Bank failure, mark-to-market and the financial crisis

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Abstract

This paper is concerned with the allegation that fair value accounting rules have contributed significantly to the recent financial crisis. It focuses on one particular channel for that contribution: the impact of fair value on actual or potential failure of banks. The paper compares four criteria for failure: one economic, two legal and one regulatory. It is clear from this comparison that balance sheet valuations of assets are in two cases crucial in these definitions, and so the choice between "fair value" or other valuations can be decisive in whether a bank fails; but in two cases fair value is irrelevant. Bank failures might arise despite capital adequacy and balance sheet solvency due to sudden shocks to liquidity positions. Two of the most prominent bank failures cannot, at first sight, be attributed to fair value accounting: we show that Northern Rock was balance sheet solvent, even on a fair value basis, as was Lehman Brothers. The anecdotal evidence is augmented by empirical tests that suggest that mark-to-market accounting does not increase the perceived bankruptcy risk of banks.

Keywords: financial crisis, credit crunch, fair value accounting, mark-to-market, Basel 2, capital requirements, bank failure

Classification: G01, G18, G33, M41

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I. Introduction

"There are two sides on the balance sheet.
The left side of the balance sheet has nothing right
and the right side has nothing left.
But they are equal to each other.
So accounting-wise we are fine."

Jacob Frenkel, VC of AIG

In analysing the financial crisis, distinguished commentators have attributed part of the blame to the financial reporting regime – in particular the use of "fair values" in reporting financial instruments in bank balance sheets. Anatole Kaletsky of the London Times, wrote: "Much of the damage in the financial crisis was caused by forcing banks to use mark to market accounting rules…" (Times, 9 July (2009)). And Bill Janeway writes of "The Accountants' Doomesday Machine" (Janeway (2009)).

Economic policy-makers have joined the condemnation. For example, European Commissioner McCreevy announced, "I must add that there is growing concern among Finance Ministers at the perceived slowness of the International Accounting Standards Board in responding to the systemic crisis we have endured…many Ministers have complained about what they see as an 'over-academic' approach to standard setting, which many see as 'out of touch' with today's reality"[1] And the communiqué from the April 2009 G20 summit joined the implicit criticism with a call (paragraph 15) on the accounting standard setters to work urgently with supervisors and regulators to improve standards on valuation and provisioning.

[1] http://www.iasplus.com/europe/0905mccreevy.pdf

The principal accounting regulators (IASB and FASB) have – not always enthusiastically – introduced modifications to the fair value accounting regime. In October 2008, the IASB issued amendments to IAS 39 and IAS 7 to permit reclassifications of some financial instruments (so that they did not have to be recorded at current market value); and later that month issued guidance on measurement when markets become inactive, relaxing requirements to use current market prices (IASB 2008).

This paper investigates the allegation that fair value accounting rules have contributed significantly to the recent financial crisis. It focuses on one particular channel for that contribution: the impact of fair value on the actual or potential failure of banks. Bank failure can play several roles in financial crises. It brings deadweight bankruptcy costs incurred by courts, administrators and liquidators (Altman (1984)). It can destroy organisation capital (Lev et al (2009)). It can lead to fire sales of assets, depressing asset valuations across markets. It can eliminate financial claims, and dent the confidence of counterparties that their claims on other banks will be honoured: spreads may widen, and, in the extreme, markets will freeze. And a heightened fear of failure may cause banks to scale back lending, curtailing potentially profitable economic activity.

We trace the impact of fair values on insolvency conditions in law, exit conditions in economics, and (potentially lethal) violation of the capital adequacy conditions prescribed in prudential bank regulation. For evidence we consider the contribution of fair valuation rules to the actual or potential failure of banks, first by building on the work of Shin (2009) via case studies of Northern Rock and Lehman Brothers – pivotal failures in the crisis – and, second, via statistical

analyses of stock prices and credit spreads of a large sample of international financial institutions during the financial crisis.

Bank failure can, of course, also play a benign role in enhancing the efficiency of the economic system. This is for the Darwinian reasons famously developed by Friedman (1953): elimination of the "unfit". As the last Governor of the Bank of England emphasised (George (1993)): "The possibility of failure is necessary to the health of the financial system, as it is to the efficiency of all other economic activity." And he cited Bagehot on moral hazard – "Any aid to a present bad bank is the surest mode of preventing the establishment of a future good bank". In the UK there were 31 bank failures in the period from the secondary banking crisis of 1973-6 until 2009; and in only four of these cases did the Bank of England consider that government support was warranted (SRM 2009, para 137).

However, the literature identifies circumstances where failure may not play this ultimately benign role. The law and economics literature explores cases where the legal criteria for failure do not correspond with the economic criteria for exit. Jackson (1982) and Webb (1991) analyse examples where this divergence leads, under a creditor-oriented legal system such as the UK's, to destructive creditor races and economically undesirable exit.

The discussion in this paper focuses on whether fair values exacerbate or mitigate such problems. Our work is motivated by concerns that failure – or increased probability of failure – of one bank might damage the operations of others. In Governor George's words, "The … issues for us are (a) what effect the failure of

the institution would have on the system as a whole; and (b) what should be done to protect the system from contagion."

Platin, Sapra and Shin (2005, 2008) investigate the financial stability implications of the use of market prices for the valuation of loans. The authors argue that although the emergence of surrogate prices via innovative derivatives markets for previously illiquid assets allows these assets to be marked to market, this may not be desirable due to the magnifying role of prices on financial intermediaries' actions during financial crises. Changes in asset prices are found to be a major channel of contagion among financial institutions (Cifuentes, Ferrucci, and Shin, 2005); and particularly during financial crises these changes might predominantly be reflective of the overall liquidity of the market – its ability to absorb large asset sales (Adrian and Shin, 2008; Gorton and Huang, 2004; Schnabel and Shin, 2004; Bhat et al (2011), Kolasinski (2011)). Under these circumstances the liquidity shortages and distressed asset sales may lead to systemic failures in the banking system as highlighted in Diamond and Rajan (2005).

At first sight, bank failure appears a straightforward event. But actually we distinguish four different criteria, or triggers, for bank failure: one economic, two legal, and one regulatory. This diversity of criteria has several implications for the efficiency of the failure mechanism, particularly in periods of financial crisis. First, none of the legal or regulatory criteria is usually aligned with the economic criterion for exit: viable banks may fail, whilst neither the legal nor the banking regulators' mechanisms can be relied upon to eliminate a bank which is economically "unfit". Second, the legal constraints which eliminate banks and

other businesses depend on prevailing economic circumstances: other things equal, a bank may survive in deep and liquid markets yet fail in less active markets. Third, we show that fair values in the balance sheet are potentially critical in two of these four failure triggers (one legal and the regulatory), but irrelevant in two of them (the economic and the other legal one). We therefore explore whether actually they have been important in the current crisis.

First, we analyse the financial statements of the two most notorious bank failures of the crisis, Northern Rock and Lehman Brothers. And we conclude that the failure of these banks cannot be attributed to fair value accounting. When measured at fair value, and without any of the relaxations of fair value rules that were subsequently introduced, neither bank was balance sheet insolvent – usually the primary legal criterion for failure in the relevant jurisdictions; and nor did they break the regulators' capital adequacy rules in relation to their balance sheets. Their demise is instead attributable to cash flow insolvency, a condition which is of little consequence in normal times when markets are deep and liquid.

We turn then to other evidence which might reveal a pernicious role for fair values in the crisis.

We attempt formally to test whether mark-to-market risk increased the bankruptcy risk of financial institutions during the financial crisis. More specifically, in time-series regressions we test whether daily changes in the ABX.HE index increased the perceived risk of bankruptcy reflected in spreads on credit default swaps. We do not find evidence suggesting this in our tests. Instead we find some explanatory power in the spread between LIBOR and Overnight Index Swaps (OIS), which measures counterparty risk for borrowings with very short maturities, confirming

our theoretical argument that cash flow insolvency becomes the binding failure condition during financial crises.

Changes in the fair value regime offer another opportunity to assess the role of fair value in bank failure. The accounting regulators have during the crisis twice introduced relaxation in the fair value regime. First we consider the amendment of IAS 39 in 2008– allowing banks to re-classify certain financial instruments from the trading category (which requires continuous marking to market) to the loan category (which is measured at cost). We reason that, even though it does not affect their underlying solvency or viability, this partial suspension of fair value accounting may for some banks have reduced the probability of regulatory failure with all its attendant costs; and such a benefit would show in share prices. At first sight this benefit for the banking sector's market valuation does seem to have accompanied the IASB announcement.

A second relaxation of the fair value regime introduced by IASB and FASB concerns the fair values to be used where the markets in which the relevant instruments are to be priced have become very thin. This relaxation responds to the fear of externalities and vicious circles, where one bank's distress sale of an instrument in an illiquid market determines the prices at which equivalent or comparable instruments are recorded – for legal or regulatory purposes – in other banks' balance sheets. To assess this relaxation we measure share price changes in the banking sector – again as an indicator of changed failure risk – in response to a notorious example of a financial instrument being sold in large quantity at a massive discount – Merrill Lynch's sale of its ABS CDO portfolio with a face value of $30.6bn at a price of $6.7bn in the summer of 2008. Despite a negative effect on share prices for the banking sector overall at time of the announcement,

the results do not indicate that the market expected this distress sale to have a long-term adverse impact on other banks' balance sheets. Although, the results presented in this paper highlight the need for further investigation, nevertheless, some relevant conclusions can already be drawn from this analysis.

Balance sheet valuations can become decisive for two failure conditions: Balance sheet insolvency and regulatory failure. Our analysis shows that neither of the two contributed to prominent bank failures during the crisis, but that rather cash flow insolvency, which is independent of the prevailing accounting regime, becomes binding during downward cycles. The anecdotal evidence is augmented by empirical tests that show that liquidity risk, not market risk, is reflected in default expectations for banks. Moreover, prima facie evidence does not suggest negative externalities of market transactions in thin markets.

The remainder of the paper is structured as follows. In section II we introduce four conditions of bank failure and compare these with each other. Section III discusses the impact of mark-to-market accounting on the failure conditions and Section IV presents the two prominent failure cases during the recent financial crisis – Northern Rock and Lehman Brothers. We complement the theoretical arguments and case evidence with several empirical tets in Section V. Recognising that some of our results are still tentative, section VI concludes with implications of our analysis for fair value accounting.

II. What triggers bank failure?[2]

1. One legal criterion for company failure - balance sheet insolvency (BSI)

One legal criterion for company failure – balance sheet insolvency - can be formulated as

$$A < L, \qquad \text{(i)}$$

where A is the value of the firm's assets (we leave the valuation basis undefined at this stage: this is a critical issue later in the paper) and L is the value of the firm's liabilities (debts). Referring to this inequality the US bankruptcy code of 1978 states: "'Insolvent' means, in relation to an entity, that … the sum of such entity's debts is greater than all of such entity's property, at a fair valuation…"[3]

Similarly, one component of the UK Insolvency Act (1986, 2.123) has an equivalent balance sheet test:

"A company is also deemed unable to pay its debts if it is proved to the satisfaction of the court that the value of the company's assets is less than the amount of its liabilities…".

In general the courts will adopt generally accepted accounting practice in valuing the assets and liabilities in this calculation; so the accounting standard setters play a powerful role in this process: in a falling market a bank might be deemed solvent if its assets are valued at cost, but insolvent if they are recorded at a fair value based on current market price.

2. The economic criterion for company failure (EF)

The economic criterion for company failure (EF) can be stated as:

$$A_{pv} < A_{nrv} \qquad \text{(ii)}$$

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2 This section is developed from Meeks and Meeks (2009).

3 We are particularly grateful to Len Sealy for lucid explanations of the definition of insolvency in different jurisdictions.

Where A_{pv} is the present discounted value of net future cash flows generated by the company's assets if they are retained in their existing use and A_{nrv} is the net realisable value of the assets, if they are sold for an alternative use. This is simply saying that economic efficiency would be enhanced if a company discontinued once its assets could yield higher returns in an alternative use. It does not depend on accounting choices whether to record assets at fair value or historical cost. Instead it involves comparing two sets of potential cash flows[4]. Nor does it take account of the company's legal insolvency, since no comparison is made between assets and liabilities. Hence it may be economically desirable for a business to continue even where it fails on legal grounds.[5]

3. Regulatory failure (RF)

In addition to the economic and legal mechanisms of failure financial institutions are subject to regulatory tests whether they hold enough capital against potential claims from their creditors. To prevent the cost of government intervention in case of bank failures and the associated transfer of taxpayers' funds to bank creditors, bank regulators impose binding capital constraints for financial institutions which

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4 These correspond, of course, to two of the ways of measuring fair value under current accounting standards: mark to model uses discounted cash flows; and mark to market uses realisable value.

5 Jackson (1982) and Webb (1991) analyse cases where, on legal grounds, companies are liable to fail (A<L: they are insolvent); but on economic grounds the assets would best remain employed in the present business: the business is worth more as a going concern than if it is liquidated. Under a creditor-oriented legal system (such as the UK's), the incentive system may induce destructive creditor races, and economically undesirable exit (Meeks and Meeks, 2009).
On the other hand there are firms which, on economic grounds should be disbanded (Apv<Anrv), but are not compelled to by the legal system. Such companies are the focus of Jensen's (1986) analysis of cash-rich firms free to squander stockholders' money because of agency problems; and of his prescription of raising their leverage, thus compelling them to return some cash flow to wealth-holders every year in the form of interest payments: unless their performance improves they will ultimately be driven into the insolvency net, with the prospect of law intervening to part executives from their under-performing assets. A related case analysed by Stiglitz (1972) (see also White (1992)) has managers continuing in business under the protection of Chapter 11, gambling with stockholders' money, even though liquidation is warranted on economic grounds (see the analysis of Eastern Airlines by Weiss and Wruck (1998)).

limit their lending activities and ultimately the amount of leverage (Thakor, 1996; Berger et al., 1995). Regulatory failure can be expressed as:

$$q \times K < A \qquad \text{(iii)}$$

Where

K = Regulatory Capital

q = leverage multiplier

A = Assets

Although a breach of the minimum capital requirements does not simultaneously and immediately constitute legal or economic insolvency, it is usually, however, accompanied by reprimanding and intervening actions by the regulator on the banks financial activities.[6] The amount of regulatory capital to be held by financial institutions has to be set by regulators in relation to the risk (and hence possible losses) it should be able to absorb. A risk-based capital ratio allows the minimum capital held as protection against bankruptcy to adjust to the variability in net worth of the bank (Bradley et al., 1991; Avery and Berger, 1991). The Basel capital adequacy rules require all banks to hold a minimum of 8% of total (regulatory) capital to risk-weighted assets. The risk weights are designed to take into account the bank's exposure to the credit risk of the counterparty within its banking book activities, i.e. traditional banking activities such as borrowing and lending. Banks' trading activities require additional capital provisions for exposure to market risk usually based on more complex techniques such as Value-at-Risk calculations.

[6] In addition to minimum capital requirements financial institutions are subject to a panoply of regulatory safety measures such as deposit insurance, access to liquidity pools (e.g. discount window), and credit guarantees.

Compared with the legal definition of failure in II.1.(i) balance sheet insolvency (A<L), the regulatory failure constraints are breached even before a financial firm reaches negative equity. Assuming - for simplicity reasons but without loss of generality - that no subordinated debt or hybrid capital is held by the financial firm (such that K = A –L), the regulatory failure conditions can be expressed as:

$$A < L + (\frac{1}{q} \times A) \Rightarrow A < L + W \qquad \text{(iv)}$$

Since W is always positive it is obvious that the regulatory conditions are breached before the financial firm reaches legal insolvency based on BSI. These more stringent failure conditions for financial firms are justified by the regulators on the grounds of the systemic importance of financial companies for the economic system and for confidence in capital markets.

4. A second legal criterion: cash flow insolvency (CFI)

Can financial institutions fail if they are neither legally insolvent, on the balance sheet test, nor in breach of the capital adequacy rules of the banking regulators? One perspective on this comes from the legal criteria for insolvency in some jurisdictions outside the US. For example, at the opposite end of the spectrum from the US is Australia, under whose law the only test of insolvency is (Corporations Law (Aust), s95A):

(1) A person is solvent if, and only if, the person is able to pay all the person's debts, as and when they fall due and payable.

(2) A person who is not solvent is insolvent.

This is a cash flow, rather than a balance sheet test. It asks not whether liabilities exceed assets, as in the US, but whether cash flows are sufficient to meet the

payments which the company is required to make. UK law appears to be a hybrid of US and Australian rules: it includes a cash flow test, one component of which is (Insolvency Act 1986, s 123):

1. {c} …the company is unable to pay its debts as they fall due

But it also includes a balance sheet test:

2. A company is also deemed unable to pay its debts if it is proved to the satisfaction of the court that the value of the company's assets is less than the amount of its liabilities…

The cash flow test might be written:

$$CI(t) < CO(t) \qquad \text{(v)}$$

Where

CI(t) = cash in (initial liquid assets, plus cash receipts)during period t

CO(t) = immediate obligations to pay, plus fresh obligations to pay in period t

5. Comparing BSI and CFI

Does this mean that *balance sheet* insolvency is irrelevant in these other jurisdictions? We would argue that **<u>if markets are deep and liquid</u>** BSI is the binding condition even if the law is framed in terms of cash flow insolvency, and that it is CFI which is irrelevant. Suppose an Australian company (in that cash flow bankruptcy regime) has encountered a cash flow difficulty and does not have cash in the bank with which to pay a "debt due and payable". What happens next? Managers (and equity-holders) have strong incentives to avoid the legal process of failure, since it entails bankruptcy costs (elaborated, for example, in Altman

(1984), Andrade and Kaplan (1998)), and would typically deprive equity-holders of their wealth, and managers of their control and their income. They can therefore be expected to seek cash with which to meet the debt. They could do this by selling off any non-cash assets which are not required for operations (surplus inventories, real estate or equipment). Or, if there were no such surplus assets, they could borrow against the assets they wished to continue operating. For example, in the case of real estate they could construct a mortgage or a sale and lease back arrangement; in the case of inventories they could follow common practice and use these as collateral for short-term bank borrowing; and in the case of receivables, they could adopt factoring to "turn them into cash" ahead of the due payment day.

What is the limit on such borrowing? For a credit-worthy company operating in deep and liquid capital markets, the limit will be set by its potential collateral. In other words, the question will be: does it have more assets than liabilities? Cash flow insolvency will only matter, therefore, if it is accompanied by balance sheet insolvency: $A < L$.

Otherwise the rational manager will solve the problem of cash flow insolvency with some form of re-financing package. This is the analogue of the standard Modigliani-Miller proposition that stockholders will, in certain circumstances, be indifferent between dividends – cash flows – and retained earnings. This is because, for listed companies, retained earnings, which are equity – can readily be transformed into cash via financial markets: stockholders can "declare their own dividend" by selling some stock. Similarly, in our context, **with deep and liquid financial markets**, the executive faced with cash flow insolvency can sell assets

or raise finance against collateral, provided there is positive equity – balance sheet solvency.

III. Mark-to-market accounting and the different concepts of bank failure

1. Mark-to-market and economic failure

The notion of marking to market under a fair value accounting regime is based on the relevance and reliability of market prices in approximating economic or fundamental value (Whittington 2008). This concept relies on exit prices to reflect the equilibrium state of demand and supply (Chambers, 1966).[7] Measurement of the economic failure condition is therefore inherently connected to the notion of fair value. In perfect and complete markets prices are readily available for all assets and the economic failure condition can easily be assessed by comparing observable exit prices (net realizable values) with the value in use of all assets of a business.[8] However, when markets are less than perfect and are incomplete the exit price might no longer serve as a good approximation for economic value. Yet this does not necessarily alter decisions for going concerns based on the economic failure condition. If, for instance, during financial crises markets become illiquid and prices reflect investor's demand for liquidity rather than expected future cash flows (Allen and Carletti, 2008; Plantin et al., 2008), realizable values will fall substantially below values in use as market participants will require a premium to

[7] Conceptually, also entry market prices could be used as objectively verifiable representations of fair value which are founded on the notion of replacement costs rather than realisable values (Revsine, 1973)

[8] In a world under certainty this would become obsolete since all market participants would be knowledgeable about ex post realisations already ex ante and hence net realisable value would equal value in use.

give up liquidity and hold the illiquid asset. Consequently, the economic failure condition will not be breached and assets will remain in their current use. Marking assets to market does therefore not influence rational decisions under pure economic failure conditions.

2. Mark-to-market and legal failure

In the previous section we introduced two legal definitions of failure, BSI and CFI and concluded that in functioning markets CFI is irrelevant since assets can be turned into cash by pledging them as collateral as long as the entity is balance sheet solvent, i.e. the value of the assets exceeds the value of liabilities. Under these legal conditions the valuation of assets becomes crucial. When assets are continuously marked to market creditors are able to verify asset valuations instantaneously. In an environment of falling asset prices debtors will receive collateral calls asking them to pledge a larger volume of assets for the same value of liabilities. Again, as long as A exceeds L even on a mark to market basis the debtor is able to continue with ordinary business although it will prove to be more costly. Ceteris paribus if asset prices drop fast and deep enough the value of L will exceed A and the business will be declared insolvent. Under a historical cost regime the drop in asset values (and hence insolvency) will only feed through to the balance sheet if asset prices remain impaired for a sustained period of time and the business is not able to refinance itself through earnings during this period. Consequently, the legal failure condition may not be breached under historical cost accounting as opposed to under a fair value regime.[9]

[9] This was the case during the US Savings and Loans Crisis in the 1980s until the early 1990s. Although total liabilities of the savings and loans institutions exceeded their total assets by USD 118bn on a fair value basis, effectively leaving most institutions insolvent, this deficit did not appear in their balance sheets, which were based on historical costs. Simultaneously,

However, assuming prices come under enough pressure (which by definition is a feature of financial crises), irrespective of balance sheet valuations creditors will demand more collateral since expectations of defaults have increased. Ad extremum, creditors may not be willing to hold non-cash collateral in anticipation that the value of these assets will drop further (even though they are still held at cost on the balance sheets). The cash flow constraint becomes binding. As liquidity dries up in markets, creditors demand liquid assets or charge higher premia to hold illiquid assets as collateral, forcing debtors to turn assets into cash with a substantial discount (Gorton and Metrick 2009). Short-term funding in wholesale markets seizes. This may result in pro-cyclical adjustments of balance sheets with negative feedback effects as explained in Adrian and Shin (2009). If creditors anticipate each other's moves, all will demand cash almost simultaneously as everyone tries to pre-empt the other's move even though collectively it might prove beneficial to forbear (Epstein and Henderson 2009). Now not balance sheet values, but cash flows become crucial. Hence, CFI overrides BSI and balance sheet valuations become irrelevant. These circumstances are tantamount to a bank run and caused the demise of Northern Rock and Lehman Brothers as explained in the next section.

3. Mark-to-market and regulatory failure

So far we have illustrated that legal failure might be triggered even when the business should continue on economic grounds and that under certain extreme

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no mark-to-market losses from rising interest rates were recognised in income although the funding costs of these institutions had surpassed their mortgage rates (Enria et al. 2004). At that time the accounting regime concealed inefficiencies in the savings and loans institutions which was said to have contributed to the length and severity of the crisis to the detriment of stakeholders and taxpayers (Michael 2004; Kane 1987 and 1989). After the S&L crisis fair value accounting for financial institutions was advocated as remedy for such a prolonged credit crisis.

market conditions cash flow insolvency becomes the decisive factor in failure irrespective of the prevailing accounting regime.

Although we argue here that the accounting convention does not change the fundamental value of the assets and that investors and creditors see through mere accounting numbers, fair value accounting might introduce feedback loops when market prices are used as inputs for valuation models. Once mark downs occur under mark-to-market accounting these might amplify downward movements in asset prices if they artificially induce balance sheet de-leveraging. We argue that these feedback effects do not automatically occur due to economic or legal insolvency conditions as explained above, but rather are introduced through regulatory channels. If balance sheet variables are marked to market, vicious circles can develop in falling markets as banks seek to comply with capital adequacy regulation and shrink their balance sheets to avert failure. This can intensify the cycle and create externalities when, in thin markets, banks decide to trade assets or liabilities. Due to the dual role of market prices under fair value accounting one bank's market transaction might affect the valuations in another bank's balance sheet.

For illustration purposes consider a bank with equity of 10 and a 10% regulatory capital ratio under three different regulatory systems, one crude leverage constraint and two risk-based capital rules, one static (Basel 1) and one dynamic (Basel 2). Assume that under each regime the bank is required to hold a minimum of 8% equity to regulatory capital. Further assume that the average risk weights of the assets under the risk based regimes Basel 1 and Basel 2 are 50%. Also assume all loans are marked to market and due to a deterioration of economic conditions are worth only 97 cents on the dollar.

First, consider the change in the banks' balance sheet under the regime with the crude leverage constraint as under the FDICIA. Initially, the bank made loans valued 100 (10 equity with a capital ratio of 10%). These loans are marked down 3% and are now worth 97 since equity is reduced by 3, the bank now has a capital ratio of (10-3)/0.97*100=7.2%. If no capital can be raised the bank has to reduce its balance sheet by 97-(7/0.08)=9.5 to reach the minimum capital ratio requirement of 8%.

Now consider the case for a bank operating under Basel I. Because the average risk weight of assets is 50% the bank can now make 200 in loans in order to have a 10% capital ratio to risk-weighted assets. After a 3% write-down the assets are now worth 194 and equity is reduced by 6. The new risk-weighted capital ratio is now only (10-6)/(0.5*194)=4.1%. Hence the bank has to reduce its balance sheet by 194-(4/0.5*0.08)=94 to be able to maintain a minimum risk-weighted capital ratio of 8%.

Recall that Basel II differs from Basel I in as much that the risk-weights are not static but depend on (external or internal) credit ratings of the loans. It is likely that due to the deterioration of the economic conditions default probabilities increase such that the risk-weights under dynamic risk-based capital rules such as Basel II increase. Assume for simplicity that average risk weights have increased from 0.5 to 0.6. Although the bank has incurred the same loss of 6 and holds loans worth 194, it now must raise 194-(4/0.6*0.08)=110.7, i.e. almost 20% more than under Basel I.

This simple example illustrates that the main pro-cyclical downward pressure results from the risk-based regulatory regime (Basel 1) which is further magnified

in the dynamic version (Basel 2). Compared to the crude leverage constraint regime, almost ten times worth more loans have to be sold under risk-based capital adequacy rules. Consequently, Laux and Leuz (2009) argue that measures against contagion and procyclicality in bank balance sheets should be implemented by changes in prudential regulation rather than changes in accounting standards.

Platin et al. (2008) show analytically that mark-to-market accounting is inefficient for non-standardised illiquid and long-term assets such as loans. However, the current accounting regime acknowledges this since loans are predominantly required to be measured at amortised cost on bank balance sheets. Laux and Leuz (2010) argue that fair value changes of the majority of debt securities do not affect regulatory capital since these – at the time of the financial crisis - fell under the held-to-maturity or available-for-sale category for which temporary fair value losses were not recognized in income and Tier 1 capital. And of course, if the loans had not to be marked to market initially no write off would be necessary at all (although this might change if the loans are deemed impaired in the long-term). The discussion in this section provides simple simulations suggesting that risk-based capital adequacy rules reinforce strains on equity capital beyond losses incurred due to mark-to-market accounting.

4. Summary

Table 1 compares the four failure triggers we have identified. We conclude that:

- The use of fair value in a falling market could be <u>sufficient</u> to tip into balance sheet insolvency, our first legal criterion, a bank which was solvent on a traditional, historic cost accounting basis

- Fair value could likewise be sufficient to make a bank breach its capital adequacy ratios and suffer regulatory failure under a regime such as Basel 2
- However, neither balance sheet insolvency nor regulatory failure is necessary for a bank to fail, as we will see with Northern Rock and Lehman Brothers in the next section: failure may be precipitated by cash flow insolvency when markets are not deep and liquid

None of the legal or regulatory criteria coincide – except by unlikely chance - with the condition for economically efficient exit. These failure conditions may drive out of existence a bank which should continue on economic grounds; and may allow a bank to survive which should exit.

IV. Bank failure during the financial crisis

1. Northern Rock

Northern Rock provided a milestone in the crisis. It experienced the first bank run in Britain since the nineteenth century; and it had to be bailed out by the UK government.

Table 2 provides excerpts from the balance sheet of Northern Rock for December 2007, after the bank run, but before nationalisation. It is clear that:

- Northern Rock was not balance sheet insolvent: assets exceeded liabilities and the margin between the two was only slightly below the corresponding value a year earlier
- The bank comfortably exceeded the tier 1 and overall capital ratios stipulated by Basel 2

So it failed neither on the legal, balance sheet test, nor on the capital adequacy test of Basel 2. Northern Rock complied fully with the fair value requirements of the accounting regulations; and these measurements predate the relaxation of fair value accounting rules in 2008. Moreover, the auditors did not make a going concern qualification for these accounts. This assessment is confirmed by a High Court Judgement in 2009 (SRM and The Commissioners of Her Majesty's Treasury), paragraph 82(b):

"At all relevant times the assets of Northern Rock exceeded its liabilities. It was solvent on a balance sheet basis."

In normal times, when markets are orderly, the bank could have turned positive equity into cash via the short-term lending markets. However, in Northern Rock's case, "on August 9, 2007, the short-term market and interbank lending all but froze" (Shin (2009), p.102". NR was unable to renew its short- and medium-term paper: as Shin's analysis shows, by the December 2007 balance sheet, the funding from this wholesale market had shrunk to £11.4 billion, from £26.7 billion a year earlier. When news leaked of the bank's request to the central bank for substitute funding, in the following month, the famous run developed: the retail deposits market also became inaccessible for Northern Rock, and these liabilities fell by a similar sum to the shrinkage of wholesale sources - some £14 billion over the year to December 2007. Northern Rock became cash flow insolvent.

2. Lehman Brothers

The failure of Lehman Brothers was another major milestone in the crisis, with a potent effect on confidence and behaviour. According to financial data from the

balance sheet of Lehman Brothers for the second quarter ending August 31, 2008 two weeks before the company declared bankruptcy in September, Lehman Brothers was neither balance sheet insolvent nor did it fail the appropriate capital adequacy tests, similar to the Northern Rock case. -Its second quarter figures show that:

- Lehman Brothers was not balance sheet insolvent: assets exceeded liabilities by $26bn
- The bank had a market capitalization of more than $20bn.
- The bank exceeded the minimum net capital requirements for broker-dealers under SEC rules by $2.1bn. [10]

In addition, according to Bloomberg the company had already announced total write-downs of $13.8bn and at the same time raised $13.9bn of equity in 2008.

Similar to the Northern Rock case, Lehman Brothers became victim of the capital and term structure of its balance sheet. Lehman was extremely reliant on short-term funding and high levels of leverage (Zingales, 2008). As opposed to commercial banks, Lehman Brothers as a broker-dealer had no access to retail deposits and only limited access to liquidity from the Federal Reserve Bank but relied heavily on the repo market. In the immediate days before the bankruptcy filing Lehman faced collateral calls on its secured loans and was denied access to wholesale funds. Even though Lehman's assets exceeded its liabilities based on fair values, the collateral value of these mostly illiquid and hard to value assets pledged for liquidity in Repo-markets required steep haircuts. Due to the

[10] An examiners report in 2010 by the US bankruptcy court confirms the balance sheet solvency of Lehman Brothers despite evidence of accounting manipulations termed repo105 in which assets were transferred off-balance sheet to reduce leverage figures in Lehman's quarterly reports in 2008 (Valukas, 2010).

uncertainty surrounding the value of the collateral in highly volatile markets, lenders generally demanded higher haircuts for all type of non-cash collateral - in the extreme case of up to 100 percent for mortgage related assets, i.e. these assets were not accepted as collateral at all any more (Gorton and Metrick, 2009). Liquidity previously accessible in abundance froze almost instantaneously as haircuts on assets used as collateral became prohibitive and suitable collateral became scarce (Morris and Shin, 2008; Brunnermeier, 2009).[11] Lehman Brothers, too, became cash flow insolvent.

The cases of Northern Rock and Lehman Brothers highlight that bank failures might arise despite capital adequacy and balance sheet solvency due to sudden shocks to liquidity positions (see also Alexander, 2009, p.81; Alexander et al., 2007).

V. Empirical analysis

The paper now analyses larger sets of data for statistical tendencies. We focus on the question whether fair value accounting and the use of market values in bank balance sheets per see increased default expectations for banks during the financial crisis and whether it lead to contagious effects in the markets. Specifically, we attempt to answer the following main questions:

[11] According to a Bloomberg report "secured financing fell out of reach because of the devaluation of assets securing the loans, forcing Lehman to deplete its cash to continue trading, said lawyer Shai Waisman of Weil Gotshal & Manges in a Sept. 16 court hearing. This began the stranglehold on Lehman, Waisman said. […] JPMorgan had more than $17 billion of Lehman's cash and securities three days before the investment bank filed the biggest bankruptcy in history on Sept. 15, the creditors committee said in a filing Oct. 2 in bankruptcy court in Manhattan. Denying Lehman access to the assets on Sept. 12, the bank 'froze' Lehman's account, the creditors claimed." (Sandler and St.Onge, Bloomberg October 4, 2008, retrieved at http://www.bloomberg.com/apps/news?sid=aOBEg1wAitck&pid=20601109)

- Did daily mark-to-market risk on sub-prime asset backed securities increase the perceived risk of bankruptcy for banks reflected in spreads on credit default swaps?

- Was there a positive share price response to the amendment in 2008 of IAS 39 – allowing banks to re-classify certain financial instruments from the trading category (which requires continuous marking to market) to the loan category (which is measured at cost)? We link this to possible changes in the probability of regulatory failure with all its attendant costs.

- Did a distress sale of a large quantity of illiquid structured assets by one bank have a long-term adverse impact on other banks' balance sheets? We measure share price changes in the banking sector – again as an indicator of changed failure risk – in response to a financial instrument being sold in large quantity at a massive discount using Merrill Lynch's sale of its ABS CDO portfolio as an instrument.

1. What determines default expectations for financial institutions during the crisis?

Our arguments presented in section II and III are closely related to Gorton and Metrick's (2009) explanation of the panic in the repo market during the height of the financial crisis. The simple example on regulatory failure supplemented by the two case studies of Northern Rock and Lehman Brothers requires some additional formal tests. In this section we attempt to assess the impact of mark-to-market risk on the perceived bankruptcy likelihood of financial institutions. We focus on the spreads of credit default swaps for banks as a proxy for default risk as perceived by the market. We use the daily average spread on a basket of 125

global financial institutions for which data was provided by Markit and available via Bloomberg from January 2007 to September 2009. We regress the daily change in average CDS spreads on a set of variables that proxy different risks. As a proxy for the risk of mark-to-market losses on asset-backed securities we use the on-the-run ABX.HE index which reflects the price of 20 equally-weighted residential mortgage-backed securities (RMBS).[12] Specifically, we use the price for the sub-index of AAA rated tranches of these securities. These are representative of the most secure securities based on sub-prime mortgages and are the last to be affected by mortgage defaults but rather bear market risk.[13] We use asset backed securities based on sub-prime mortgages since these were the most contentious assets on bank balance sheets during the initial phases of the financial crisis. Fair value accounting requires financial institutions to mark all asset-backed securities, not held to maturity, to market, for which indicative fair values are usually estimated using a market index such as the ABX.

Following Gorton and Metrick (2009) we choose the LIBOR-OIS spread as a proxy for illiquidity risk in the repo market. LIBOR represents the funding rate for banks in the interbank market over a period of 3 months and OIS is the overnight index swap rate, which is a fixed-to-floating interest rate swap based on an overnight reference rate such as the Fed funds rate. Since the OIS has virtually no counterparty risk – there is no principal payment and the interest rate differential between the fixed and the floating rate is paid at maturity – the LIBOR-OIS

[12] More precisely the ABX.HE references subprime RMBS and equivalent sub-indices on rated tranches of RMBS from AAA to BBB-. The index is re-calculated on a new basket of RMBS every six months and rolled over based on pre-specified rules. In this analysis we use prices of the first vintage 2006-1. The ABX.HE index is employed as a proxy due to the fact that it is an investable index which is often used by financial institutions as a hedge against exposure to mortgage-backed securities as well as for indicative valuation purposes. However, the index is a fairly young invention launched by broker-dealers in 2006 who provide Markit, the index provider, with daily valuations of the index constituents. ABX.HE prices were obtained from LehmanLive, a financial research database now maintained by Barclays Capital.

[13] Using lower rated tranches in our regressions does not alter the results significantly.

spread mainly reflects counterparty risk for the lender. A spread widening indicates a greater reluctance of lenders in the interbank market to provide short-term liquidity.

In addition, we use the daily change in the VIX index, which measures the implied volatility of S&P 500 index options, and daily returns on the S&P financials index as control variables. We estimate the following time-series equation with daily data from January 2007 until September 2009:

$$\Delta CDS_t = \lambda_1 + \sum_{k=0}^{2} \lambda_{2+k} * \Delta LOIS_{t-k} + \lambda_{5+k} * \Delta ABX_{t-k} + \lambda_8 \Delta VIX_t + \lambda_9 \Delta SPXF_t + \eta_t \qquad \text{(vi)}$$

If potential mark-to-market write downs on asset-backed securities were expected to increase the risk of default for banks, the coefficient of *ABX* should be positive and significant controlling for other market risk proxies. The regression is estimated using three different estimation methods, Prais-Winston-FGLS, OLS with autocorrelation robust standard errors, and an ARCH model.

The results, presented in Table 3, seem to suggest that contemporaneous and lagged changes in prices for ABX.HE AAA tranches do not have any explanatory power on the market's assessment of bankruptcy risk for financial institutions. This indicates that the market does not attribute daily mark-to-market risk on banks' exposures to asset-backed securities to heightened insolvency risk. All coefficients on the daily changes to the ABX.HE AAA are insignificant using different estimation models. Rather the coefficients on the LIBOR-OIS spread are statistically significant and seem to explain part of the changes in CDS spreads of banks, particularly with a one-day lag (coefficients in all three models around 0.16, $p<0.001$). The results somewhat support the anecdotal evidence of the

Northern Rock and Lehman Brothers failure and suggest that constraints in the interbank lending market increased the perceived risk of bankruptcy, not daily mark-to-market risk.

2. Does the market perceive Fair Value Accounting to increase the risk of bank failure during times of market distress?

The risk of balance sheet insolvency and regulatory failure of banks should also be reflected in stock prices as investors face expropriation in the case of bankruptcy or nationalization of troubled institutions. Hence, an increase in bankruptcy risk is generally associated with negative stock returns. In this section we investigate stock returns of a portfolio of 481 international banks from the Compustat Bank file around the IASB's announcement of an amendment in IAS 39. The amendment allowed banks to re-classify certain financial instruments from the trading category (which requires continuous marking to market) to the loan category (which is measured at cost). This effectively allowed banks to measure securities which were previously held for trading purposes at amortized cost and can be viewed as a partial suspension of fair value accounting for certain assets.[14] If investors regarded mark-to-market accounting as one of the main reasons for the increased bankruptcy threat to financial institutions the overall market reaction to the announcement of this amendment should be positive. In fact, as shown in Figure 2 abnormal returns are predominantly positive in the run-up to the announcement and also reveal a sharp increase thereafter.[15] The pre-

[14] A reclassification was already permitted by the FASB in rare circumstances. Yet the IASB's move to allow a reclassification under regular circumstances was seen by the market as a partial suspension of fair value accounting and hence expected to benefit all financial institutions.

[15] Since the event date is the same for all stocks and these only include financial institutions, calculated abnormal returns will be clustered in calendar time and industry. Bernard (1987) discusses possible problems with statistical inference methods when residuals are cross-sectionally dependent. However, Brown and Warner (1980) show in their simulation results

announcement run-up in bank shares might indicate the expectation of a "positive" change in accounting rules during the increased public discussion and media attention to this matter. During this period a significant amendment in the accounting rules became increasingly likely.[16] Table 4 summarizes cumulative abnormal returns (CAR) and statistics for various event windows. Almost all CARs are highly statistically and economically significant. During the 3 day window around the announcement the portfolio experienced abnormal returns of 3.25%, in 11 days these increased to 6.9% and in the 21 days around the announcement the cumulative abnormal return of the portfolio reached 17%. The evidence points towards the market's perception of a reduction in bankruptcy risk resulting from the relaxation of the fair value accounting rules.

3. Do investors expect distress sales of one bank to affect market valuations for other banks?

In line with the previous section we further investigate stock returns of a portfolio of banks around a major market transaction in July 2008 in the, until then, frozen market for asset-backed securities. In July 2008 Merrill Lynch's announced the sale of its ABS CDO portfolio with a face value of $30.6bn at a price of $6.7bn to the private equity fund Lone Star. This sale constituted one of the few market transactions in these assets and hence could have served as a reference for other

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that if other than mean adjusted returns are used as performance measures adjustments for cross-sectional dependence have little effect. Nevertheless, in the tests conducted here all stocks are aggregated into a single portfolio in event time and all relevant measures are calculated on the portfolio level. Conducting the tests of significance for the portfolio takes into account the cross-sectional dependence of the individual stocks (Schwert 1981; Jaffe 1974). Abnormal returns are calculated using the Fama-French three factor model plus a momentum factor. As proxy for the market portfolio the CRSP value-weighted index is used. Re-estimation with the equally weighted index does not change the results significantly. Model parameters are estimated over a 255 day estimation period ending 45 days before the event date.

[16] As regulatory changes are usually introduced after a public debate in prior months it is difficult to identify an exact event date for the purpose of this study. Therefore, the event window is expanded to 30 days around the announcement day.

financial institutions to mark similar assets at equally high discounts with profound effects on balance sheet valuations and write-downs.[17] If investors feared that the prevailing price in this single transaction would have had an impact on fair values of similar assets on other banks' balance sheets due to the application of mark-to-market accounting, this would cause a general decline in share prices of financial institutions at the announcement of the transaction.[18] Figure 3 shows daily abnormal portfolio returns for a portfolio of 588 international banks (excluding Merrill Lynch) during the days surrounding the transaction announcement. Abnormal returns are predominantly negative in the month before and after the announcement and highly volatile, reflecting the market's uncertainty regarding bank valuations. As summarized in Table 5 cumulative abnormal returns are highly negative during the period 30 days before until 2 days before the announcement (albeit only statistically significant based on the sign test), but significantly positive one day before the announcement. With the announcement of the Merrill Lynch transaction cumulative stock returns of the portfolio of other banks turn significantly negative (-0.66%, t-statistic -2.14) suggesting the market's reassessment of the bankruptcy threat due to the sale announcement. However, the results based on longer event windows do not provide a consistent picture in this respect. Moreover, the results might have been confounded due to the release of other market relevant information regarding the financial position of banks, although a news search on Factiva revealed that no other major announcements were made. The preliminary results presented here do not provide consistent evidence of investors perceiving increased risk of

[17] The transaction was announced before the FASB and the IASB issued additional guidance in October 2008 on the application of fair value measurement when markets become illiquid.

[18] See for example Financial Times article from 30 July 2008: "Banks under pressure to follow $30bn Merrill cut-price debt sale".

externalities and feedback loops in bank balance sheet valuations due to mark-to-market accounting.

4. Robustness test: Cross-sectional time-series regressions for clustered announcement dates

Recognising the deficiencies of event studies for statistical inferences of the impact of regulatory changes on stock returns particularly during periods of financial distress, we additionally run cross-sectional time-series regressions similar to Cornett et al. (1996) and inspired by Schipper and Thompson (1983). Due to clustering in event time and industry – in our extreme case the event dates are the same for all firms and all firms belong to the same industry – the residuals from the asset pricing regressions will be cross-sectionally dependent. This might lead to rejection of the null hypothesis that the event had no effect on stock returns when in fact it is true. In order to mitigate this problem in our event study set up we investigate returns to an equally weighted portfolio of stocks instead of returns to individual firms and all relevant inference measures are calculated on the portfolio level. However, to make more efficient use of the information of individual firms we additionally run cross-sectional time series regressions similar to Cornett et al. (1996). The return generating process is given by:

$$R_{it} - R_{ft} = \alpha_i + \beta_{1,i}(R_{mt} - R_{ft}) + \beta_{2,i}SMB + \beta_{3,i}HML + \beta_{4,i}MM + \sum_{k=1}^{2}\beta_{4+k,i}D_k + \varepsilon_{it} \qquad \text{(vii)}$$

where

$R_{it} - R_{ft}$ = Daily excess stock return for firm i.

α_i = Intercept coefficient for firm i.

$\beta_{j,i}$ = Risk coefficients/ parameters to factors j (j =1,…,6).

$R_{mt} - R_{ft}$ = Market premium to stock i.

SMB = Fama-French factor mimicking portfolio of returns on small minus big firms retrieved from Kenneth French's website

HML = Fama-French factor mimicking portfolio of returns on high minus low book-to-market firms retrieved from Kenneth French's website

MM = Momentum factor retrieved from Kenneth French's website

D_k = dummy variables which equal one during a three day period around the event announcement and zero otherwise for the two announcements k=1 (IASB announcement) and k=2 (Merrill Lynch announcement).

ε_{it} = random disturbance term assumed to be normally and identically distributed independent of the excess return on the market, the Fama-French and momentum factor loadings and the event announcement variables.

Under the null hypothesis that the announcements had no impact on stock returns the parameters on the dummy variables will be equal to zero. The regression coefficients are estimated using generalized least squares (GLS). Coefficient estimates and statistics are given in Table 6. The coefficient on the IASB announcement is positive and significant confirming our previous results of the event study (0.014, $p<0.01$). The coefficient on the Merrill Lynch announcement is also positive, but not significant, which also re-affirms the inconsistent results of the event study.

VI. Conclusions: Implications for fair value

Against the background of a polarised debate on the merits of fair values in bank balance sheets, it would be easy to draw unsound partial inferences from our discussion. For example, those hostile to fair values might conclude that if fair

value was irrelevant to the failure of Northern Rock and Lehman Brothers, why go to all the trouble of fair values: why not instead revert to cost? Or critics of fair value might find comfort in our evidence that the stock market prices of banks changed when fair value procedures were relaxed, even though there was no change in the banks' underlying economic position: fair value induces artificial valuation changes, it might be argued.

We take a more complex view. For example, we accept that, for many decisions, cost may be a more important measure of an asset than current market price – for example, if the asset is to be held to maturity, if the bank is sure to survive to its maturity, and if the market for that asset is currently frozen. Then, we agree that if fair values are relied upon for valuing bank assets, pro-cyclical tendencies may be reinforced as collateral recorded at fair value swells and shrinks over the cycle. We also recognise the problems caused under the present legal and regulatory regimes if one bank's distress sale of an asset at a huge discount requires a reduction in the carrying value of corresponding assets in another bank's balance sheet, which the second bank has no intention of liquidating before maturity.

But these concerns do not lead us to support a retreat to cost in place of fair value. On the contrary, our analysis reinforces the case for reporting market values, especially in circumstances of financial crisis[19]. First, we have argued that it is precisely at times of crisis that cash flow insolvency comes to dominate balance sheet insolvency; and so the liquidation values of assets become crucial in decisions on whether a bank should continue to operate, and whether it is a reliable counter party. This is the case even if the bank would ordinarily choose to

[19] In the light of their post mortem analyses of corporate failures, Clarke et al (1997) place emphasis on the particular need, when assessing a company in financial crisis for the "current money's worth of its available assets" (p.245).

hold these assets until maturity: in the extraordinary circumstances of crisis it may not have that option! One might argue that cash flow insolvency only becomes binding because of uncertain valuations on the balance sheet, i.e., because of the fear of balance sheet insolvency. But this would actually call for more transparency and increased use of more relevant market values. However, liquidation values alone are not appropriate in such circumstances: stakeholders and regulators reading the accounts also need to know the valuation of the asset relevant if it continues in business and holds to maturity – that valuation will often be amortised cost.

Second, we have argued that neither the legal triggers for failure nor the regulators' rules for capital adequacy are aligned with the economic decision for equity-holders whether to continue or to close a business such as a bank. That decision requires a comparison of value in use of the business assets with their realisable value in the best alternative use[20]. In the case we have been considering, the bank would compare holding the asset to maturity (where cost might be appropriate) or selling now, for whatever it would fetch on the market (mark to market version of fair value). To conclude, much of the debate on whether to opt for fair value or cost is redundant: we need both valuations to be disclosed and to be incorporated in regulators' assessments.

[20] Ronen (2008) pursues the case for such comparisons of valuations rather than reliance on a single measure.

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Table 1

Triggers for bank failure

Failure type	*Formula*	*Affected by balance sheet valuation method?*
Legal – BSI	A<L	Yes
Legal – CFI	CI<CO	No
Economic - EF	$A_{pv} < A_{nrv}$	No
Regulatory - RF	$A < L + (\frac{1}{q} \times A)$	Yes

Table 2

Northern Rock key balance sheet items

<u>Northern Rock Balance Sheet items, 31.12.2007</u>

	£ billion	
Assets	109.3	(2006: 101.0)
Liabilities	106.6	(2006: 97.8)
Risk-weighted assets	20.7	
Basel 2 Ratios	**%**	
Tier 1 ratio	7.7	
Total capital	14.4	

(Source: Northern Rock, Annual Report and Accounts, 2007)

Table 3

Regression results (dependent variable: Daily change in CDS spreads)

This table presents coefficients and t-statistics of time series regressions of the daily average change of credit default swap spreads of 125 banks on daily changes of LIBOR-OIS spreads ($\Delta LOIS$) and its two lags, daily changes of the price of the ABX.HE AAA tranche index ΔABX and its two lags, daily changes in the VIX index ΔVIX and on daily returns on the S&P financials index $\Delta SPXF$. The regression is run from January 2007- September 2009. Model (1) uses Prais-Winston FGLS estimation for serially correlated errors, model (2) estimates the regression with OLS and autocorrelation robust standard errors based on the Newey-West method, and model (3) includes a lag for the dependent variable ΔCDS as regressor and hence is estimated with an ARCH model. T-statistics are calculated using heteroscedasticity robust standard errors where appropriate. ***, **, * statistically significant at the 0.01, 0.05, 0.10 level, respectively.

	(1)	(2)	(3)
$\Delta LOIS_t$	0.055	0.049	0.054
	(1.65)	*(1.68)**	*(1.93)**
$\Delta LOIS_{t-1}$	0.161	0.161	0.157
	*(5.31)****	*(5.91)****	*(5.99)****
$\Delta LOIS_{t-2}$	0.031	0.03	0.016
	(1.43)	*(1.96)***	*(1.00)*
ΔABX_t	0.019	0.005	0.011
	(0.11)	*(0.03)*	*(0.03)*
ΔABX_{t-1}	0.017	0.038	0.04
	(0.1)	*(0.24)*	*(0.12)*
ΔABX_{t-2}	0.138	0.13	0.103
	(0.82)	*(0.78)*	*(0.3)*
ΔVIX_t	0.054	0.057	0.054
	(1.47)	*(1.97)***	*(1.70)**
$\Delta SPXF_t$	-0.008	-0.002	-0.001
	(-0.16)	*(-0.05)*	*(-0.01)*
ΔCDS_{t-1}			0.167
			*(4.35)****
Constant	0.003	0.003	0.002
	(1.39)	*(1.26)*	*(1.04)*
Observations	391	391	391
R-squared	0.09		

Table 4

Abnormal portfolio returns around the IASB announcement of amendments to IAS 39 (reclassification of financial instruments)

481 financial institutions are aggregated into a single portfolio in event time and abnormal returns are calculated on the portfolio level. Abnormal returns are calculated using the Fama-French three factor model plus a momentum factor. As proxy for the market portfolio the CRSP value-weighted index is used. Re-estimation with the equally weighted index does not change the results significantly. Model parameters are estimated over a 255 day estimation period ending 45 days before the event date

Days	N	Cumulative portfolio abnormal returns	t-statistic	Generalized Sign Z
(-30,-2)	481	17.04%	6.660***	8.518***
(-1,0)	481	1.02%	1.523	1.131
(-1,+1)	481	3.25%	3.945***	4.232***
(0,+30)	481	9.81%	3.711***	7.150***
(-5,+5)	481	6.88%	4.366***	7.059***
(-10,+10)	481	17.16%	7.883***	9.339***

*** statistically significant at the 0.001 level.

Table 5

Abnormal portfolio returns around Merrill Lynch's announcement of the sale of their ABS CDO portfolio to Lone Star

588 financial institutions are aggregated into a single portfolio in event time and abnormal returns are calculated on the portfolio level. Abnormal returns are calculated using the Fama-French three factor model plus a momentum factor. As proxy for the market portfolio the CRSP value-weighted index is used. Re-estimation with the equally weighted index does not change the results significantly. Model parameters are estimated over a 255 day estimation period ending 45 days before the event date

Days	N	Cumulative portfolio abnormal returns	t-statistic	Generalized Sign Z
(-30,-2)	588	-2.45%	-1.475	-3.852***
(-1,0)	588	1.05%	2.399**	5.551***
(-1,+1)	588	-0.66%	-2.140*	-2.780**
(0,+30)	588	-0.06%	-0.033	0.19
(-5,+5)	588	1.78%	1.740*	4.066***
(-10,+10)	588	1.92%	1.361	1.427

***, **, * statistically significant at the 0.001, 0.01, 0.05 level, respectively.

Table 6

Cross-Sectional Time-Series Regression with event dummy variables

This table presents coefficients and z-statistics of cross-sectional time-series regressions of excess stock returns of financial institutions on dummy variables representing the IASB's announcement of amendments to IAS 39 (D1) and Merrill Lynch's announcement of the sales of their ABS portfolio (D2). The common asset pricing factors are also included as control variables, where $R_{mt} - R_{ft}$ is the market premium to stock i. SMB is the Fama-French factor mimicking portfolio of returns on small minus big firms retrieved from Kenneth French's website, HML is Fama-French factor mimicking portfolio of returns on high minus low book-to-market firms retrieved from Kenneth French's website and MM is the Momentum factor retrieved from Kenneth French's website. D_k represents the dummy variables which equal one during a three day period around the event announcement and zero otherwise for the two announcements k=1 (IASB announcement) and k=2 (Merrill Lynch announcement). Regression coefficients are estimated using GLS. Absolute values of the z-statistic are given in parentheses. * denoted significance at 5%-level, ** denotes significance at 1% level.

Rm-Rf	0.588
	(117.23)**
SMB	0.495
	(43.82)**
HML	0.511
	(36.29)**
MM	-0.211
	(24.06)**
D1	0.014
	(13.39)**
D2	0.002
	(1.85)
Constant	-0.0004
	(5.41)**
Observations	284386

Figure 1

Composition of regulatory capital

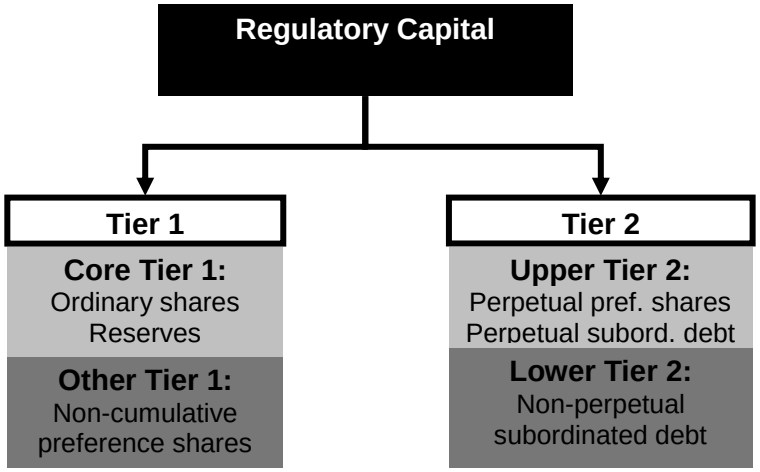


Figure 2

Abnormal portfolio returns of a portfolio of 481 banks around the IASB announcement of amendments to IAS 39 (reclassification of financial instruments)

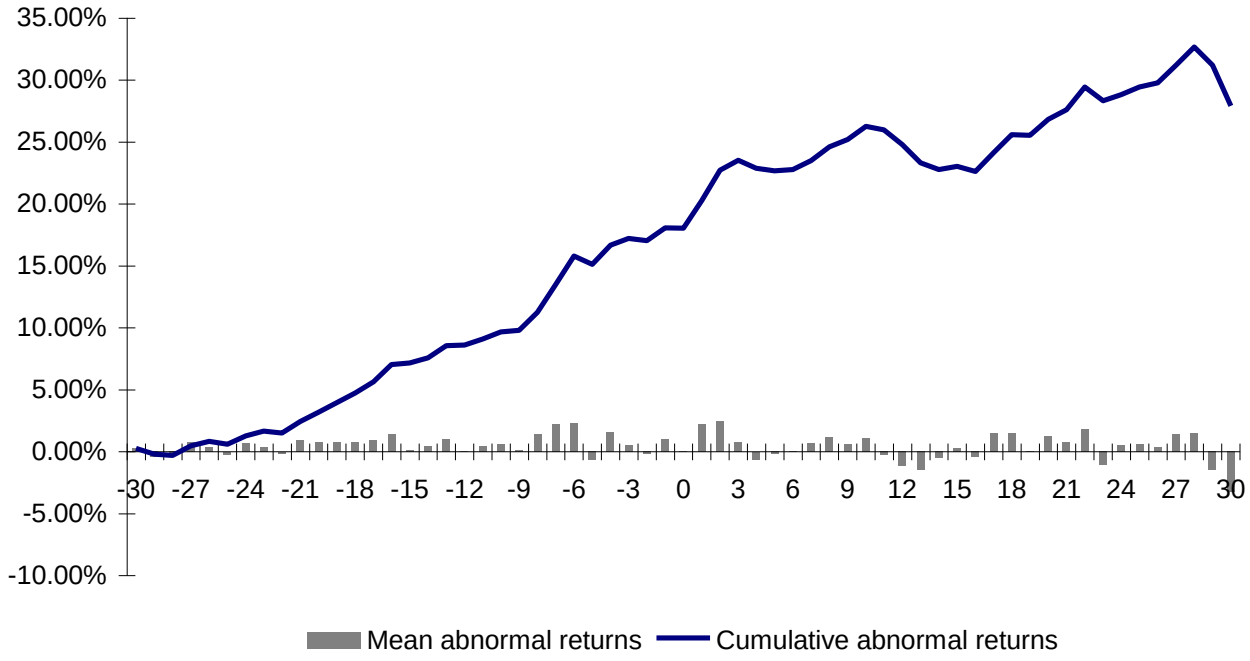
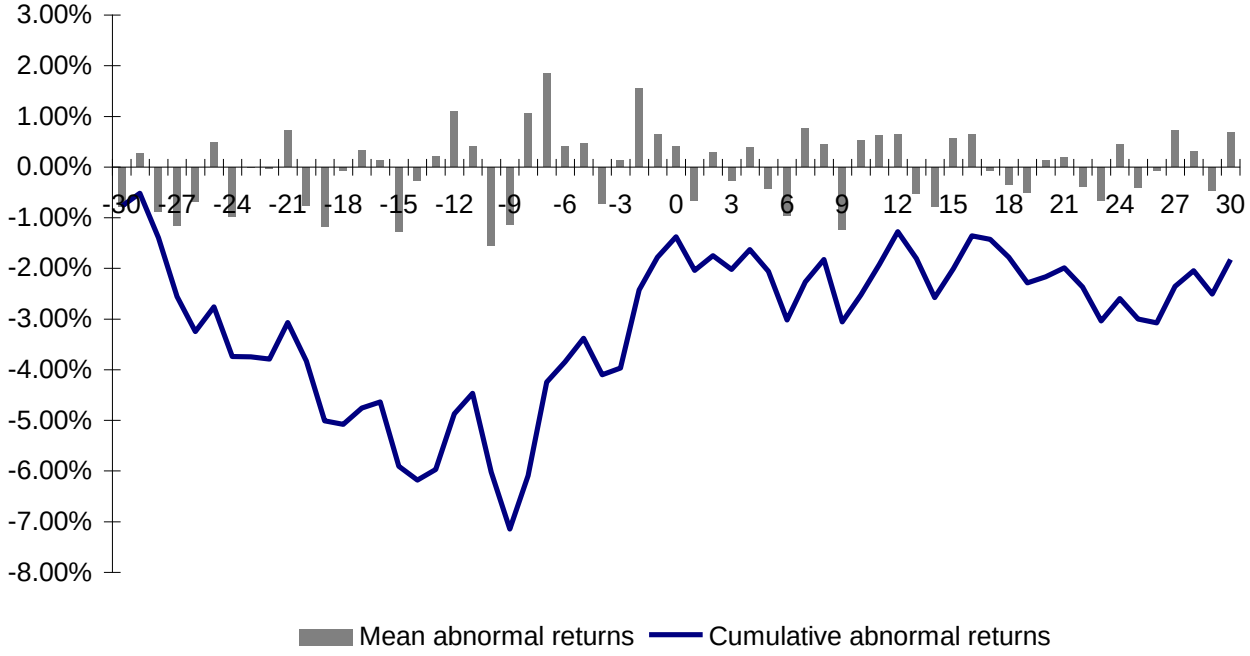


Figure 3

Abnormal portfolio returns of a portfolio of 588 banks around Merrill Lynch's announcement of the sale of their ABS CDO portfolio to Lone Star