing a major financial institution failure mode

David Murphy

rivast consulting

Abstract

This paper proposes the solvency/liquidity spiral as a failure mode affecting large financial institutions in the recent crisis. The essential features of this mode are that a combination of funding liquidity risk and investor doubts over the solvency of an institution can lead to its failure. We analyse the failures of Lehman Brothers and RBS in detail, and find considerable support for the spiral model of distress.

Our model suggests that a key determinant of the financial stability of many large banks is the confidence of the funding markets. This has consequences for the design of financial regulation, suggesting that capital requirements, liquidity rules, and disclosure should be explicitly constructed so as not just to mitigate solvency risk and liquidity risk, but also to be seen to do so even in stressed conditions.

1. Introduction

It has long been known that financial institutions suffer from two main classes of risk which can affect their ability to continue as going concerns: solvency risk and (funding) liquidity risk. These risks often intertwine, in that investors concerns about the risk of insolvency can lead to funding stress, forced asset sales, funding stress, and actual failure. We refer to these interacting phenomena as the solvency/liquidity spiral.

While the spiral model is not original¹, our emphasis on the importance of investors' confidence in an institution, and the resulting policy proposals, are novel. The next section outlines the proposed mechanism in more detail. Then two further sections provide evidence from the official accounts of the failures of both Lehman Brothers [Val10] and the Royal Bank of Scotland [FSA11] for our proposal. These are two of the best documented cases of recent large financial institution failure, so they make excellent case studies.

The final sections analyse post crisis regulatory enhancements in the light of this model, and advance a number of further changes suggested by it.

¹ See for instance [Bru09] or [Mur09] for accounts of the role of solvency/liquidity spirals in the 2008 crisis.

2. Solvency/liquidity spirals

We begin by discussing the key ideas of solvency and (funding) liquidity in more detail. This then allows the proposed financial institution failure mechanism to be described.

2.1 Solvency

The term 'solvency' is widespread, but in fact captures a number of different if related phenomena. These include:

- Solvency in the sense of statutory accounting ('accounting solvency') means that a firm has more assets than liabilities. Note that this implies that the firm is a going concern, as statutory accounts are prepared on this basis. Furthermore, accounting solvency can typically only be demonstrated in retrospect (since accounts take time to prepare) and relative to a particular interpretation of the relevant accounting standards.
- Solvency in the market sense ('market solvency') means that a well-informed acquirer would pay a positive amount for the entire equity of a firm while taking on their liabilities. In particular, this implies an independent, conservative valuation of the firm's financial instruments.

Both notions of solvency are potentially matters of debate: typically observers do not have financial statements prepared today, nor is a firm bid available, so they must conjecture whether a firm is currently solvent in either sense. Of course, typically there are safeguards which make it highly likely in normal conditions that a given financial institution is indeed solvent, including regulatory capital requirements (which offer a slightly different but more conservative standard than accounting solvency). However, these safeguards do not guarantee solvency, and an observer can be legitimately unsure if a firm would be accounting solvent were its accounts to be prepared today, or if a well-informed buyer would make a positive bid for it.

2.2 Valuation uncertainty

There are two phenomena which generate uncertainty over solvency²:

- First, even at financial statement date, there is doubt over the accounting value over some financial instruments. For instruments subject to fair value, the primary cause of this is the absence of a liquid market³; while for amortised cost accounted instruments, there is often uncertainty in assessing the correct provision or allowance for credit losses⁴.
- Second, the value of financial instruments can change significantly between statement dates, giving rise to the concern that although an institution was solvent the last time it prepared financial statements, it may not be solvent today.

There can be a significant gap between how accounting solvent an institution is, and how market solvent it is. Wachovia was a good example of this: its (audited) financial statements of 30th

² For more background on this issue, see [BT06].

³ The distinction between fair value assets where values are likely to be reasonably reliable and those where there is a degree of estimation is recognised by the three levels of IFRS and GAAP. Fair value instruments where there is an active market which the reporting entity can access are reported in level 1, while those instruments whose fair value is estimated using some other approach than the prices of market transactions in an identical instrument are reported in levels 2 or 3 [FASB11a].

⁴ We agree with the perspective of [HL09] here: 'Banks have considerable discretion in the timing of their loan loss provisioning for bad loans and in the realization of loan losses in the form of charge-off'.

September 2008 showed that it had a net worth of \$50 billion, yet on 2nd October of the same year, the Wachovia board recommended an offer for the firm which valued it at \$15 billion⁵. Clearly here a potential acquirer is taking a different view on the value of Wachovia to that used in the bank's financial statements⁶.

Both valuation uncertainty and the gap between accounting solvency and market solvency are likely to be higher in a crisis [Per03]. This means that investors will be less certain of the solvency of financial institutions during stressed periods.

2.3 Funding liquidity

Liquidity for a financial institution is the ability to meet claims as they become due⁷. Funding liquidity risk is the risk that an institution will find itself unable to meet claims and thus either have to declare bankruptcy, access a lender of last resort (often the central bank), or otherwise undergo resolution. This risk has typically been the immediate cause of failure of large financial institutions during the recent crisis. For instance, during 2008 Bear Stearns, Lehman Brothers and RBS all found themselves unable to raise sufficient funds on the open market to meet claims. In all cases this quickly led to their failure and, respectively, takeover, bankruptcy and recourse to lender of last resort.

Funding liquidity risk arises because:

- Financial institutions typically have some form of funding mismatch. Longer term assets are funded using liabilities which are contractually shorter term such as sight deposits or commercial paper⁸. Thus many institutions rely for their survival on investors being willing to continue to roll their obligations.
- Many institutions also have significant contingent liquidity risk for instance through vulnerability to haircut increases on secured financing transactions or increased collateral requirements on derivatives transactions⁹.

2.4 Funder behaviour

The holder of a typical short term bank senior obligation, or an uninsured depositor, have highly asymmetric payouts: in the likely situation that the bank does not fail, they will earn a small positive return, but in the unlikely situation of bank failure, their return will almost certainly be a large loss. This means that such an investor faced with the choice between funding or not funding¹⁰ a financial

⁵ So far as the author is aware, this example was first highlighted by Jonathan Weil [Wei08].

⁶ Part of this gap, at least, is explained by the fact that a bidder would typically compare loan loss provisions with expected future credit losses, while neither US GAAP nor IAS require forward looking provisions (yet).

⁷ See [Mur06] or [Per03] for a more extensive discussion of liquidity and liquidity risk.

⁸ [Per03] describes the classic 'run on a bank' whereby depositors, fearing the future of insolvency of a bank, withdraw funds. This causes a liquidity crisis, precipitating that which was feared.

⁹ We note in passing here that the failure of AIG was due to a form of contingent liquidity risk. Contingent liquidity risk is partly due to the increased importance of the shadow banking system in funding financial institutions: see [PAAB10].

¹⁰ We use 'funding' as shorthand here for buying an obligation such as a note or commercial paper, making an uninsured deposit, or making a secured loan such as a repo.

institution in which they do not have complete confidence will likely not roll: it is better to be safe than sorry¹¹.

2.5 Failing to believe

A crude description of the principal large financial institution failure mode during the 2008 crisis is:

1. The institution had significant funding liquidity risk;
2. Events cause investors to doubt the solvency of the institution¹², *even though at this point it was actually accounting solvent and may have been market solvent*;
3. Therefore they declined to roll over the institution's debt, increased haircuts on its secured funding, and terminated some trading relationships¹³;
4. This caused a liquidity crisis which led to the failure of the institution.

The key issue is that the institutions' disclosures were insufficient to persuade the market that the preparer was solvent. Moreover, once confidence in a firm is lost, it is very difficult to regain.

The mechanism described above is widely understood by investors. In particular, they are aware that in a crisis:

- Investors will fail to roll debt if they are not confident in the health of an institution; and
- If sufficiently many investors fail to roll an institution's debt, then that institution may fail.

This means that the key question for a funder is not

Is the institution I am considering funding solvent?

but rather

Will most other potential funders consider the institution solvent?

Evidently, this is a coordination problem¹⁴, with the market prices of various elements of the bank's capital structure forming an important communication mechanism between investors. There are two equilibria corresponding to investors having justified confidence in the institution, and distrusting it (often then leading to failure)¹⁵.

A crude measure of solvency uncertainty can be obtained from all-in versus stand-alone ratings¹⁶. The reasoning is as follows: a lender of last resort ('LOLR') will lend to a solvent but illiquid bank (against good collateral). Moreover the LOLR has access to private information to assure itself about

¹¹ The problem is compounded for investors who themselves do not have an equity cushion, such as money market mutual funds. This is why the FSB recommends [FSB11b] enhancement of the regulatory framework for these entities.

¹² One might reasonably argue that what matters is not 'is the firm solvent now?' but rather 'will it be solvent at maturity of the debt I am considering?'. However given the importance of short term markets in bank funding, these two questions are very closely related.

¹³ See chapter 2 of [IMF10] or [Duf10] for more detailed accounts of the failures of bank funding markets during the crisis.

¹⁴ See [MS10] for a full account of investor coordination problems in debtor bankruptcy.

¹⁵ This is just the wholesale version [GM10] of the classic Diamond and Dybvig theory of bank runs [DD00].

¹⁶ An alternative terminology is 'supported' vs. 'unsupported' ratings. See [PT11] for a discussion of bank ratings.

the bank's accounting solvency, so it has little or no uncertainty. The market, on the other hand, does not have access to this information and will only lend if it is collectively sure that the bank is solvent. Therefore the difference between a bank's ratings with and without the possibility of support is a measure of the impact of solvency uncertainty.

3. The failure of Lehman Brothers

The report of Anton Valukas into the failure of Lehman Brothers [Val10] provides an invaluable insight into the dynamics of this significant financial failure. In this section we analyse the Valukas Report based on the schematic failure model outlined immediately above. References to the report will be given as (V, page x).

3.1 Funding liquidity risk

Like the other four large broker/dealers before the crisis 'Lehman was "heavily reliant upon wholesale financing sources" to fund a substantial portion of its balance sheet every 24 hours using overnight repos'¹⁷: in other words, Lehman had significant funding liquidity risk. This meant that 'Confidence was critical. The moment that repo counterparties were to lose confidence in Lehman and decline to roll over its daily funding, Lehman would be unable to fund itself and continue to operate'¹⁸.

Despite this vulnerability, Lehman had set a minimum permitted level of liquidity of as little as \$2 billion for a balance sheet of \$691 billion¹⁹, and enacted pledges over collateral which severely reduced its net unencumbered liquidity as the crisis progressed. For instance 'only \$2.4 billion of Lehman's \$32.5 billion liquidity pool was readily convertible to cash on September 12 [2008]'²⁰. This meant that once counterparties started to lose confidence, the end came very quickly.

Senior Lehman staff were aware of the importance of liquidity risk. 'As [Lehman CFO] Erin Callan noted after Bear Stearns' near collapse, "liquidity is the thing that will kill you in a moment."²¹. Lehman was 'widely regarded as the investment bank second-most dependent on short-term secured financing' and 'Lehman acknowledged this point in its public filings'²². Market participants were aware of this vulnerability too, and as the crisis progressed, many of Lehman's counterparties demanded collateral or other security before they would allow Lehman to continue dealing with them²³. They would probably have been even more demanding had they realised the true extent of

¹⁷ V, page 1402 quoting D. Hinton, Standard & Poor's Ratings Direct, Liquidity Management In Times Of Stress: How The Major U.S. Broker-Dealers Fare, November 8th 2007.

¹⁸ (V, page 3).

¹⁹ (V, page 148) and Lehman Brothers Annual Report 2007.

²⁰ (V, page 1452).

²¹ (V, page 1403) quoting a story by Maria Bartiromo in Business Week, 20th March 2008, *Lehman CFO Erin Callan: Back from Ugly Monday*.

²² (V, pages 1406-1407) which also quotes a Morgan Stanley research report of 30th June 2008 which analyses the disproportionate (compared to its peers) level of Lehman's liquidity risk.

²³ (V, page 1458) summarizes the demands of JPMorgan (\$4 billion of CLOs plus \$2.7 billion of cash and money market funds), Citibank (\$2 billion cash deposit), Bank of America (\$500 million cash deposit) and HSBC (\$1 billion collateral deposit).

Lehman's liquidity position: Lehman's disclosures to both ratings agencies and its regulators did not disclose the increasingly dire nature of its unencumbered cash and near-cash holdings²⁴.

We can be confident, then, that Lehman's funding risk was the major cause of its failure once confidence was lost.

3.2 Valuation solvency and investor doubts

Lehman was a broker/dealer, and hence the majority of its financial instruments were held at fair value²⁵. As the crisis intensified through 2007, 'certain of Lehman's assets became increasingly less liquid' and 'Lehman progressively relied on its judgment to determine the fair value of such assets. In light of the dislocation of the markets and its impact on the information available to determine the market price of an asset, investors, analysts and the media focused on Lehman's mark-to-market valuations. Lehman devoted a considerable part of its earnings calls for the first and second quarters of 2008 to explain the values it had determined for a wide range of its assets and the methodologies it had employed in doing so. Notwithstanding such disclosures, it is apparent that Lehman's valuations, or its "marks," for its illiquid assets, were being questioned by market participants.'²⁶.

This disbelief is evident in the price to book ratio of Lehman. As a mid 2008 article says, 'Lehman's market capitalization, at \$19.2 billion, is now almost \$7 billion less than the company's \$26 billion book value, or assets minus liabilities. That suggests that the market believes Lehman hasn't fully cleaned up its balance sheet and that the worst is still to come, management's assurances notwithstanding.'²⁷

Valukas notes the most significant areas of concern in Lehman's US inventory: commercial real estate, residential mortgage whole loans, RMBS, CDOs, derivatives, corporate debt, and equities²⁸. In all of these areas, Lehman's valuations were at the aggressive end of what could be legally justified. However, given that these valuations were not sufficiently egregious as to generate a colourable claim against management, it can be argued that Lehman was accounting solvent until very close to its failure²⁹.

²⁴ (V, pages 1467-1475) discusses Lehman's liquidity disclosures to Fitch, Standard & Poor's, Moody's, the Federal Reserve Bank of New York and the SEC.

²⁵ (V, page 203) which then goes on to note 'In addition, Lehman owned positions within its financial inventory that were classified as held for sale, which were reported at the lower of carrying amount or fair value'.

²⁶ (V, page 204) which notes in particular the concerns of David Einhorn, noted hedge fund investor.

²⁷ Jonathan Weil, *Lehman's Greatest Value Lies In Lessons Learned*, Bloomberg, 11th June 2008, quoted at *op cit*.

²⁸ Respectively (V, page 356), (V, page 494), (V, page 527), (V, page 538), (V, page 568), (V, page 583), and (V, page 594).

²⁹ Valukas, despite documenting for 250 pages Lehman's aggressive valuation approaches in a variety of asset classes, finds 'insufficient evidence to support a finding that Lehman's valuations of its RWL, RMBS, CDO or derivative positions were unreasonable during the second and third quarters of 2008': this suggests that Lehman did not step over the line, but instead used what discretion was available in valuation to its benefit. (This is not to suggest that there are not other areas of Lehman's financial reporting, such as Repo 105, which did not cross the line: see Valukas volume 3 for more details here.)

It is worth noting that Lehman only had \$21 billion of common equity at the end of 2007, so the ‘many billions’ of write downs suggested as necessary by one observer³⁰ would have had a substantial impact on Lehman’s leverage and probability of default. Indeed, it is evident from Valukas’ analysis that the valuation uncertainty in Lehman’s inventory was of a comparable order of magnitude to its common equity. Moreover by mid 2008, the market suspected this. Despite Lehman’s accounting-solvency, then, lack of investor confidence in this fact caused a loss of confidence in the firm³¹.

Lehman’s market solvency was more doubtful by late 2008. Bank of America conducted the kind of due diligence which forms the basis of an assessment of market solvency, and found a substantial gap between their own assessment of valuation and Lehman’s. As Valukas narrates, ‘BofA [Bank of America] put together a diligence team at some point around September 10 or 11, 2008, and it became quickly apparent to them that, without substantial government assistance, the deal [for BofA to buy Lehman] would not be beneficial to BofA. The sticking point for BofA was what [BofA CEO Kenneth] Lewis described as a “\$66 billion hole” in Lehman’s valuation of its assets.’³² This is a real world example where the gap between accounting solvency and market solvency was approximately three times the firm’s common equity. Clearly investors doubted Lehman’s solvency³³ and they had reasonable grounds for that doubt³⁴.

3.3 Failure to roll and crisis

As the crisis of 2008 deepened through the autumn, Lehman’s counterparties demanded more collateral and provided less funding. The end was quick. As Valukas reports, ‘On September 11, 2008, JPMorgan demanded an additional \$5 billion in collateral from Lehman. That same day, Lehman’s management told the Board that “liquidity is forecasted to decrease to \$30 billion today as a result of providing collateral,” from the previous day’s announced liquidity of \$42 billion. [These numbers include encumbered liquidity and hence do not reflect the firm’s true liquidity situation.] On Friday, September 12, 2008, Citibank obtained an amendment to its Clearing Agreement, which strengthened Citibank’s lien over [Lehman subsidiary] LBI’s property at Citibank’. At this point, Lehman ‘no longer had sufficient liquidity to fund its daily operations’ and by the evening of September 12, its ‘only hope to survive was federal assistance or a merger.’³⁵

³⁰ Lehman’s 2007 Annual Report gives total common stockholders’ equity as \$21.395 billion. The ‘many billions’ quote is from David Einhorn, Presentation to Grant’s Spring Investment Conference, *Private Profits and Socialized Risk*, April 8th 2008, quoted in (V, page 205).

³¹ (V, page 206) an Interview with SEC staff confirming this point. The extra collateral and security demands noted in the previous section also support a growing lack of confidence in the broker/dealer.

³² (V, page 209).

³³ (V, page 615) describes a conversation in June 2008: ‘Federal Reserve Vice Chairman Donald L. Kohn expressed to [Federal Reserve Chairman Ben] Bernanke the opinion held by some institutional investors, which Kohn appeared to share, that it was not a matter of whether Lehman would fail, but when’.

³⁴ Of course, it does not matter whether investors were right to doubt the firm or not: all that is important for the purposes of generating a run on the firm is whether they stopped funding. In Lehman’s case, they did.

³⁵ (V, page 12) and (V, page 621). This background on the deterioration of Lehman’s liquidity position is very helpful, but Valukas is noticeably silent on the key topic of the withdrawal of repo counterparties. Detailed evidence is hard to obtain here, but it is known that Lehman reported to the FED that repo lines were being pulled during July and August 2008 [FCIC10].

4. The failure of the Royal Bank of Scotland

A major source of information into the failure of RBS is the recent FSA Board report [FSA11]. Here we show how the FSA's analysis supports the conjecture that RBS's failure followed the pattern set by Lehman. References to the report are given as (F, page x).

FSA summarizes the cause of RBS's failure as due to the following factors³⁶:

- 'significant weaknesses in RBS's capital position';
- 'over-reliance on risky short-term wholesale funding';
- 'concerns and uncertainties about RBS's underlying asset quality';
- 'substantial losses in credit trading activities, which eroded market confidence';
- 'the ABN AMRO acquisition'; and
- 'an overall systemic crisis in which the banks in worse relative positions were extremely vulnerable to failure'.

Of these, the only idiosyncratic factor not accounted for in the model we discuss is the ABN AMRO acquisition. This weakened RBS at just the time when stresses were building in the financial system, and hence contributed to the loss of confidence in the bank when the crisis peaked after the failure of Lehman Brothers. However, even without the ABN AMRO transaction, RBS would still have suffered significant stress during the crisis and may well have failed³⁷.

4.1 Funding liquidity risk

FSA notes that RBS followed its peer group during the pre-crisis period in expanding its loan book faster than its deposit base: 'UK banks in general significantly increased their reliance on wholesale, and often within that short-term, funding'³⁸. However by 'end-June 2007, RBS had clearly developed a more risky liquidity profile than many of the large UK banks'. Nearly all of RBS's funding was unsecured, making it more vulnerable to a loss of confidence. 'The proportion of RBS's wholesale funding that was short-term was greater than that of all but one of these peers,' FSA notes, and 'on an absolute basis, RBS made the greatest use of short-term wholesale funding'³⁹.

RBS also had significant currency risk in its funding. The 'majority of its very short-term wholesale funding gap was, increasingly, non-sterling denominated and that non-sterling component was predominantly US\$'. Partly this reflects the relative liquidity of the US dollar funding markets, but it is also the case that the FSA's regulation of liquidity predominantly focuses on sterling, and so RBS's use of dollar funding resulted in reduced regulatory control over its funding strategy.

A common phenomenon in financial crises is that the term of available liquidity drops. Thus when firms which are already reliant on short term finance come to roll these short term obligations, they find that the only available sources of funds are even shorter term: this in turn further increases their liquidity risk. This spiral is hard to break: as FSA notes, 'it is extremely difficult to unwind over-reliance on short-term funds once there is a decline in market confidence'. This phenomenon was

³⁶ (F, page 21).

³⁷ (F, page 160) opines that 'it is possible that RBS would have failed even without the acquisition'.

³⁸ (F, page 94).

³⁹ (F, page 96), which also notes that the 'RBS Group Finance Director stated that RBS's use of wholesale funding made it more vulnerable (than other firms)'.

evident in RBS's funding during late 2007 and 2008 where 'funding continued to be concentrated at the short end as there was limited term funding available'⁴⁰.

RBS also offers a good example of the tight interaction between funding and solvency as it conducted a substantial rights issue during early 2008. This raised RBS's £12 billion of extra capital, and provided evidence that RBS was both market and accounting solvent. Accordingly, 'there was some improvement in RBS's liquidity position', as investors deigned to provide somewhat longer term funding to the bank⁴¹.

4.2 Solvency uncertainty and investor doubts

In retrospect, RBS's trading losses during the crisis were neither sufficient to threaten its solvency, nor unusual in their source. Between 2007 and 2010, it made net accounting loss of £30.7 billion compared with total capital resources of £68 billion at end 2007⁴². The main categories of loss were:

- Goodwill write-offs of £30.5 billion⁴³;
- Losses of £32.5 billion on loans and advances in RBS's banking book; and
- £17.7 billion from credit trading⁴⁴.

As FSA perceptively says, 'while the losses which RBS actually incurred over the period 2008 to 2010 [are known now], the precise scale of these losses was not known in advance. In explaining RBS's failure in autumn 2008, it is important to identify and understand the *market perceptions* of RBS's asset quality' as these 'played a role in the collapse in confidence and which resulted in a funding crisis'⁴⁵.

The following areas of market concern in RBS's balance sheet have been identified:

- Generally, 'the speed of risk-weighted asset growth';
- RBS's commercial property exposures⁴⁶;
- Its 'structured credit, leveraged finance and other riskier asset' exposures.

As in the Lehman example, there was a basis to these concerns. There are a number of examples of aggressive valuation by RBS in 2007 and 2008, notably CDO valuations (particularly CDOs of ABS). FSA notes that the valuations used by major dealers were 'significantly lower' than those that were

⁴⁰ (F, page 102-103).

⁴¹ This relationship between solvency and liquidity shows that funding providers do not believe that financial institution capital structure is irrelevant, as the Modigliani-Miller theorem might suggest.

⁴² (F, page 120) and (F, page 64). RBS also raised additional capital during the period, notably the £12 billion rights issue.

⁴³ Goodwill is not a regulatory balance sheet asset so goodwill write offs do not reduce capital.

⁴⁴ It is perhaps worth noting in passing here that the smallest of these three losses is from trading – an area of intense regulatory scrutiny post crisis – while the most significant cause of losses, making loans and advances, has received no major alteration in its capital treatment since Basel II. This lack of focus on the banking book is common. As FSA notes that their review 'saw limited evidence that the Supervision Team undertook work to understand the quality of RBS's loan portfolios in its banking book in order to assess the potential impairments that could materialise from an economic downturn'.

⁴⁵ (F page 133), emphasis ours.

⁴⁶ (F, page 134) quotes a Merrill Lynch survey note 'which identified RBS (along with three other banks) as having 'the most aggressive lending standards in the UK commercial property market'.

announced by RBS in December 2007. This difference was known and ‘a focus of concerns by market participants’ who were worried that ‘further write-downs would be needed’⁴⁷.

FSA further note⁴⁸ ‘concerns about the quality of the purchased assets’ in the ABN AMRO acquisition, ‘anxiety... about the potential for losses on RBS’s credit market exposures (including monolines)’. There were also concerns about ‘the composition of RBS’s loan portfolio, including exposures to the US sub-prime mortgage market, corporate and retail loans in Ireland via Ulster Bank and the rapid proliferation of commercial property loans from 2004 onwards’. In short, the market did not believe that RBS’s marks net of provisions were sufficiently conservative, and feared that further provisioning would be required.

RBS’s failure to mark its assets down fast during the early stages of the crisis was a major contributor to the loss of investor confidence in its solvency later. In the second half of 2008 market liquidity in many credit-related assets had declined dramatically and uncertainty about true market value was large. Those banks who were perceived not to have been honest during the early stages of the crisis, like RBS, were penalised: as the report says ‘The fact that RBS had already incurred major trading losses, and had been slow in its anticipation of those losses in late 2007 and early 2008 is likely to have contributed materially to the collapse in confidence in the firm and to funding concerns in September and October 2008’⁴⁹.

4.3 Failure to roll and crisis

The pattern of Lehman, whereby concerns about how solvent a firm is result in it suffering liquidity stress, was repeated with RBS. FSA reports ‘in mid-July [2008], there was a sudden further deterioration in RBS’s liquidity position, as indicated by the increase in its very short-term wholesale funding gap. During August, RBS’s reliance on very short-term wholesale funding increased again. RBS began to suffer a gradual outflow of retail and corporate deposits, which put further pressure on it to source funding from the wholesale markets’⁵⁰.

The failure of Lehman on the 15th September pushed RBS over the edge. At first, ‘RBS’s reliance on very short-term and, in particular, overnight wholesale funding grew’. ‘In October there was evidence of further falls in market confidence about RBS’s solvency, as well as concern around its liquidity position’. RBS could borrow overnight, and ‘continued to fund its growing overnight gap’ until the 7th October. At this point sufficient funding of any kind was not available and RBS ‘became reliant on ELA [emergency liquidity assistance from the Bank of England]’⁵¹.

This was the point of failure. One of the largest banks in the world, and one which was at all times up to its failure accounting solvent, required substantial injections of both government liquidity and capital to survive.

⁴⁷ (F, page 149-151). See also (F, page 389) for a more extended discussion of RBS ABS CDO valuation issues.

⁴⁸ (F, page 200) which cites investor comments on RBS earnings calls, ratings agency reports, newspaper articles and investment bank research to support this point.

⁴⁹ (F, page 154).

⁵⁰ (F, page 197).

⁵¹ (F, page 201) which also notes how public this stress was, quoting a BBC report of 3rd October 2008: ‘a big British bank was having difficulty renewing credit, which took it too close-for-comfort to the brink’.

5. Post crisis policy

There has been massive regulatory change in response to the 2008 crisis, both at the international level and nationally. Within the Basel Accords alone, there have been substantial changes in the composition of bank capital, the details of capital requirements and liquidity policy amongst other areas. In this section we review some of the most significant changes in bank regulation in the light of the large financial institution failure mode proposed and analysed in prior sections. Some changes to accounting and regulatory policy are recommended in this light⁵².

5.1 Liquidity requirements

The liquidity proposals in Basel III [BCBS10a] represent a profound regulatory change. Liquidity risk, as we have seen, was a key ingredient in financial institution failure during the 2008 crisis, and so regulator's focus on this risk is greatly to be welcomed. While some of the details of the Basel III proposals are controversial, measures are needed which constrain funding liquidity risk and harmonize regulation of it, especially for systemically important institutions.

FSA provides some detail of what the impact of the Basel III liquidity proposals would have been were it to have been implemented pre-crisis: 'RBS would have had to increase by between £125 billion and £166 billion its stock of high-quality unencumbered liquid assets or, alternatively, reduce its reliance on short-term wholesale funding'. Moreover, FSA notes, 'while it is not possible to determine whether this would have prevented the firm's failure, it would have allowed RBS longer to withstand the widespread collapse in market confidence in August through to October 2008'⁵³.

It is therefore to be hoped that the Basel Committee's broad⁵⁴ initiative for banks is extended by other supervisors to non-banks. In particular, the crisis demonstrated that the broker/dealer business model of funding significant amounts of the balance sheet via repo was highly dangerous⁵⁵, so the following is suggested:

RECOMMENDATION ONE The regulatory framework for non-bank financial institutions should be enhanced to restrict the degree of permitted funding liquidity risk including contingent liquidity risk⁵⁶.

5.2 Capital requirements

Basel III and related initiatives such as the G-SIFI charges⁵⁷ have dramatically increased the quality and quantity of capital that banks – especially large banks – are required to hold. Clearly a bank with more common equity tier 1 capital can absorb more losses before becoming insolvent, and hence these changes can be seen as enhancing financial stability. However, there is a perverse sense in

⁵² As such, this work is a contribution to the growing literature on the *regulatory/accounting nexus*. See for instance [BT06], [HLO9] or [Mat08] for more work in this area.

⁵³ (F, page 108).

⁵⁴ We say 'broad initiative' because the detailed Basel III LCR regulation suffers from the same problem as the capital requirements: since the buffer required by the LCR has to be in place at all times, it cannot be used.

⁵⁵ For more details of the pre-crisis broker/dealer regulatory framework and its inadequacies, see [Mur09].

⁵⁶ This is consistent with the FSB's position [FSB11b] that the 'regulation of secured funding markets, in particular repos (repurchase agreements) and securities lending should be assessed carefully and further enhanced from the prudential perspective as necessary'.

⁵⁷ See [BCBS10a,b] for the Basel proposals and [FSB11a] and the references therein for more details of the work of the FSB in this area.

which increasing capital requirements can also *decrease* financial stability. The phenomenon is as follows:

- Regulators announce that capital requirements for banks are to be raised;
- The market accepts this new standard as the baseline for well-capitalized institutions;
- Therefore any banks not meeting this standard suffer a loss of confidence in a crisis;
- And because the new requirements are higher, this is more likely than it would have been under the old, lower standard.

This analysis shows that while higher capital *ceteris paribus* increases a bank's ability to absorb losses, higher capital requirements can have a perverse effect. It is only capital in excess of the minimum requirement that is available to absorb losses, because a bank that dips below this minimum – regardless of any regulatory forbearance – will likely suffer a funding crisis.

The Basel III capital conservation buffer, seen in this light, is not a buffer in that it is unlikely that the market would continue to fund a large bank which dropped close to it.

We therefore suggest the following design principles for financial institution capital:

RECOMMENDATION TWO Minimum capital requirements for systemically important institutions should be set at a level which keeps confidence, i.e. at a level which is sufficient to assure potential funders that the bank is solvent, given inherent valuation uncertainties.

RECOMMENDATION THREE Disclosures of regulatory capital adequacy, including the design of stress tests, should be designed to enhance confidence in the reporting institutions⁵⁸.

RECOMMENDATION FOUR Financial institutions should hold sufficient capital above the minimum to absorb losses in a plausible stress scenario, i.e. they should be able to survive a crisis without the market losing confidence in them.

Notice that this suggests a complete inversion of the usual approach for thinking about capital requirements. In our model, required capital is intended to provide confidence to investors, and thus provides them with comfort that the bank is solvent⁵⁹. It is capital *above the minimum* that is available to absorb losses and hence which should be determined using some form of risk-based capital estimate.

This approach has the notable advantage of reducing the damage due to the procyclicality of the capital framework in the sense that, by design, going concern financial institutions have enough capital both to keep confidence and to absorb losses, and so losses during a crisis are much less likely to create a funding crisis.

⁵⁸ Thus for instance a banking system wide stress test which the market does not view as stressful can reduce rather enhance confidence.

⁵⁹ The FSA has previously suggested that capital requirements *include* capital for valuation uncertainty [FSA10]. We are proposing in some sense that capital requirements are *only* for valuation uncertainty, or at least for market solvency uncertainty.

5.3 Valuation uncertainty

Financial institutions can trade for extended periods of time with equity prices well below book. For instance, in the current European sovereign debt crisis⁶⁰. Turning to our two exemplary failures, both Lehman and RBS traded at a price to book ratio of well below par for months before their ultimate distress. These phenomena indicate that the market does not believe that the firm's book value reflects reality.

A key difficulty, we suggest, is that the market does not have sufficient information to allow it to believe in the reported figures. In particular, it is known that there is valuation uncertainty, but it is not known how big it is, therefore the market takes a conservative view. Clearly some disclosure of valuation uncertainty would reduce the probability of loss of confidence⁶¹.

RECOMMENDATION FIVE Financial institutions should provide an estimate of the uncertainty in valuation of balance sheet items. This should include estimates of the impact of parameter error on level 2 and level 3 fair value items and estimates of the uncertainty in expected loss provisions.

There is good evidence⁶² that more extensive disclosure of valuation practices increases confidence. Therefore:

RECOMMENDATION SIX Financial institutions should provide comprehensive details of their approach to the valuation of both fair value items and the estimation of expected loss provisions.

5.4 Confidence in accounting disclosures

The value of market prices as an early warning signal of loss of confidence should not be ignored. There are various prices which are relevant, including bond and CDS spreads, but the most direct indicator of perceptions of market solvency is equity price:

RECOMMENDATION SEVEN Supervisors should monitor firm price to book ratios and should take measures if these fall significantly below par for an extended period. Such measures could include lengthening the institution's funding profile, capital increases, and/or increased disclosure.

As we have noted, the existence of persistent, substantial discounts to book is evidence that accounting solvency is not the most useful measure for investors. The main reason for this is the substantial discretion available to the preparers of financial statements⁶³. Providing investors with a consistent definition of the purposes of provision which is aligned with the perspective of a potential

⁶⁰ By mid November 2011, 40 of the top 50 largest European banks traded for less than their book value, and 18 for less than half their book value. Similarly, as [HL09] reports, by end-2008, more than 60% of U.S. bank holding companies had a market-to-book value of assets of less than one,

⁶¹ This suggestion is not new. For instance, [BT05] recommend disclosure of 'measures of the uncertainty surrounding' both risk and valuation estimates. This has moreover been discussed if not yet comprehensively embraced by accounting standards setters: FAS 820 [FASB11a], for instance, requires that 'a reporting entity should disclose quantitative information about the significant unobservable inputs used in a fair value measurement categorized within Level 3 of the fair value hierarchy'.

⁶² [NR11] shows that banks with lower valuation transparency are more likely to experience regulatory intervention. The less you tell investors, the more likely they are to lose confidence in you.

⁶³ This discretion goes in both directions: Lehman (and to a lesser extent RBS) were aggressive in the valuations, but equally some banks have used loan loss reserves to smooth earnings; they provision in good times and release these provisions in bad ones. See [HL09] for a discussion of how banks under-provision to preserve capital in bad times, or [WK] or an account of the SEC's action on bank over-provisioning in the 1990s.

acquirer would enhance confidence, as would information on the past performance of firms' valuations.

RECOMMENDATION EIGHT Accounting standards for accrual accounted items should be harmonized to require provisioning for expected loss over the life of the instrument⁶⁴.

RECOMMENDATION NINE Financial institutions should provide comprehensive backtesting of their marks. For fair value assets this will include details of sales or purchases vs. marks, while for accrual accounted assets it will include disclosure of actual default losses and charge-offs vs. provisions taken.

RECOMMENDATION TEN Supervisors should conduct regular, detailed, cross institution mark reviews and should publish the results of these reviews.

6. Concluding remarks

We have set out a financial institution failure mode which we believe was pervasive during the 2008 crisis. It is well supported by the evidence from the two most detailed inquests into crisis failures, those of Lehman Brothers and RBS. There are two novel conclusions that follow from this analysis.

6.1 The importance of investor beliefs

Pre crisis, one might have thought that

Banks survive if their assets are worth more than their liabilities.

Post crisis, we know that a more accurate account is

Banks survive if investors believe that the bank's assets are worth more than their liabilities and further believe that this state of affairs is highly likely to persist.

This suggests that regulatory policy should be set not just to ensure that banks can absorb losses but also to ensure that bank funders believe this to be the case. Well capitalized financial institutions can and do fail; well-funded ones can at least survive long enough that they may be able to correct a solvency problem if it arises.

6.2 Required capital may not be available to absorb losses

If the failure mechanism we propose is important, then required capital cannot always absorb losses. This is because if a bank dips below its capital requirement, it may fail due to liquidity risk (or at least need to access the lender of last resort). Given the very substantial increases in required capital in Basel III and related initiatives, this possibility is disquieting. We suggest that supervisors carry out an extensive market survey of funding providers to ascertain if they view the new common equity tier 1 ratios⁶⁵ as a minimum. If so, supervisors may wish to reassess the balance between capital above and below the required minimum before Basel III is enacted.

⁶⁴ See [FASB11b] for more details of the current (and divergent) thinking of the FASB and the IAS on provisioning.

⁶⁵ I.e. the 7% ratio under Basel III net of the capital conservation buffer, and the 9.5% ratio for the largest current G-SIBs.

Bibliography

- [BCBS10a] Basel Committee on Banking Supervision, (2010). *Basel III: International framework for liquidity risk measurement, standards and monitoring*. BCBS 188.
- [BCBS10b] Basel Committee on Banking Supervision, (2010). *Basel III: A global regulatory framework for more resilient banks and banking systems*. BCBS 189.
- [BT05] Borio, C., & Tsatsaronis, K. (2005). *Accounting, prudential regulation and financial stability: elements of a synthesis*. BIS working paper No. 180.
- [BT06] Borio, C., & Tsatsaronis, K. (2006). *Risk in financial reporting: status, challenges and suggested directions*. BIS Working Papers 213.
- [Bru09] Brunnermeier, M. (2009). *Deciphering the Liquidity and Credit Crunch 2007–2008*. Journal of Economic Perspectives, Volume 23, Number 1.
- [DD00] Diamond, D., & Dybvig, P. (2000). *Bank Runs, Deposit Insurance and Liquidity*. Federal Reserve Bank of Minneapolis Quarterly Review Vol. 24, No. 1.
- [Duf10] Duffie, D. (2010). *The failure mechanics of dealer banks*. BIS Working Paper No. 301.
- [FASB11a] FASB, (2011). *Fair Value Measurement (Topic 820)*. Financial Accounting Standards Board. Accounting Standards Update No. 2011-04.
- [FASB11b] FASB, (2011). *Financial Instruments: Impairment*. Financial Accounting Standards Board Supplementary Document 2011-150.
- [FCIC10] Financial Crisis Inquiry Commission, (2010). *Chronology of Selected Events Related to Lehman Brothers and the Possibility of Government Assistance*.
- [FSA10] FSA, (2010). *The prudential regime for trading activities: A fundamental review*. Financial Services Authority DP 10/04.
- [FSA11] FSA, (2011). *The failure of the Royal Bank of Scotland*. Financial Services Authority Board Report.
- [FSB11a] FSB, (2011). *Policy Measures to Address Systemically Important Financial Institutions*. Financial Stability Board.
- [FSB11b] FSB, (2011). *Shadow Banking: Strengthening Oversight and Regulation*. Financial Stability Board.
- [GM10] Gorton, G., & Metrick, A. (2010). *Securitized Banking and the Run on Repo*. Yale ICF Working Paper No. 09-14.
- [HL09] Huizinga, H., & Laeven, L. (2009). *Accounting Discretion of Banks During a Financial Crisis*. IMF Working Paper 09/207.
- [IMF10] IMF, (2010). *Global Financial Stability Report*. International Monetary Fund, October 2010.

- [Mat08] S. Matherat, (2008). *Fair value accounting and financial stability: challenges and dynamics*. Banque de France Financial Stability Review No. 12.
- [MS02] Morris, S., & Shin, H. S. (2002). *Coordination Risk and the Price of Debt*. Cowles Foundation Discussion Paper No. 1241R.
- [Mur06] Murphy, D. (2006). *Understanding Risk*. Chapman Hall.
- [Mur09] Murphy, D. (2009). *Unravelling the credit crunch*. Chapman Hall.
- [NR11] Ng, J., Rusticus, T. (2011). *Banks' Survival during the Financial Crisis: The Role of Financial Reporting Transparency*. Harvard Law School Forum on Corporate Governance and Financial Regulation.
- [Per03] Persaud, A. (2003). *Liquidity Black Holes: Understanding, Quantifying and Managing Financial Liquidity Risk*. Risk Books.
- [PAAB10] Pozsar, Z., Adrian, T., Ashcraft, A., & Boesky, H. (2010). *Shadow Banking*. Federal Reserve Bank of New York Staff Report No. 458.
- [PT11] Packer, F., Tarashev, N., (2011). *Rating methodologies for banks*, BIS Quarterly June 2011.
- [Val10] Valukas, A. (2010). *Report of A. Valukas, Examiner, In Re Lehman Brothers Holding Inc.* United State Bankruptcy Court, Southern District of New York: Available at lehmanreport.jenner.com.
- [WT00] Wall, L., & Koch, T. (2000). *Bank Loan-Loss Accounting: A Review of Theoretical and Empirical Evidence*. Federal Reserve Bank of Atlanta Economic Review Second Quarter 2000.
- [Wei08] Weil, J. (2008). *Wachovia Shows Why No Bank's Books Are Trusted*. Bloomberg.

Acknowledgements

My thanks are due to Gary Dunn, Victor Ng, Evan Picoult and Peter Sime for insightful discussions on capital and financial stability. In particular, the discussion presented here on the role of capital above and below the minimum owes much to Gary Dunn.