

Wrap-up Discussion

1. Satyajit Das

The Credit Default Swap Market – Will It Unravel?¹

I would like to focus my attention on the first part of this Conference, which covered issues associated with financial innovation and the problems which led to and exacerbated the recent episode of financial turmoil. These have prompted a lot of discussion about ways in which financial markets allow risk to be shared and raised concerns about how these markets have operated. There has also been much discussion of the appropriate role of regulators in this environment. For my part, I would like to extend this general discussion with some specific points about the market for a particular credit instrument which has grown very rapidly in recent years; that of the credit default swap (CDS). I contend that some of the insights that we can draw from examining this market give us a general sense of the types of problems that we need to address. I am also of the view that the effects of the financial turmoil on this particular market are yet to be played out fully.

In May 2006, Alan Greenspan, the former Chairman of the Fed, noted:

The CDS is probably the most important instrument in finance ... What CDS (credit default swaps) did is lay-off all the risk of highly leveraged institutions ... on stable American and international institutions.²

The reality may prove different.

A CDS is economically similar to credit insurance. The buyer of protection (typically a bank) transfers the risk of default by a borrower (the reference entity) to a protection seller, who for a fee indemnifies the protection buyer against credit losses.³ The CDS contract and the entire structured credit market were originally predicated on hedging credit risk. Over time the market changed focus – in Mae West’s words: ‘I used to be Snow White, but I drifted’.

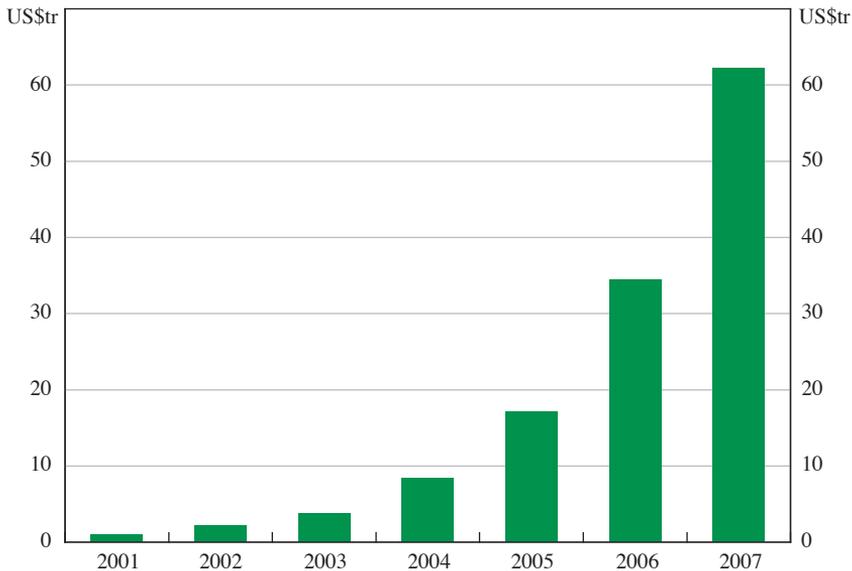
The abilities to short-sell credit instruments, leverage positions and trade in credit instruments in a way that is unrestricted by the size of the underlying debt market have become the dominant drivers of growth in the markets for these instruments. As a result, the CDS market has grown exponentially to around US\$62 trillion in 2007 (Figure 1). While these figures involve some double-counting of volumes, even when we abstract from this the figures are impressive, especially when you consider that the market was less than US\$1 trillion in 2001. Nonetheless, the size of the market – which has attracted much attention – is not the major issue.

1. An earlier version of this paper appeared as Satyajit Das ‘How Supposed Risk Hedgers Could Become Risk Creators’, FT.com site, 6 February 2008. Available at < <http://www.ft.com/cms/s/0/65739114-d456-11dc-a8c6-0000779fd2ac.html>>.

2. See ‘Greenspan Slams CDS Paperwork’, *Asia Risk*, June 2006, p 4.

3. For a more technical treatment of CDS contracts see Das (2005).

Figure 1: Credit Default Swaps
Outstanding notional value



Source: International Swaps and Derivatives Association, Inc

1.1 Documentary SNAFUs

Banks have used CDS contracts extensively to hedge credit risk on bonds and loans. The key issue is: will the contracts protect the banks from the underlying credit risk being hedged? As Mae West noted: ‘An ounce of performance is worth pounds of promises’.

Documentation and counterparty risk means that the market may not function as participants and regulators hope if actual defaults occur. CDS documentation is highly standardised to facilitate trading and so it generally does not exactly match the terms of the underlying risk being hedged. CDS contracts are also technically complex. There are issues regarding the identity of the entity being hedged, the events that are covered and how the CDS contract is to be settled. This means that the hedge may not provide the protection sought. In fairness, all financial hedges display some degree of mismatch or ‘basis’ risk.

A CDS contract is triggered by a ‘credit event’, broadly defined as default by the reference entity. For each corporate grouping only one or, in exceptional cases, a few reference entities are traded in the CDS market. Therefore there are substantial mismatches in ‘who’ is being hedged with ‘whom’. If there are corporate actions (takeovers, mergers, leveraged buyouts) then the reference entity can change according to a set of complex rules. A hedging bank may end up ‘hedged’ on a counterparty to which it has no exposure. Alternatively, a bank seeking exposure to a particular credit risk can end up with exposure to an entity to which it did not intend to be exposed.

The buyer of protection is not protected against ‘all’ defaults. They are only protected against defaults on a specified set of obligations in certain currencies. Even if there is a loan default, ‘technical difficulties’ may make it difficult to trigger the CDS hedging that loan. CDS contracts are specified in different and complex ways, so that for example, ‘restructuring’ is often classified as one of the following: R (restructuring); MR (modified restructuring); MMR (modified-modified restructuring); or NR (no restructuring). To trigger the CDS contract publicly available information must generally be used. Many of the recent credit events have been straightforward Chapter 11 filings and bankruptcy, however, for other credit events (failure to pay or restructuring) there may be problems in establishing that the credit event took place.

These issues have a systemic dimension. A CDS protection buyer may have to put the reference entity into bankruptcy or Chapter 11 in order to be able to settle the contract. A study by Hu and Black (2008) concluded that CDS contracts may create incentives for creditors to push troubled companies into bankruptcy. This may exacerbate losses in the case of defaults. In this case, the protection buyer of the CDS must deliver a defaulted bond or loan – the deliverable obligation – to the protection seller in return for receiving the face value of the delivered item (known as physical settlement). For example, when Delphi defaulted, the volume of CDS outstanding was estimated at US\$28 billion against US\$5.2 billion of bonds and loans (not all of which qualified for delivery). On actively traded names, CDS volumes are substantially greater than outstanding debt, which is likely to make it difficult to settle contracts.

Shortage of deliverable items and practical restrictions on settling CDS contracts has forced the use of ‘protocols’ – where any two counterparties, by mutual consent, substitute cash settlement for physical delivery. In cash settlement, the seller of protection makes a payment to the buyer of protection. The payment is intended to cover the loss suffered by the protection buyer based on the market price of defaulted bonds established through a so-called ‘auction system’. The auction is designed to be robust and free of manipulation. In the case of Delphi, the protocol resulted in a settlement price of 63.38 per cent (which was the market’s estimate of recovery by the lender). The protection buyer received 36.62 per cent (100 less 63.38) or US\$3.662 million per US\$10 million of CDS contracts. Fitch Ratings assigned an R6 recovery rating to Delphi’s senior unsecured obligation, which equated to a 0–10 per cent recovery band – far below the price established through the protocol (Batterman and Rosenthal 2005). It is clear from this example that the buyer of protection, depending on what was being hedged, can potentially receive a payment on its hedge well below its actual losses – and in practice may therefore not be fully hedged.

The settlement mechanics may cause problems even when there is no default. In one example, a company (Sainsbury) refinanced its debt using commercial mortgage-backed securities (CMBS). The company was downgraded by rating agencies. It had a shortage of deliverable obligations – having used the funds from the CMBS to repay its bond and loans – which meant that the CDS fee for the company fell sharply. While this is generally indicative of an improvement in credit

quality, it resulted in mark-to-market losses for bemused hedgers. This is known, in the trade, as an ‘orphaned CDS’.

In general, the intricacies of CDS contracts and their operation are not well understood by users. In the words of an anonymous trader:

Credit derivative dealers talk about their market in much the same way spotty teenagers talk about sex. A lot of people profess to be accomplished experts, but when it really boils down to it, most of them are still fumbling in the dark.

In the case of actual defaults, the CDS market may provide significant employment to a whole galaxy of lawyers trying to figure out whether and how the contract should work. Unfortunately though, the contract may not always provide buyers of protection with the hedge against losses that they assumed they had purchased.

1.2 Encounters with counterparty risk

CDS contracts allow the buyer of protection to substitute the risk of the protection seller for the risk of the loan or bond being hedged. However, if the protection seller is unable to perform, then the buyer obtains no protection. A significant proportion of protection sellers are financial guarantors (monoline insurers) and hedge funds. Concerns about the credit standing of the monolines are well documented. Recently, a number of banks created substantial provisions against the counterparty risk on hedges with financial guarantors. This was done to cover the possibility that the counterparty is not able to perform under the contract, leaving the hedger exposed to a loss on the risk being hedged. The financial institutions included Merrill Lynch (US\$3.1 billion), Canadian Imperial Bank of Commerce (US\$2 billion) and Calyon (US\$1.7 billion).

For hedge funds, CDS contracts are marked to market daily, and any gain or loss is covered by collateral (cash or high quality securities) to minimise risk. If there is a failure to meet a margin call then the position must be closed out and the collateral applied against the loss. In practice, banks may not be willing or able to close out positions where collateral is not posted. In a recent example of these problems, ACA Financial Guaranty sold protection totalling US\$69 billion while having capital resources of around US\$425 million. When ACA was downgraded to a credit rating of below A in late 2007, it was required to post collateral of around US\$1.7 billion. ACA was unable to meet this requirement. The banks made a ‘forbearance agreement’ whereby the buyer of protection waived the right to collateral temporarily. ACA has subsequently been downgraded to a credit rating of CCC, reducing the value of the CDS contract and the protection offered. The problems at ACA are not unique.

A critical element is the level of over-collateralisation. A buyer of protection will want an initial margin to cover the risk of a change in the value of the CDS contract and any failure by the seller of protection to meet a margin call. The seller of protection wants to increase leverage by reducing the amount of cash it must post as an initial margin. It is possible that the initial collateral may prove to be too low, particularly as collateral models use historical volatility and correlations that

may underestimate risk. Also, the entire process assumes liquidity in the underlying CDS market that may be absent in a crisis.

The use of collateral also poses liquidity risks for sellers of protection. When its credit rating declines, a bank may have to post increased collateral. There is anecdotal evidence that large hedge funds are now asking banks to post collateral as surety to mitigate credit risk in transactions. Merrill Lynch estimated that a downgrade of its credit rating by one category (notch) would require it to post an additional US\$3.2 billion of collateral on over-the-counter derivative transactions. Similarly, Morgan Stanley and Lehman Brothers estimated that a single notch downgrade would require posting US\$973 million and US\$200 million of additional collateral, respectively. Following its recent credit ratings downgrade, MBIA may be required to post an additional US\$7.4 billion in collateral. Collateral arrangements, in reality, may not provide the desired credit enhancement to CDS contracts but rather, they may exacerbate liquidity pressures on financial institutions.

CDS contracts can also entail significant operational risks. Delays in documenting CDS contracts forced regulators to step in, requiring banks to confirm trades more promptly. Where collateral is used, there are additional challenges of ensuring the accuracy of the marking to market of CDS and monitoring of collateral. Paradoxically, in the course of the May 2006 speech praising CDS contracts, Alan Greenspan expressed shock and horror at the appalling state of settlements in the credit derivatives market. He was dismayed that banks trading CDS seemed to document trades on scraps of paper. The ex-Chairman, perhaps unfamiliar with the reality of financial markets, had difficulty reconciling a technologically advanced business with this ‘appalling’ operational environment. Then again, in finance as in life, appearances are misleading.

If the CDS contracts fail then ‘hedged’ banks are exposed to losses on the underlying credit risk. Recently, one analyst suggested that losses from failure of sellers of CDS protection to perform could total between US\$33 billion and US\$158 billion (Cicione 2008). This compares to the US\$300 billion or so that banks have written off to date in the sub-prime crisis. While it may be unlikely that the CDS market will fail entirely, it is possible that losses on the hedges will add to the losses that the banks have already incurred.

1.3 Concentration risks

The CDS market entails complex chains of risk. This is similar to the reinsurance chains that proved so problematic in the case of Lloyds. Like reinsurance premiums, CDS fees are received up-front. In both cases, the risks are potentially significant and ‘long-tailed’ – they do not emerge immediately and may take some time to be fully quantified. As in the reinsurance market, the long chain of CDS contracts may create unknown concentration risks. Defaults may quickly cause the financial system to become gridlocked as uncertainty about counterparty risks restricts normal trading.

The impact of a bankruptcy filing by Bear Stearns on the over-the-counter derivatives market, including CDS contracts, was probably one of the factors that influenced the Federal Reserve and US Treasury's decision to support the rescue of this investment bank. Barclays Capital recently estimated that the failure of a dealer with US\$2 trillion in CDS contracts outstanding could potentially lead to losses of between US\$36 billion and US\$47 billion for counterparties (Wood 2008). This underlines the potential concentration risks that are present.

1.4 Conclusions

Over the past year, securitisation and the collateralised debt obligation market have become dysfunctional. As the credit crisis deepened, the risk of actual defaults became real. Analysts expect the level of defaults to increase further. My contention is that the next stage of the crisis will involve the CDS market, which has not yet been fully tested. While there have been a few defaults, the market has not had to cope with a large number of simultaneous defaults. CDS contracts may experience problems and may be found wanting.

Ludwig von Mises, the Austrian economist from the early part of the twentieth century, once noted:

It may ... be expedient for a man to heat the stove with his furniture. But ... he should not delude himself by believing that he has discovered a wonderful new method of heating his premises. (von Mises 1949, p 650)

CDS contracts may not actually improve the overall stability and security of the financial system but may create additional risks in much the same way that occurred with many of the financial innovations that have underpinned the sub-prime crisis.

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2. Malcolm Edey

The papers for this Conference were structured around three themes, namely:

- the unfolding turmoil;
- innovation, disintermediation and capital regulation; and
- the role of central banks as providers of liquidity.

Let me start by recapping briefly how the papers addressed these themes.

Ben Cohen and Eli Remolona's paper started by reviewing the background to the crisis. Like a number of the other authors, they point to several contributing factors. These include: a low-interest rate environment in the years leading up to the crisis; financial innovations, especially the growth of off-balance sheet vehicles and complex structured securities; an increased appetite for risk; and a range of weaknesses in regulation and in market infrastructure. Included in the latter were shortcomings in disclosure and in the role of the rating agencies. Eli and Ben hold out some hope that the implementation of Basel II, along with the various recommendations from recent official reviews, will help to alleviate these weaknesses.

The paper by Nigel Jenkinson, Adrian Penalver and Nicholas Vause covered some of the same territory but, I think, gave greater weight to the endogenous dynamics of financial innovation. The authors argue that innovations like structured debt instruments brought genuine improvements in the capacity of markets to allocate risk efficiently. They recognise that the amount of risk-taking went too far, but they also point to the capacity of these markets for self-correction. They predict markets will learn from recent mistakes and deliver some of the needed changes, like improvements in transparency, product simplification and better performance from rating agencies.

The next paper, by Adrian Blundell-Wignall and Paul Atkinson, differed from Ben and Eli's paper in the other direction, by focusing more of the story on regulatory shortcomings. Like the other authors, they agree that low interest rates and the search for yield were key preconditions of the crisis. But they argue that it was the regulatory transition from Basel I to Basel II that created the incentives for banks to innovate and expand in the direction they did. And this in turn helps to explain the form that the financial crisis took. This is an interesting thesis, and one that deserves to be examined further. Before I am convinced, I would like to see some more detailed analysis of how the incentive structures worked. On the face of it, the incentive to use off-balance sheet vehicles to economise on capital already existed under Basel I, and would already go a long way towards explaining the innovations and risk-taking that were characteristic of the crisis.

The remaining three papers brought us on to the question of how central banks should respond to events like this in their role as providers of liquidity. Philip Davis's paper gave us a helpful discussion of the nature of liquidity risk, the way financial contagion can spread, and the issues central banks face in deciding how to meet liquidity needs in a crisis. Spence Hilton gave us a detailed account of how the Fed modified its operations in response to the crisis, and the new liquidity facilities

that were introduced. He also raised the interesting question of whether these new facilities should be maintained in normal times. These issues were taken up and explored in a more general way in the paper by Jonathan Kearns and Phil Lowe.

Finally, we have heard from Das that the crisis might not yet be over. He makes the case that the resilience of the credit default swap market, in particular, is yet to be fully tested. And of course, we have had news in the past few days of the difficulties in the US federal mortgage agencies, which has formed an important part of the background to our discussions here.

All of that amounts to a fairly comprehensive coverage of the issues that arose out of these recent events. They are complex issues, and it is easy to get lost in the complexity. So to try and focus this final discussion, let me draw together a few of the common themes that seem to emerge.

The first theme is that periodic bouts of financial over-exuberance, followed by their unpleasant aftermath, are to some degree unavoidable. All of the papers presuppose this to be the case. That is why bank assets are worth more in good times than in bad times, which in turn is why banks need a lender of last resort. It is also why we need prudential regulators, to contain risk-taking and to make sure the system has some buffer against the financial cycles that are inevitably going to occur.

It is interesting to observe in history the way each successive financial cycle is both similar to, and different from, its predecessors. The common elements are very familiar: the build-up of leverage; the rise in asset prices, often from what starts out as a sound basis; the development of innovative financial instruments; the elements of reckless or near-fraudulent behaviour that get drawn into the mix; and, above all, the belief that this time it is different. What differs each time is the set of assets or financial instruments at the centre of the event, be they railway shares, tech stocks, emerging market debt or sub-prime mortgage securities. People are unlikely to jump on the same bandwagon twice in quick succession, so we can be sure that next time there is a crisis, it will be something different again.

Obviously, those of us who work in central banks, or financial supervisory agencies, make it our business to do what we can to reduce the risk that these kinds of events will occur, or to mitigate their effects when they do occur. But we have to be realistic about what can be achieved. History suggests we are never going to be able to eliminate financial cycles entirely.

The second theme is that low interest rates in the major economies were a key factor in promoting excessive risk-taking in the lead-up to the crisis. The major economies all ran with unusually low interest rates in the first half of this decade, for reasons that can be debated, but which can at least be understood given circumstances at the time. The low-interest rate environment encouraged both credit expansion and the much-discussed 'search for yield', which saw risk spreads on a range of financial instruments bid down to unsustainably low levels.

Adrian and Paul's paper used the analogy of a dam wall containing structural weaknesses and with water piling up behind it. Eventually the dam will break, but

what cannot be predicted is exactly when it will happen, or which villages will be destroyed. There seems to be general agreement that the low-interest rate environment contributed to the build-up of financial pressure, while various regulatory and other weaknesses eventually allowed the structure to give way.

This brings me to the third theme, which is that unintended consequences of financial regulation were responsible for shaping the types of risk that were being taken. The most obvious example of this is bank capital regulation. Banks responded to the incentive to economise on capital by shifting more and more of their business into off-balance sheet vehicles, and by embracing the originate-and-distribute model for mortgage lending. In this way, a set of regulations intended to contain a certain type of risk actually had the effect of shifting risk into the unregulated or less regulated parts of the financial system. And in the process, other kinds of risk-taking were being encouraged.

I am not an expert on financial regulation, but my impression is that there are many examples of this phenomenon. And it is not just bank regulation *per se* that contributes to these unintended consequences. It is the whole network of market conventions, investment mandates, and even things like investor rules of thumb that help to channel the direction of financial innovation.

When I first heard about how collateralised debt obligations (CDO) work, I was puzzled as to what could be the economic rationale for the existence of this kind of instrument. Here was a security that concentrates risk in highly unpredictable ways, and I wondered where the underlying demand for it could come from. The paper from Adrian Penalver *et al* discusses this and suggests a possible rationale – namely, that a CDO allows investors to take a position on the size of an aggregate default event. That sounds plausible enough, but I suspect the main demand for CDOs didn't arise from that kind of deliberate position-taking. It came from rule-based investors whose mandates required them to invest in securities with a minimum credit rating; or from naïve investors like local governments, who were using rules of thumb roughly along the lines of 'invest in the AAA securities with the highest yield'. CDOs seem to have been designed, at least in part, to meet this kind of demand.

My fourth theme is that the process of regulatory reform in response to these events will necessarily be a dynamic one, with no final end-point. Eli's remarks at the beginning of the Conference make this very clear. There are certain aspects of regulation and market conduct that need to be fixed, including in areas like bank capital regulation, disclosure and reporting practices, and the role of rating agencies. The same goes for the various conventions and rules of thumb that influence investor behaviour. Investors are going to have to go through the process of adjusting those rules and conventions in response to what they have just learned. But, for reasons I have already discussed, the next crisis is going to be different from this one. Market practitioners will continue to innovate around regulations, and regulators and supervisors will continue to adjust their approach as best they can, trying to anticipate where the next source of systemic risk is coming from. As I said earlier, perfect results are not going to be attainable on this front, but the effort has to be made.

Finally, I want to sum up some of the discussion concerning the role of central banks in providing liquidity. One important distinction here is that between providing liquidity to an institution and providing it to the system as a whole. It is the institution-level support that raises the major difficulties, particularly in relation to questions of moral hazard, whereas system-wide liquidity provision by the central bank is generally regarded as uncontroversial. This conventional view makes a good deal of sense. Nevertheless, I am not sure that the two concepts can be kept entirely separate, since the routine liquidity operations of the central bank necessarily work through the institutions that are bidding for funds.

In fact, this whole area is one where neat formulations and principles are hard to come by. We can see this by thinking about the extreme approaches to liquidity provision discussed by Jonathan and Phil. At one extreme would be an approach that offered banks unlimited liquidity support on demand. There is, in fact, some economic rationale for such an approach. Central bank liquidity costs no real resources to produce. It could, in principle, be offered to commercial banks in volumes that would meet all conceivable liquidity demands. Why not do so? The answer has to be that such an approach would involve unacceptable risk to the central bank. I think it would also mean a significant extension of the central bank's function. Why? Because presumably that risk would have to be managed, and this in turn would mean taking some ongoing involvement in the risk management decisions of the commercial banks.

At the other extreme is the approach that commits itself to providing no emergency liquidity support at all to institutions, or providing such support only under tightly specified preconditions. This deals with the moral hazard problem, but runs up against a problem of credibility: that is, circumstances may well arise in which it is not realistic to withhold liquidity support, and it is impossible to specify in advance exactly what those circumstances might be.

For these reasons, the two extreme positions I have just outlined do not seem to be workable, and all of the papers that addressed this question looked for a middle ground between them. These intermediate approaches need to find a balance between freely providing central bank liquidity, which can be viewed as an essentially costless public good, and containing the moral hazard that can flow from that. I sense the general balance being struck by participants here involves a relatively liberal approach to liquidity provision in crisis conditions, but a reluctance to get too involved in funding the balance sheets of commercial banks in normal times. But this still leaves a lot of the details up for grabs, and no doubt these are issues that will continue to be debated for some time.

3. General Discussion

The discussion in the final session started with a call by one participant for the scope of the regulatory net (as it applies to banking) to be more clearly defined and for the authorities to be more explicit about which types of banks would be permitted to fail. It was suggested that this could involve a starker distinction between commercial and investment banks, and perhaps regulations restricting commercial banks from owning or conducting investment banking business. It was argued that doing so would better protect public funds and avoid problems of moral hazard. Along the same lines, a number of participants suggested that perhaps regulators needed to define a group of institutions that were considered 'too big to fail'. These institutions could be required to operate as 'narrow banks' that only issue on-balance sheet loans and hold government securities but no derivatives. Others were somewhat sceptical that narrow banks could somehow be 'ring-fenced' from the rest of the financial system. Also on the question of investment banks (and some of the riskier commercial banks), the issue of their culture of risk-taking was raised in the context of the remuneration of executives. One participant questioned the benefit of shorter-term, equity-related executive bonus structures. Another questioned whether very high remuneration for financial executives was justifiable given their performance which had little true social value and suggested that it could be due to their excessive influence over boards.

The discussion moved on to the magnitude and duration of the current financial turmoil. One participant suggested that a key distinguishing feature of the current episode was its long duration. Another participant claimed that this was because the turmoil had centred on assets that were held off-balance sheet, and that exposures had been widely spread across institutions and around the world. If instead problem assets had been on the balance sheets of only a handful of institutions, the crisis may have resolved more rapidly – since it would have been feasible for the institutions and authorities to agree on a resolution, as had been done in many previous crises. It was less clear, however, whether the nature of this financial crisis implied more or less of an adverse impact on the real economy than earlier crises, with one participant doubting that the overall quantum of risk would have been as great had the problematic mortgage assets been on-balance sheet. One participant suggested that the spiral of falling asset prices, leading to falls in demand for credit and further falls in asset prices, had only just begun, and that there was likely to be more weakness yet to come, particularly in real activity. In this light, it was suggested that problems of moral hazard should take a 'back seat' in current policy considerations. A number of participants agreed that the moral hazard problem had perhaps been over-emphasised given that: first, much of the empirical evidence appeared to indicate that bailouts had only a limited effect on market behaviour; and second, in a number of cases where institutions had failed, shareholders had suffered sizeable losses and management had lost their positions and reputations, which provided market discipline on its own.

There was also some discussion about the causes of the recent turmoil. Some participants highlighted the role of macroeconomic factors, including low interest

rates and a ready supply of funds which found their way into housing markets, most notably in the United States. On the contribution of the financial system, one participant suggested that an appropriate policy response depended on the extent to which the crisis reflected: first, positive correlations across different assets, which were not properly appreciated; second, a more general inability to assess risk – in part reflecting the information problems highlighted in a number of the papers at the Conference; or third, financial market participants knowingly selling financial products that were overpriced. Another participant thought that it was likely that all three were at work, making the policy choices more complicated. Yet others suggested that while the purpose of the originate-to-distribute model and products such as collateralised debt obligations was to distribute risk to those most able and willing to hold it, it seemed that what had actually been achieved was an unexpected concentration of risk.

One participant argued that in the longer run of history, innovation in financial markets had a mixed track record. In the early 1980s, crises took the form of sovereign debt defaults and a failure of prudent fiscal policy. The 1990s brought the Asian crisis, which was associated with fixed exchange rates and the assumption that domestic financial systems could borrow in foreign currency. During these episodes, the developed nations and international agencies argued that the developing nations needed to deregulate their financial systems. But the two largest financial problems of this decade have occurred in the deepest financial markets: the ‘tech’ bubble and the bubble in house prices. It was contended that this is a significant blow to the argument that deregulated and flexible financial markets are superior. However, other participants suggested that the benefits of financial innovation still far outweighed the costs. It was argued that the technology is available to better deal with the costs, for example, by the use of collateral, subordination and delegation to the credit rating agencies, but the way in which these technologies are applied is important and there is clearly a significant role for public policy.