

# Market Illiquidity and Financial Instability<sup>\*</sup>

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## **Introduction**

Three topics related to liquidity and financial instability and their impact on the real sector are considered below. The first is liquidity and cash-in-the-market pricing. It is suggested that one of the exacerbating factors in the current crisis is that markets have not been pricing the AAA tranches of securitized products in a way that reflects fundamentals. This pricing failure provides a justification for the new institution recently announced by the Treasury and Federal Reserve that will act in a similar way to the Resolution Corporation of two decades ago. The second is contagion. This is arguably the most important market failure associated with crises and is the one that provides a justification for regulation and ex post intervention by the authorities. The third is mark-to-market accounting. Given cash-in-the-market pricing, mark-to-market accounting can cause contagion. The problems that AIG has faced are a good example of this. The alternative of historic cost accounting is not attractive either, however, as in situations like the savings and loan crisis of the 1980s, this prevents discovery by investors and regulators of expected reductions in future cash flows. Allen and Carletti (2008a) have suggested a reform that involves using a variety of methods including mark-to-market, historic cost accounting and model based valuations when these provide different valuations. This divergence will alert investors and regulators that there is a problem and encourage further investigation.

### **1. Liquidity and Cash-in-the-Market Pricing**

One of the most puzzling features of the current crisis has been the pricing of AAA tranches of a wide range of securitized products. It appears that the market prices of many of these instruments are significantly below what plausible fundamentals would suggest they should

be. This pricing risk has come as a great surprise. We argue that the sharp change in pricing regimes that started in July 2007 is consistent with what is known in the academic literature as “cash-in-the-market” pricing. Holding liquidity is costly because less liquid assets usually have higher returns. In order for providers of liquidity to markets to be compensated for this opportunity cost, they must on occasion be able to make a profit by buying up assets at prices below fundamentals. Once the link between prices and fundamentals is broken then arbitrage becomes risky and the usual forces that drive prices and fundamentals together no longer work. Such *limits to arbitrage* mean that prices can deviate from fundamentals for protracted periods of time (Shleifer and Vishny 1997).

Some banks have had to write down the AAA-rated super senior tranches of mortgage-linked collateralized debt obligations by as much as 30 percent (Tett 2008) due to a fall in their market prices. According to the Bank of England (2008, pp. 18-21) if this change in price was due to deterioration in fundamentals, then it would be necessary to believe that the ultimate percentage loss rate of securitized subprime mortgages would be 38 percent. This would be justified, if, for example, 76% of households with subprime securitized mortgages would default and the loss given default rate was 50%. This seems, however, implausible given that none of the AAA tranches have yet defaulted and, as the Bank of England also estimated, there should not be any future default in AAA subprime mortgage-backed securities, even with a continued decline in US house prices.

It is not only AAA tranches of subprime mortgage-backed instruments that have suffered but also commercial mortgage-backed securities and securitizations linked to corporate credit quality. As Figure 1 illustrates, at the start of the crisis the co-movement of these instruments

rose dramatically. The high co-movement among different types of AAA securities with different fundamentals suggests that it is probably not fundamentals driving the falls in prices.

The movements observed are consistent with the cash-in-the market pricing of securities explained above (Allen and Gale 2007, Allen and Carletti, 2006 and 2008b). In this framework it can be shown that aggregate shortages of liquidity can cause even risk free securities to trade at a significant discount to their fundamental. Usually the theory is developed in terms of a single asset. However, the analysis can be applied to the case of multiple assets. With segmented markets the theory can also explain why different but related types of security would also be affected so their prices would tend to fall as well.

Participating in a market involves the initial fixed cost of finding out information about the security being traded. This fixed cost limits the number of participants. The structure of investment banks and other similar institutions is usually such that a desk will trade a number of related products to try to economize on this fixed cost. Risk management in these firms is such that in the short run there is a fixed limit on the total amount of cash available to purchase these securities. Allen and Carletti (2008c) argue that as news about the subprime default problems came out, many investors changed their estimate of the risk of these securities and readjusted their portfolios. This led to a wave of selling and overwhelmed the capacity of the market to absorb sales. As a result prices of even the AAA tranches fell. The reason that the prices of other securities such as AAA tranches of commercial mortgage backed securities also fell is that they are traded by the same desks as securitized subprime products and so sales of these also led to a drop in prices.

One important feature of this pricing of AAA tranches at such large discounts has been their persistence. One might expect cash-in-the market prices to last for a few days. But once the limits on each desk's ability to trade have had time to be adjusted it would be natural to expect the desks to bid up the prices of the securities since there would appear to be a significant arbitrage opportunity. By going short in similar maturity Treasuries and investing in these AAA tranches a significant premium could apparently be earned. What prevents this? The answer is limits to arbitrage. In particular, once the link between prices and fundamentals is broken, the difference between them may widen in the wrong direction during the period of holding the position.

It is well known that such limits to arbitrage can prevent even virtually identical securities from trading at the same price. The classic example is the shares of the Dutch company Royal Dutch Petroleum and the British company Shell Transport and Trading. Before July of 2005 when the two entities were formally merged into a single company, the shares of Royal Dutch Petroleum and Shell Transport and Trading were Siamese twins that shared in the profits of the oil major. Royal Dutch received 60% of the dividends and earnings of the joint company and Shell Transport and Trading received the remaining 40%. Standard asset pricing theory suggests they should have traded at a ratio of  $60/40 = 1.5$ . In fact they traded at very different price ratios than this (see, for example, Brealey, Myers and Allen 2008, p. 367).

The complexity of the securitizations and lack of knowledge associated with securitizations increased the risk associated with arbitraging the AAA tranches of securitized products. It is interesting to note that although the prices of AAA tranches of non-subprime mortgage backed securities such as commercial mortgage-backed and securitizations linked to corporate credit quality were significantly affected, the prices of conforming prime mortgage-

backed securities issued by Fannie Mae and Freddie Mac were much less affected in the summer of 2007. This is not surprising given that here the arbitrage is virtually risk free given the implicit government guarantee provided to the securities of these government-sponsored enterprises at the time.

Once the value of AAA-rated tranches of securitized products fell significantly, it no longer became possible to fund the Structured Investment Vehicles (SIVs) and similar entities holding them using short term finance. Thus the market for asset-backed commercial paper to finance such SIVs dried up since it was now clear the collateral was lower in value and also risky whereas before it was thought to be safe. To avoid loss of reputation, the banks that had set up these SIVs were forced to bring the underlying assets back on to their balance sheets. Their need for liquidity was thus dramatically increased.

One of the important features of the current crisis is therefore that cash-in-the-market pricing combined with limits to arbitrage has significantly affected the pricing of large volumes of fixed income securities for significant periods of time. Effectively this means that the creation by banks of uninsured off-balance sheet vehicles that borrow short and invest long has significantly increased risk in the financial system. Moreover, until significant experience has been gained concerning this type of risk of the cash-in-the-market pricing of such assets, the ability of financial institutions to manage risk exposures will be considerably impaired.

The pricing risk that this deviation between fundamentals and prices represents has occurred before. After the Russian moratorium on some of its debt payments in 1998, Long Term Capital Management (LTCM) had to be rescued by a private consortium of banks formed at the urging of the Federal Reserve Bank of New York. LTCM was engaged in trades that

relied on the yields of government bonds in the Euro area converging when the euro was formally introduced. These trades involved going short in low interest rate securities such as German government bonds and going long in high rate securities such as Italian government bonds. When the Russian moratorium was announced the readjustment of portfolios led to an increase in the prices of illiquid securities such as Italian bonds as cash-in-the-market pricing kicked in. This caused a heavy loss in the convergence trades and required LTCM to come up with significant amounts of margin that it was unable to provide. After the rescue by the private consortium the margin was provided and the positions did not need to be liquidated. In the long run the trades were profitable as initially envisaged.

The recent announcement by the Treasury and Federal Reserve of a fund designed to buy the securitized products trading at low prices, the so-called “toxic assets”, represents the best policy to deal with this problem of pricing risk by the government in my view. Going forward risk managers and others in the private sector will need to recognize that even the safest securities are subject to pricing risk.

## **2. Contagion**

A second important concept when markets are incomplete is contagion. The linkages between banks that interbank markets provide imply that problems in one bank can spread to other banks and can potentially disrupt the whole financial system. Allen and Gale (2000) analyze a basic model of liquidity provision to consider how this process works and the inefficiencies involved (for a survey of the literature on contagion see Allen and Babus (2008)). The possibility of contagion arises from the overlapping claims that different banks have on one another rather than from asset price volatility. When one bank suffers a shock and defaults as a

consequence, the other banks suffer a loss because their claims on the troubled bank fall in value. If this spillover effect is strong enough, it can cause a crisis throughout the system. In extreme cases, the crisis passes from bank to bank, eventually having an impact on a much larger set of banks than the one in which the original shock occurred.

If there is a large degree of interconnectedness between banks in the sense that many hold the assets of others, there are many links through which a crisis can spread. On the other hand, the importance of each link will be smaller. This means that a shock can be more easily absorbed by the capital buffer of each institution. If there are a few links but each involves a larger amount of funds, crises are more likely to spread because each bank's capital buffer will be overwhelmed if another bank fails. Thus the case of some interconnectedness but not too much represents the most likely situation for contagion to occur.

Contagion is an extremely worrying phenomenon for policy makers. The costs of bankruptcy of financial institutions can be large. A whole string of bankruptcies among banks and other intermediaries can cause tremendous damage to the financial system, and this in turn has the potential to have large spillovers to the real economy. If firms no longer have access to funding from banks or other financial institutions then they may have to cut investment and their level of output significantly.

Many factors affect the probability and the extent of contagion. One that seems to have played a role in the current crisis relates to the use of mark-to-market accounting. This accounting method has the benefit of reflecting the market value of the balance sheets of financial institutions and therefore of allowing regulators, investors and other users of accounting information to better assess the risk profile of financial institutions. This is true provided

financial markets operate perfectly and prices correctly reflect the future earning power of assets. However, when markets do not work perfectly and prices do not always reflect the value of fundamentals as in the case where there is cash-in-the-market pricing, mark-to-market accounting exposes the value of the balance sheets of financial institutions to short-term and excessive fluctuations, and it can ultimately generate contagion. If there is cash-in-the-market pricing in one sector of the financial system, then other sectors can be affected by the change in the prices and may be forced to write down the value of their assets as discussed below. It can be argued that it was this kind of contagion that led to AIG's problems.

The justification that the Federal Reserve gave for arranging the takeover of Bear Stearns by J. P. Morgan was the fear of contagion [Minutes of the Federal Reserve, March 14, 2008]. Bear Stearns was the counterparty in a large number of derivative transactions. The fear was that if they had gone bankrupt there would have been contagion through the network of derivative contracts that they were part of and a large number of other financial institutions may have been adversely affected.

Theories of contagion have mostly been developed in the context of banks and interbank markets. They show how a shock to one bank that causes bankruptcy can cascade through the financial system and cause a string of bankruptcies. If bankruptcy costs are high, then this string of failures can be very costly. The effect on asset prices may be large if failed institutions are forced to liquidate assets and there is cash-in-the market pricing. Moreover, there may be significant spillovers into the real economy if a significant number of financial institutions fail. Contagion potentially provides a strong justification for central banks to intervene and save institutions such as Bear Stearns. The key issue is how likely this kind of damaging contagion is in practice. This depends on the number and size of counterparties active in the market as well as

on the size of the interrelations among them. The more numerous are the counterparties and the smaller the interrelations, the less likely it is that a default of one counterparty leads to contagion. The reason is that the buffers of capital of the surviving intermediaries are more likely to be large enough to absorb the default, especially if each of them has only small claims with the troubled intermediary. Given the characteristics of the markets where Bear Stearns operated, it is quite possible that this would have been the case and no contagion would have occurred.

Upper (2007) provides a survey of simulation exercises that look for evidence of contagious failures of financial institutions resulting from the mutual claims they have on one another. Most of these papers use balance sheet information to estimate bilateral credit relationships for different banking systems. The stability of the interbank market is tested by simulating the breakdown of a single bank. This methodology has been applied to the Belgian, German, Swiss, UK and US banking systems among others. These papers find that the banking systems demonstrate a high resilience, even to large shocks. Simulations of the worst case scenarios show that banks representing less than 5% of total balance sheet assets would be affected by contagion on the Belgian interbank market, while for the German system the failure of a single bank could lead to the breakdown of up to 15% of the banking sector in terms of assets. These results heavily depend on how the linkages between banks, represented by credit exposures in the interbank market, are estimated. For most countries, data is extracted from banks' balance sheets, which can provide information on the aggregate exposure of the reporting institution vis-à-vis all other banks. To estimate bank-to-bank exposures, it is generally assumed that banks spread their lending as evenly as possible. In effect, this assumption requires that banks are connected in a complete network. Hence the assumption might bias the results, in the

light of the theoretical findings that better connected networks are more resilient to the propagation of shocks.

The main finding of this literature is that contagion is unlikely. However, there are a number of reasons for caution in accepting this result and concluding that policymakers need not worry about contagion between banks. The first is that they do not model price effects of bankruptcy. Cifuentes, Ferrucci and Shin (2004) have argued that these price effects are the main transmission mechanism for contagion. As Upper (2007) points out, they also rely on the initial shock being confined to a single bank. If there is an initial shock that affects several banks simultaneously, then this can also lead to contagion being more likely.

In the case of Bear Stearns it is not clear from publicly available information how much contagion there would have been had it been allowed to fail. Press reports stress the large number of derivative contracts that Bear Stearns was a counterpart in. However, this could mean that contagion was less likely because there would be more institutions with capital buffers to absorb the defaults. In any case, more simulations like those undertaken for banks are needed in the context of derivatives to assess the likelihood of contagion with this kind of default.

As a final point, one also has to keep in mind that even when there is a realistic risk of contagion that justifies central bank or government intervention, this also involves costs that should be traded-off against the costs deriving from contagion. These costs of intervention include the future moral hazard associated with increased risk taking by financial institutions going forward.

### **3. Mark-to-Market Accounting for Financial Institutions**

One of the points emphasized above is that cash-in-the-market pricing leads to prices that do not reflect fundamentals. If that occurs, mark-to-market accounting for financial institutions has the disadvantage that it can understate the value of banks and other intermediaries and makes them appear insolvent when in fact they are not. Historic cost accounting has the advantage that it does not do this. On the other hand, it leads to bankrupt institutions that deserve to be closed being able to continue and possibly gamble for resurrection as occurred in the Savings and Loan Crisis of the 1980's.

Allen and Carletti (2008a) suggest that what is of crucial importance is to provide the users of accounting information such as regulators and investors with the information that allows them to understand at a deeper level what is happening and how this should affect their actions. Mark-to-market values are useful and should certainly be disclosed. However, there needs to be additional information to allow users to identify the extent to which falls in asset prices are due to market conditions such as cash-in-the-market pricing and the extent to which they are due to changes in discounted expected future cash flows. If the users of accounting information can distinguish between these factors they will be in a much better position to decide how to proceed.

What information that is easily available can be used for this purpose? The International Accounting Standards Board promulgates the International Financial Reporting Standards (IFRS) that apply to all listed European Union/European Economic Area companies. The Financial Accounting Standards Board determines Generally Accepted Accounting Principles (GAAP) and these together with Securities and Exchange Commission (SEC) regulations determine the way that companies in the United States report their results. The approach of both

for determining the fair values of financial instruments as outlined in IFRS 7 and FAS 7 are similar. However, the latter is more specific (see IMF 2008, Chapter 2, Annex 2.1). It specifies three levels. Level-one valuations, which are to be used if available, are based on observable prices in liquid markets. Level-two valuations are based on prices on nearby dates or prices of very similar instruments. These are to be used if Level-one valuations are not available. Finally, Level-three valuations allow the use of theoretical valuation models. For example, for mortgage backed securities, these might involve assumptions concerning default rates and loss ratios. These model-based valuations require disclosure of the model assumptions. They are used when Level-one and Level-two valuations are not available.

These three valuation methods should give very similar results most of the time. In such cases there is no point in disclosing anything other than Level-one valuations based on observable prices in liquid markets as is currently done. In times of crisis, though, the different methods can give very different values. The example above during the current crisis of the 30 percent fall in the market prices of AAA super senior tranches of collateralized debt obligations is one where model-based valuations using plausible assumptions would give significantly higher values. Rather than the current approach of only using Level-three valuations when Level-one and –two valuations are unavailable, an alternative would be to also report Level-three valuations if they differ significantly from Level-one or Level-two valuations. One possible threshold for triggering the reporting of both valuations would be a difference of 5 percent, for example. In such circumstances, it may also be helpful to report historic cost values, since these are more objective than Level-three valuations given they do not require extensive assumptions. The reporting of multiple values would alert regulators, investors and other users to the fact that they need to investigate more carefully what is happening in the markets where prices are

determined. This will allow them to use better judgment as to whether the banks and other financial institutions are insolvent or not and to investigate more thoroughly whether the institutions are able to meet their future obligations. In case they are, regulators should probably practice a form of “forbearance” in that they should allow banks not to fully write down the value of their assets according to market conditions, in order to avoid artificial volatility and its consequent solvency impairment. This would help to eliminate the procyclicality problem implied by fair value accounting as there would be no need for banks to raise further capital.

In summary, when model-based valuations based on plausible assumptions differ by more than (say) 5 percent from market based valuations, both types of valuation together with traditional historic cost valuations should be provided. This will signal to the users of information that they need to be careful to identify what is going on in the markets. This is not a perfect system but it is practical and it will be an improvement over the current one.

### **Concluding Remarks**

The current crisis has resulted in severe strains on the global financial system. This article has argued that many of the problems faced so far are due to market illiquidity. It has also been suggested that the response of the U.S. authorities has been well judged. Going forward many problems remain. As the fall in property prices continues financial institutions will come under increasing strain and many problems will face the global financial system. In my view the most important of these is big banks in small countries and the “too big to save” problem. Unfortunately, countries like Belgium and Switzerland do not have the resources to step in and correct problems in their financial systems in the way that the U.S. authorities have done. This means that the risk of contagion in such circumstances is very real.

Finally there remains the issue of the innovative techniques undertaken by central banks to unfreeze uncollateralized and collateralized interbank markets. The freeze in uncollateralized markets appears to be due to liquidity hoarding and is difficult to counter. The swapping of Treasuries for mortgage-backed securities helps unfreeze the collateralized markets but may increase opportunities for window dressing. Allen and Carletti (2008c) contain a discussion of these issues.

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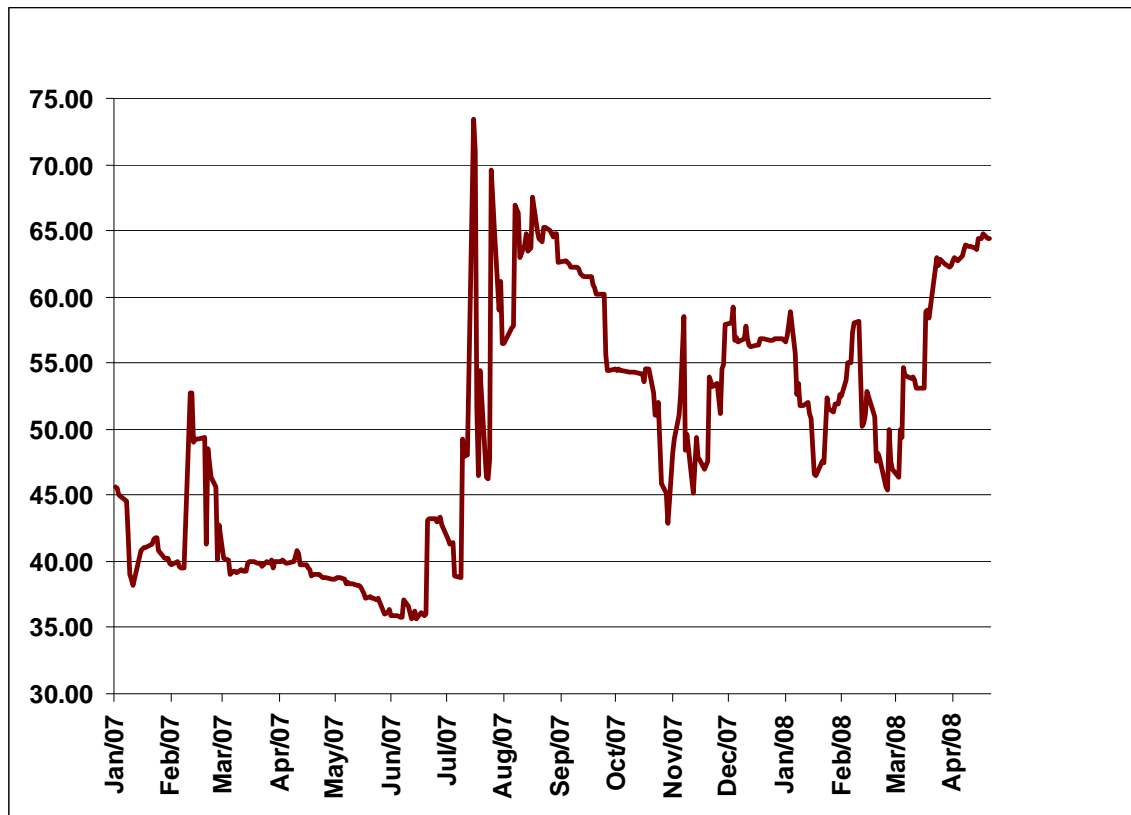
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**Figure 1**

Co-movement between AAA US Structured Financial Instruments  
(in percent)



Source: Bank of England calculations using data from JP Morgan Chase and Co. – Bank of England Financial Stability Report (2008, p. 24, Chart 1.19).

Graph plots the proportion of the variation in exponentially weighted daily changes in credit default swap premia for the most senior tranche of the ABX HE 2006 H1, CMBX NA Series 1 and CDX NA explained by the first principal component over a three-month rolling window.