

The credit derivatives market: its development and possible implications for financial stability

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Bank failures have often arisen from excessive credit exposure to particular borrowers or groups of borrowers that were vulnerable to the same shocks. The further development of markets for transferring credit risk could, therefore, improve the stability and efficiency of the financial system. The credit derivatives market, in particular, has recently been growing rapidly: the notional principal outstanding is probably approaching US\$1 trillion globally. But it is by no means fully mature; and has not been tested during an economic slowdown, when credit events tend to be bunched, in the US and Europe. The full realisation of the potential benefits therefore lies somewhere in the future. Broadly, the market can be divided into two parts: an inter-dealer market in credit default swaps on individual companies and sovereigns, based on standard ISDA documentation; and transactions designed to transfer credit risk on portfolios of bank loans or debt securities, on which the risk is usually tranching. These portfolio transactions appear to be facilitating a net transfer of credit risk from banks to non-banks, principally insurance companies. Financial stability authorities need to track the scale and direction of this risk redistribution and more data is probably needed. This article describes the instruments and explores how different market participants use them. It then raises some questions about the markets for participants and the authorities to consider¹.

MARKETS IN credit risk transfer have the potential to contribute to a more efficient allocation of credit risk in the economy. They could enable banks to reduce concentrations of exposure and diversify risk beyond their customer base. Liquid markets could also provide valuable price information, helping banks to price loans and other credit exposures. They might allow institutions other than banks to take on more credit risk, so that the immediate relationship banks have with end-borrowers need not mean they are excessively exposed to them.

A number of primary and secondary markets in debt instruments bearing credit risk are well established. Investment grade and, increasingly in North America and Europe, sub-investment grade borrowers are able to issue debt securities directly through international and domestic bond markets. Bank loans to companies are distributed through initial syndication and can be sold through the secondary loan market, including to non-banks. The development of securitisation techniques has allowed banks to sell portfolios of all

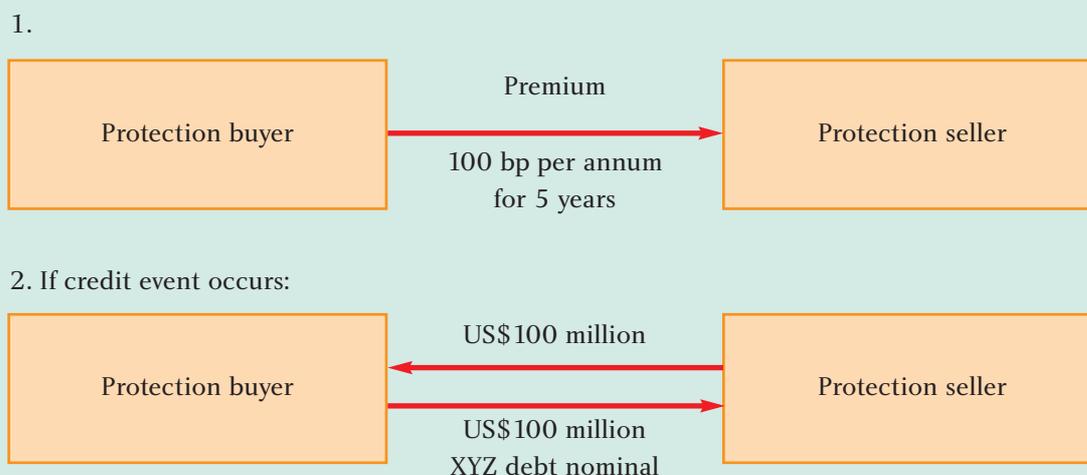
kinds of loans (eg mortgage, credit card, automobile) provided investors can be shown that the aggregate cashflows behave in a reasonably predictable manner.

All of these markets, however, require the taker of credit risk to provide funding, either directly to the borrower or to the bank selling the debt, in order to buy an underlying claim on the borrower. Credit derivatives differ because credit risk is transferred without the funding obligation. The taker of credit risk provides funds *ex post* only if a credit event occurs. Credit derivatives therefore allow banks to manage credit risk separately from funding. They are an example of the way modern financial markets unbundle financial claims into their constituent elements (credit, interest rate, funding etc), allowing them to be traded in standardised wholesale markets and rebundled into new composite products that better meet the needs of investors. In the case of credit derivatives, the standardised wholesale market is in single-name credit default swaps and the new composite products include portfolio default swaps,

¹: This article is based, in part, on discussions at a series of meetings held with market participants and observers in London, New York and Boston between January and June 2001. The author is also grateful to Greg Fisher, Anne-Marie Rieu, Alison Emblow and Paul Tucker for contributions and comments.

Diagram 1:

Single name credit default swap (CDS): example of 5 years, US\$ 100 million *Company XYZ* priced at 100 bp per annum



basket default swaps, synthetic collateralised debt obligations (CDOs) and credit-linked notes.

I Credit derivatives – the instruments

There is no universally-accepted definition of a credit derivative. The focus in this article is on single-name credit default swaps and the structured portfolio transactions put together using them.

Single-name credit default swaps

In a credit default swap (CDS), one counterparty (known as the ‘protection seller’) agrees to compensate another counterparty (‘the protection buyer’) if a particular company or sovereign (‘the reference entity’) experiences one of a number of defined events (‘credit events’) that indicate it is unable or may be unable to service its debts (see Diagram 1). The protection seller is paid a fee or premium, typically expressed as an annualised percentage of the notional value of the transaction in basis points and paid quarterly over the life of the transaction. Box 1 describes single name CDS in more detail.

A CDS is similar, in economic substance, to a guarantee or credit insurance policy, to the extent that the protection seller receives a fee *ex ante* for agreeing to compensate the protection buyer *ex post*,

but provides no funding. Being a derivative, however, makes a CDS different. Both guarantees and credit insurance are designed to compensate a particular protection buyer for its losses if a credit event occurs. The contract depends on both the state of the world (has a credit event occurred or not?) and the outcome for the buyer (has it suffered losses or not?). A CDS, by contrast, is ‘state-dependent’ but ‘outcome-independent’. Cashflows are triggered by defined credit events regardless of the exposures or actions of the protection buyer. For this reason, credit derivatives can be traded on standardised terms amongst any counterparties². The single name CDS market allows a protection buyer to strip out the credit risk from what may be a variety of different exposures to a company or country – loans, bonds, trade credit, counterparty exposures etc – and transfer it using a single, standardised commodity instrument. Equally, market participants can buy or sell positions for reasons of speculation, arbitrage or hedging – even if they have no direct exposure to the reference entity. For example, it is straightforward to go ‘short’ of credit risk by buying protection using CDS³. Standardisation, in turn, facilitates hedging and allows intermediaries to make markets by buying and selling protection, running a ‘matched’ book.

²: Unless they are subject to legal or regulatory restrictions on entering into derivatives transactions.

³: Although, in the case of physical settlement, those taking short positions still face the risk that they cannot buy deliverable debt to settle the contract following a credit event.

Box 1: Single name credit default swaps

Protection buyer and seller need to agree the following terms and conditions:

1. the reference entity, notional value and maturity of the transaction and the premium eg Company XYZ, US\$100 million, five years and 100 basis points per annum.
2. the definition of a credit event
3. the compensation that the protection seller will pay the protection buyer should a credit event occur
4. whether settlement occurs by the protection buyer delivering the agreed notional value of the reference's entity's debt against payment by the protection seller of its face value in cash ('physical settlement'); or, alternatively, by the seller paying a net cash amount ('cash settlement').
5. which debt obligations of the reference entity may be delivered to the protection seller in the case of physical settlement or used to value a cash settlement

Market practice in the great majority of transactions is to agree these items using trade confirmations that refer to the 1999 International Swaps and Derivatives Association (ISDA) Credit Derivatives Definitions¹, designed for use in transactions governed by the ISDA 1992 Master Agreement for OTC derivatives transactions. The ISDA Definitions include six types of

credit event: bankruptcy, obligation acceleration, obligation default, failure to pay, repudiation/moratorium (relevant to sovereigns), and restructuring. Counterparties can, of course, agree to exclude items from this list and 'restructuring' in particular has proved controversial in recent months (as discussed below). Other than bankruptcy, these credit events need not affect all of a reference entity's obligations eg a company may fail to pay interest on its subordinated debt but continue paying on its senior debt. Hence, the counterparties must also agree 'reference obligations'. Normally, this is defined as senior², unsecured 'borrowed money' in G7 currencies. However, CDSs are also traded on subordinated debt and on wider payment obligations – for example, if the protection buyer wants to hedge exposures to the reference entity relating to trade credit or counterparty risk.

If a credit event occurs, the protection seller normally compensates the buyer for the difference between the original face value of the debt and its market value following the credit event³. Much less frequently, counterparties trade 'digital' or 'binary' CDSs, in which the seller agrees to pay a fixed cash sum. Standard single-name CDSs are usually settled physically. In the less common case of cash settlement, the protection buyer receives a cash amount equal to the notional principal less the current market value of the reference obligations. This market value is based on a poll of dealers.

¹: Available from ISDA (www.isda.org).

²: An obligation is senior if in a bankruptcy of the borrower the creditor would rank *pari passu* with other general creditors. By contrast, a subordinated obligation is, either by statute or contractual agreement, paid out only when general creditors have been satisfied in full.

³: The debt will normally be accelerated (ie the principal becomes due for immediate repayment) following a credit event, so that the compensation is equivalent to the difference between the face value of the debt and what proportion can be recovered from the borrower. For this reason, the value of CDSs is unaffected by movements in the level and term structure of market interest rates that change the market value of deliverable bonds and loans prior to a credit event. The exception is restructuring – a credit event that may not accelerate the borrower's debt (see below).

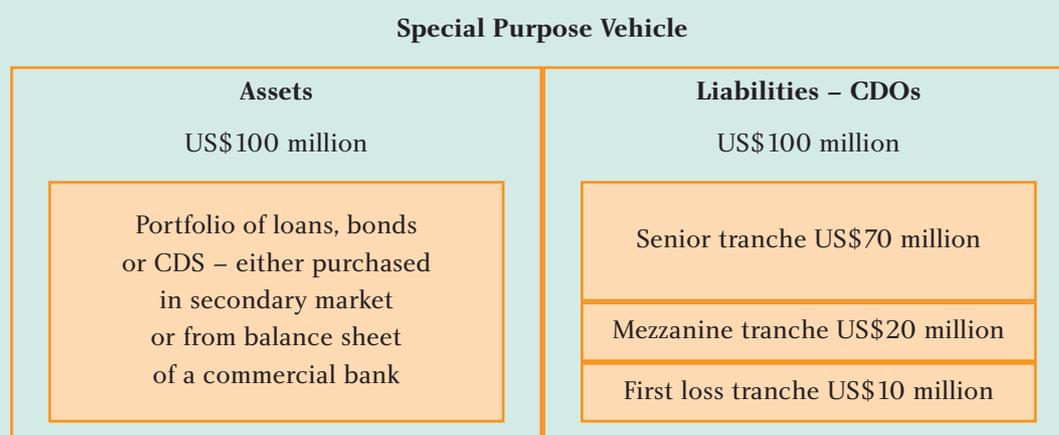
Portfolio transactions

Just as CDS can be used to unbundle credit risk, they can also be combined to create new portfolio instruments with risk and return characteristics designed to meet the demands of particular protection buyers and sellers. This use of CDS to construct portfolio instruments is part of the evolution of the market in collateralised debt obligations (CDOs). In its simplest form, a CDO is a

debt security issued by a special purpose vehicle (SPV) and backed by a diversified loan or bond portfolio (see Diagram 2).

The diversification of the portfolio distinguishes CDO transactions from asset-backed securitisation (ABS) of homogenous pools of assets such as mortgages or credit card receivables, a more established technique. The economics of CDOs is that the aggregate

Diagram 2:
Example of collateralised debt obligations (CDOs)



cashflows on a diversified portfolio have a lower variance than the cashflows on each individual credit; the lower risk enabling CDOs to be issued at a lower average yield. Because these are structured deals, they do not have standardised features in the same way as a single-name CDS. But transactions can be distinguished according to three characteristics.

1 Whether protection is funded or unfunded and sold directly or via an SPV?

The original CDO structure involved the transfer of the underlying bonds or loans to an SPV, which then issued CDOs backed by the cashflows on this portfolio. Most CDOs are still funded transactions of this type. Increasingly, however, CDSs are used to transfer the credit risk to the SPV leading to so-called ‘synthetic’ CDOs. Alternatively, the protection buyer enters into a ‘portfolio CDS’ – a CDS referenced to a portfolio of companies or sovereigns rather than a single name – directly with the seller, or embeds a portfolio CDS in a so-called credit-linked note (CLN) issued directly to the seller, avoiding the use of an SPV altogether. These variants are summarised in the table below:

	Via SPV	Direct
Funded	CDO	CLN
Unfunded	Synthetic CDO	Portfolio CDS

Entering into a portfolio default swap directly with the protection buyer is the simplest of these structures. But it exposes both parties to potential counterparty risk and, if the protection buyer is a

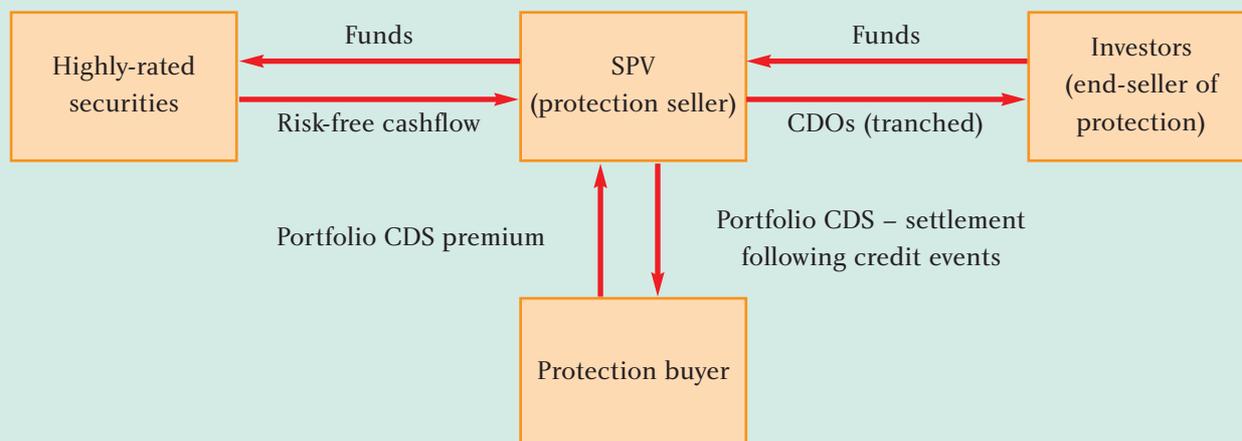
bank, it will only obtain a lower regulatory capital requirement if the protection seller is also a bank (see Box 2). A CLN protects the buyer against counterparty risk on the seller but not vice versa. It can be an attractive option if the protection buyer (issuer) is, for example, a highly-rated bank and the seller (investor) is a pension or mutual fund, with funds to invest. Some investors may also have regulatory or contractual restrictions on their use of derivatives but not purchases of securities such as CLNs.

CLNs, however, still involve the protection seller taking counterparty risk on the buyer⁴. Partly for this reason, most CDOs continue to involve an SPV. In a typical synthetic structure, the SPV issues CDOs to the ‘end-sellers’ of protection and invests the proceeds in high-quality collateral securities, such as G7 government bonds, bonds issued by government-sponsored agencies, mortgage bonds (Pfandbrief) or highly-rated asset-backed securities (see Diagram 3). The end-sellers receive the return on the collateral, often swapped into a floating rate, together with the premium on the default swap. Principal and/or interest payments are reduced if credit events occur on the reference portfolio. In this case, the bank/sponsor has a claim on the SPV under the CDS, backed by the collateral, which is typically cash-settled. This structure has advantages for the protection buyer and the end-sellers:

- It reduces counterparty credit risk for both parties. Both have potential claims on the SPV that are at

⁴ In some legal jurisdictions it may be possible to protect the principal repayment on the notes by giving the noteholders security over highly-rated bonds in a collateral account.

Diagram 3:
Synthetic collateralised debt obligations



least partly backed by the collateral securities. The SPV should be remote from the bankruptcy of either party.

- The CDOs can be structured so that they are high yielding but the principal is protected by the value of the collateral securities ('principal-protected notes'). Some insurance companies find this type of investment attractive (see below).
- If a bank has bought protection against its loanbook, some regulators may allow a lower regulatory capital requirement on the underlying loans if the counterparty is an SPV that is restricted to holding OECD government bonds.

2 How the risk and return on the portfolio is tranching to give different protection sellers obligations with varying degrees of leverage?

The risk on portfolio transactions is usually divided into at least three tranches. For example, a US\$100 million portfolio may have US\$10 million first loss, US\$20 million mezzanine and US\$70 million senior pieces. If there is a US\$15 million loss on the portfolio following a series of credit events, the seller of protection on the first loss tranche loses US\$10 million and the seller on the mezzanine US\$5 million. In effect, the holder of the first loss (or 'equity') tranche has leveraged the credit risk on the underlying portfolio by ten times whereas the holder of the senior piece may have a much lower risk security. Typical market practice at present is to tranche the risk so that the senior position is Aaa/AAA-rated and the mezzanine position Baa2/BBB-rated.

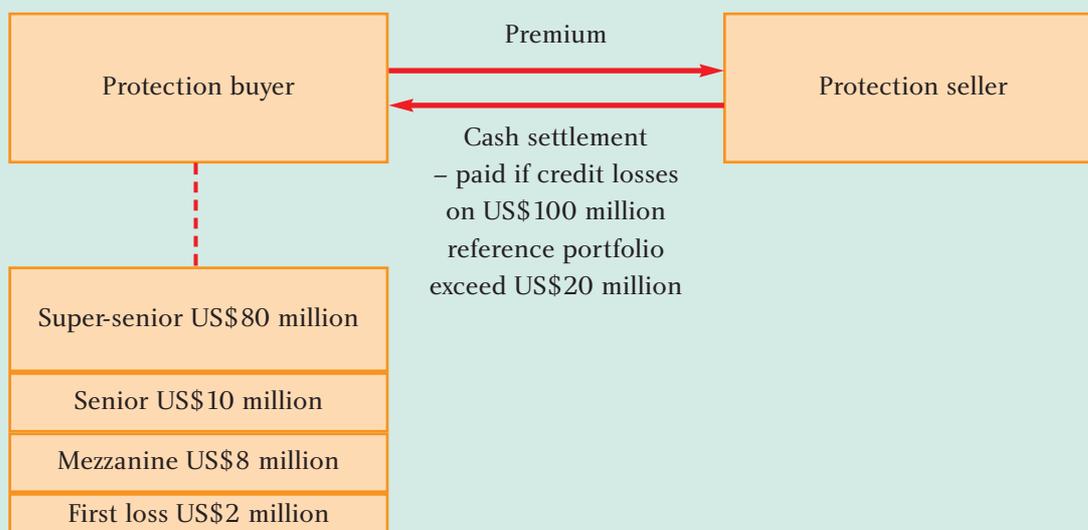
Tranching can be achieved in different ways depending on the structure of the transaction. If the risk on the entire portfolio is transferred to an SPV (whether through sales of the underlying asset or a series of CDSs), it can issue securities with varying degrees of seniority. If, however, protection is purchased directly from sellers, tranching must be included within the contractual terms of the portfolio CDS or credit-linked note.

More senior tranches of CDOs are more likely, in practice, to be unfunded than first loss or mezzanine tranches. This is partly because the amounts involved are larger and partly because protection buyers prefer to avoid counterparty risk on equity and mezzanine tranches because of the greater likelihood that these tranches will bear losses. Recently, a hybrid structure has been popular with European banks. It involves an SPV selling protection to a bank on the mezzanine/senior tranche of risk on a portfolio against issuance of trancheds CDOs. The bank separately buys protection directly on a so-called super-senior tranche using a portfolio CDS. This might specify, for example, that the protection seller will compensate the buyer if credit events on the reference portfolio lead to losses in excess of 20% of the portfolio value over the life of the transaction (Diagram 4).

Monoline insurers (see below) are said to be important sellers of protection on super-senior tranches, often via back-to-back transactions with another bank or securities firm in order to obtain a reduced capital requirement for the bank protection

Diagram 4:

Portfolio default swap – example of US\$ 80 million super- senior tranche



buyer⁵. Super-senior tranches are intended to be almost free of credit risk – they rank higher than senior tranches, which are often AAA-rated. Annual premia are correspondingly low, ranging between 6-12 basis points, depending on market conditions. But the notional value of the exposures can be very large. For example, super-senior tranches on large diversified portfolios of investment grade credits may cover the last 90% of losses on transactions of US\$ billions in size.

Basket default swaps allow protection sellers to take leverage in a slightly different way. A 'first-to-default' basket is a CDS that is triggered if any reference entity within a defined group experiences a credit event. Typically the transaction is settled through physical delivery of obligations of the entity that experienced the credit event. For example, an investor might enter into a US\$100 million first-to-default basket on five European telecoms, receiving a spread significantly higher than that for a single-name CDS on any one of the names in the basket; although less than selling US\$100 million protection on each company individually because the exposure is capped at US\$100 million. The more risk averse can sell protection on second or even third-to default baskets, which are triggered only if a credit event occurs on

more than one name in the basket over the life of the transaction.

3 The nature of the reference portfolio

Commercial banks can use the CDO structure to transfer the credit risk on loans that they have originated. These are known as collateralised loan obligations (CLOs) or sometimes 'balance sheet' transactions because the primary motivation is to remove risk from the balance sheet of the commercial bank. For example, it may want to reduce particular concentrations in its loanbook or to lower its regulatory capital requirements or to 'free up' lines to counterparties. CLOs are generally large transactions – often billions of dollars. Reference portfolios are usually loans to large, rated companies but recent transactions have included loans to mid-sized companies. Growth of CLOs began in 1997, following JP Morgan's BISTRO programme.

Another use of the structure is by fund managers to gain leverage for high-yield, managed investment portfolios. Such transactions – known as collateralised bond obligations (CBOs) or sometimes 'arbitrage' CDOs – are much more common in the US, where sub-investment grade bond and secondary loan markets are more developed, than in Europe. Typically, an investment bank will find investors

⁵ The so-called 'carrier' bank or securities firm standing between the bank (protection buyer) and the monoline (protection seller) will have a capital requirement against the credit risk on the underlying portfolio. Buying protection directly from a monoline would not reduce the risk weighting (see Box 2). But the capital requirement may be lower if the carrier bank is able to convince its regulator that its 'hedged' position can be held in its trading book. Alternatively, the 'carrier' bank may have excess regulatory capital and therefore be unconstrained by the capital requirement.

willing to purchase mezzanine and senior tranches and the fund manager (known as the 'collateral manager') will retain a share of the 'first loss' risk and so the 'equity'. Whereas CLOs are not actively managed – portfolios are typically static other than the replacement of maturing loans with others of similar characteristics – collateral managers are permitted to trade managed CBO portfolios in order to maximise yield for the equity investors. The exception is if the CBO breaches defined covenants – such as interest cover or ratings requirements. In this case, any excess return on the portfolio is redirected from the equity holders to pay down the higher ranking tranches in order of seniority. CBO tranches are more likely to be fully funded than CLOs because the collateral manager typically needs cash to invest. But collateral managers are nonetheless often permitted to buy and sell protection using CDS as part of a CBO portfolio.

A third use of CDOs – also known as 'arbitrage' transactions – is to repackage static portfolios of illiquid or high yielding securities purchased in the secondary market. Examples of securities that have been repackaged in this way include asset-backed securities, mortgage-backed securities, high-yield corporate bonds, EME bonds, bank preferred shares and even existing CDOs. Intermediaries have also used CDS to create entirely synthetic tranches of exposure to reference portfolios (see below). For example, an intermediary might buy protection from a customer using a portfolio CDS designed to replicate the mezzanine tranche of a CDO referenced to a portfolio of European companies. It then hedges its position in the single name CDS market.

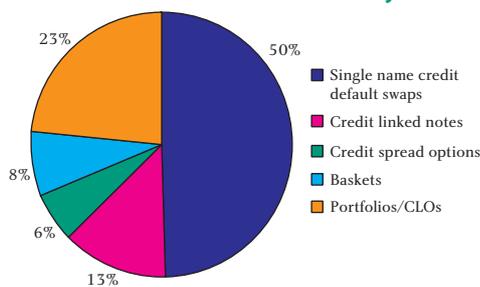
II Market size

The credit derivative market has been growing rapidly but is probably still small relative to other OTC derivative and securities markets. Comprehensive, global data do not exist. The best sources are the British Bankers' Association's 2000 survey⁶ of its members and the quarterly statistics on outstanding derivatives positions of US commercial banks and

trust companies published by the Office of the Comptroller of the Currency (OCC)⁷. The BBA survey suggests that the global credit derivatives market⁸ increased in size (measured by notional amount outstanding) from around US\$151 billion in 1997 to US\$514 billion in 1999, with the market expected to continue growing over 2001 and 2002. Market participants estimate that the market continues to double in size each year. The OCC data show that US commercial banks and trust companies had notional credit derivatives outstanding world-wide of US\$352 billion at end-March 2001. Based on market participants' estimates of their market share compared to securities dealers and European banks, this is consistent with an overall market size of around US\$1 trillion. According to the BBA survey, around half the market was in single name CDS (Chart 1). Another source of data on portfolio transactions is the volume of transactions rated globally by the major agencies. Moody's rated 138 CBOs in 2000, of which 12 were synthetic, and 51 CLOs, of which 32 were synthetic. The value of CBOs was around US\$48 billion and of CLOs US\$72 billion, suggesting that around US\$50 billion of portfolio default swaps were agreed in 2000⁹.

By contrast, data from the Bank for International Settlements (BIS)¹⁰ show the largest derivatives markets in terms of notional principal were those related to interest rates (US\$65 trillion); foreign exchange rates

Chart 1:
Breakdown of credit derivatives by instrument^(a)



Source: BBA.

(a) Based on notional values.

6: 'Credit Derivatives Report 1999/2000' British Bankers' Association 2000.

7: Available at www.occ.treas.gov.

8: Credit default swaps, portfolio swaps and baskets, credit-linked notes and credit spread options. Total return swaps and asset swaps have been excluded from the BBA data because credit derivatives are defined here as credit default swaps and other instruments based on them.

9: 2000 CDO Review/2001 Preview Moody's Investor Services, January 19, 2001.

10: The BIS derivatives survey in 2001 will provide more information about the size of credit derivatives markets.

(US\$16 trillion); and equities (nearly US\$2 trillion). According to the OCC data, credit derivative exposures comprised less than 1% of US commercial banks and trust companies' notional derivative exposures at end-March 2001. Although notional principal is only a loose guide, these figures suggest that using derivatives to trade credit risk remains small relative to their use to trade interest rate, foreign exchange and equity risk.

The notional value of credit exposure being transferred through the market is also only a fraction of the debt held by US and European banks and by bondholders in the international and US domestic bond markets. Because one or more transactions with intermediaries will often occur between an initial protection buyer and a final protection seller, the figure of US\$1 trillion is an upper bound on the actual value of exposure being transferred through the market. For comparison, the value of non-government debt outstanding in the international bond market was nearly US\$5 trillion and in the US domestic bond market US\$6¹/₂ trillion at end-December 2000; and bank balance sheets totalled around US\$5 trillion for US banks and €12 trillion for euro area banks at end-December 2000¹¹.

Market participants say that about 500 to 1000 corporate names are traded actively in the single-name CDS market, although trades have occurred on up to 2000 names. Most of these companies are rated by the major agencies. Markets in single name CDS on sovereigns are typically more liquid than companies, but only about 10-12 sovereigns are traded – mostly emerging market economies – with less frequent trades in some G7 sovereigns such as Italy and Japan. The BBA survey found that 20% of reference entities were sovereigns and 80% companies. Market participants suggest that the proportion of emerging market sovereign trades was higher in 1997-98 at the time of the Asian crisis. Demand to buy protection on sovereigns is often from banks or other investors willing to extend credit to borrowers in a particular country but not to increase their country exposure beyond a certain limit – known as 'line buying'.

The BBA survey reveals that in 1999 just under half of global trading was taking place in London. New York accounted for about the same proportion, with the

remainder trading of local names in regional centres, principally Tokyo and Sydney.

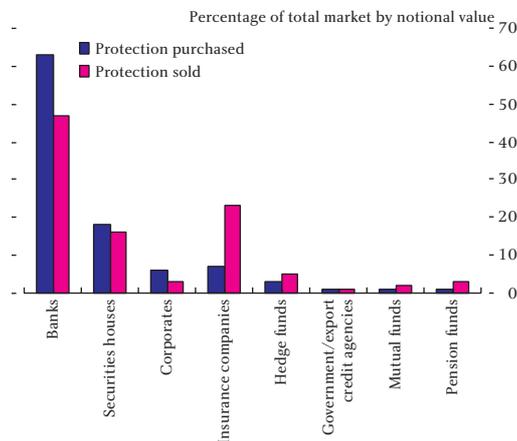
III Market Participants

A stylized structure of the credit derivatives market includes end-buyers of protection, seeking to hedge credit risk taken in other parts of their business; end-sellers of protection, usually looking to diversify an existing portfolio; and, in the middle, intermediaries, which provide liquidity to end-users of CDS, trade for their own account and put together and manage structured portfolio products.

The BBA survey gives some idea of which institutions fall into these three categories (Chart 2). By far the biggest players are the intermediaries, including investment banking arms of commercial banks and securities houses and therefore split between these two categories in Chart 2. They are thought to run a relatively matched book but are probably, in aggregate, net buyers. OCC data show that this is the case for the large US banks (Chart 3). End-sellers include commercial banks, insurance companies, collateral managers of CBOs, pension funds and mutual funds. End-buyers are mainly commercial banks but also hedge funds and, to a lesser extent, non-financial companies.

Participants suggest that the market has continued to grow and develop rapidly since the BBA survey. It is difficult to draw any firm conclusions yet about how it will work in a steady state. At present, however, the single name CDS market appears to be relatively

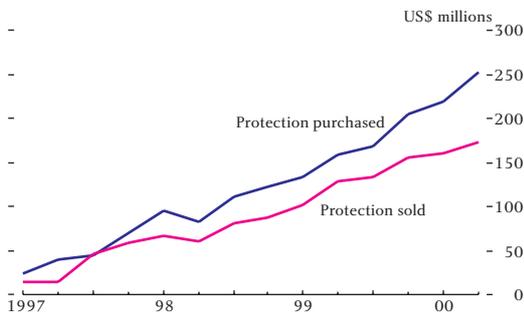
Chart 2:
Breakdown of market participants showing protection bought and sold



Source: BBA.

11: Sources: Capital Data, BIS, US National Information Centre, ECB.

Chart 3:
US banks credit derivatives: notional principal outstanding



Source: Office of the Comptroller of the Currency.

concentrated among a number of large intermediaries – mainly US and European wholesale banks and securities houses. And the market appears to be facilitating a net transfer of credit risk from the banking sector to insurance companies and investment funds, mostly through portfolio transactions. What motivates these different groups of market participants?

Commercial banks

Compared to loan sales and securitisation, credit derivatives can be an attractive way for commercial banks to transfer credit risk because they do not require the loan to be sold unless and until a credit event occurs. This makes it easier to preserve the relationship with the borrower and is simpler administratively, especially in some European countries where loan transfers are complex, although the borrower's consent may still be needed to transfer the loan if physical settlement is agreed following a credit event. Use of credit derivatives also allows a bank to manage credit risk separately from decisions about funding. Securitisation can be an expensive source of funds for banks with large retail deposit bases, although market participants say that buying protection using CDS is often more expensive than selling loans in the secondary market, perhaps reflecting concerns about moral hazard (see below).

Lending to customers is typically one of a bundle of banking services including deposit taking and liquidity management, access to payment systems and other ancillary services such as foreign exchange and derivatives. The use of credit derivatives is part of a wider trend among some of the largest banks to

separate out these services so that they can be priced appropriately. Any credit risk is, in principle, valued according to its marginal contribution to the risk and return on the banks' overall credit portfolio. If the credit risk does not fit with the portfolio, any additional cost of selling the debt or purchasing protection using credit derivatives must be recouped from the bank's other business with the customer. Banks may also purchase credit derivatives, alongside purchases of loans and bonds in the secondary markets, to manage their portfolio actively. For example, they might sell protection where they can bear the risk at a lower cost than the market price because it diversifies their portfolio across industry sectors or regions in which they do not have many customers.

In spite of these potential advantages, the OCC data for US banks show that only the largest appear to use credit derivatives on any scale at present. In the data, it is impossible to separate the activities of commercial banks as intermediaries from their purchases of protection to hedge risk on their loanbooks. For example, the notional credit derivatives exposures of JP MorganChase, an important intermediary, comprised 64% (around US\$227 billion) of the aggregate for all 400 US banks and trust companies at end-March 2001. But outside JP MorganChase, Citibank and Bank of America, the notional exposures of the remaining 396 US banks that use derivatives was only US\$18.4 billion. This suggests that regional US banks are making only modest use of credit derivatives, whether purchasing protection on their loanbooks or selling protection to diversify their credit portfolios. It may be that the European banks are more significant end-buyers of protection. For example, 29 of the 51 CLOs and 21 of the 32 synthetic CLOs rated by Moody's in 2000 involved European banking portfolios. The total value of risk transferred was US\$48 billion, of which 90% was through credit default swaps¹².

An important motivation for banks has been regulatory. The 8% Basel minimum regulatory capital requirement on corporate exposures is higher than the economic capital requirement on many investment grade exposures, giving banks an incentive to transfer the risk to entities not subject to the same regime. This may help to explain why most CLOs to

¹²: 2000 CDO Review/2001 Preview: Moody's Investor Services, January 19, 2001 and 2000 CDO Review and Outlook for 2001: The European market matures Moody's Investor Services, January 25, 2001.

Box 2: Credit derivatives – bank regulatory treatment

Regulatory recognition of risk transfer by banks using credit derivatives has been and remains important to the growth of the market. It is no coincidence that more CLO transactions occur towards the end of the year, before financial and regulatory reporting dates. At present, bank regulators do not have a common, internationally-agreed approach to how credit derivatives affect bank capital requirements. The market has developed since the 1988 Basel Accord and national regulators have been free to apply the Accord's framework for off-balance sheet transactions in slightly different ways. Nonetheless, most have followed approaches similar to those developed by the UK and US authorities. The following describes the UK treatment.

The UK FSA¹ treats unfunded CDS held in the banking book in order to hedge loans or other credit exposures in a similar way to guarantees. Protection buyers may choose to replace the risk weighting of the protected asset with that of the credit protection seller. But under the current Basel Accord, only protection sold by other banks and regulated securities firms gives a lower risk weight (20%). For example, a bank with an 8% required capital ratio buying protection on a £100 corporate loan from another bank could reduce its capital requirement from £8 to £2. Unfunded protection purchased from non-banks, such as insurance companies, would leave the capital requirement unchanged. Funded protection through an issue of credit-linked notes is, however, treated as collateralised with cash and therefore has no capital requirement. First-to-default baskets are treated as providing protection against one asset in the basket only, which can be chosen by the bank.

Where banks sell protection using CDS, they must hold the same capital as if the CDS had been settled and the underlying asset was on their balance sheet (direct credit substitute). Banks selling protection using first-to-default baskets are usually required to hold capital against all the names in the basket.

Since July 1998 the FSA has allowed bank intermediaries trading credit derivatives to include positions in their trading book, provided they can be

hedged and market-makers and screen-quoted prices exist. Under the trading book treatment, single-name CDS attract a capital charge for the specific risk on the reference asset only. Credit-linked-notes are treated as a position in the note itself with an embedded CDS. The treatment of basket products is similar to that in the banking book.

The **changes to the Basel Accord**² proposed by the Basel Committee on Banking Supervision (BCBS) in January 2001 include a harmonised treatment of credit derivatives. Protection provided by non-banks of high credit quality, such as many insurers, could also reduce the risk weight of a bank's underlying exposure, provided the CDS includes defined credit events that broadly mirror those in the ISDA definitions. In contrast to the current rules in the UK and the US, maturity mismatched hedges would be recognised provided that the residual maturity of the hedge is one year or more. Hedges denominated in a different currency from the underlying exposures would also be recognised.

There are two approaches available to banks for calculating their capital requirements – the 'standardised approach' based on external ratings, and the 'internal ratings based (IRB) approach' based on internal ratings set by the lending bank with reference to the probability of default. For buyers of protection, the banking book treatment for exposures protected using CDS under the standardised approach would be calculated according to the following formula:

$$r^* = (w \times r) + ((1-w) \times g)$$

r^* is the effective risk weight of the position, taking into account the risk reduction from the CDS

r is the risk weight of the underlying obligor

w is a residual risk factor, set at 0.15 for credit derivatives

g is the risk weight of the protection provider

¹: See *Guide to Supervisory Policy* available at www.fsa.gov.uk/pubs/supervisor.

²: Available at www.bis.org/publ/bcbsca.htm.

The risk weights of the obligor (*r*) and the protection provider (*g*) would depend on their external ratings. Thus, for example, if the protection provider was an AAA-rated insurer (20% weighted) and the underlying exposure was to a B-rated corporate (150% weighted), a bank with a required capital ratio of 8% would see its capital requirement on a £100 protected exposure decrease from

$$150\% \times 8\% \times \text{£}100 = \text{£}12.00 \text{ to}$$

$$(0.15 \times 150\%) + (0.85 \times 20\%) = 39.5\%.$$

$$39.5\% \times 8\% \times \text{£}100 = \text{£}3.16.$$

The 'w' factor is intended to capture any residual risk that protection bought using CDS might be unenforceable, leaving the bank with an unprotected exposure to the underlying obligor.

A similar formula, using probability of default (PD) rather than risk weights, is proposed for banks using the foundation IRB approach. Banks using the 'advanced IRB approach' would be permitted to use their own methodology to estimate probability of default for exposures protected by CDS.

The treatment for protection sellers would be unchanged, except that the risk weight (or PD) on the

reference asset would depend on the external or internal rating of that asset.

The treatment of portfolio and basket products is still under consideration by the Basel Committee.

The proposed changes to the Basel Accord would also affect the specific risk capital charge applied to trading book positions that are hedged by credit derivatives. They would allow an 80% specific risk offset for positions protected using CDS or credit linked notes, provided the reference asset, maturity and currency of the underlying exposure are exactly matched. This offset would be applied to the side of the hedged position with the higher capital charge. If maturities or currencies are mismatched but the reference assets are identical, only the higher of the specific risk capital charges for the two sides of the hedge would apply.

The Basel Committee has consulted interested parties on the entirety of its proposed changes to the Accord. For the most part, the proposed treatment of credit derivatives has been welcomed, although some have questioned certain elements. For example, ISDA argues that the 'w' factor is unnecessary and criticises the relative sizes of the 'w' factors for credit derivatives and bank guarantees³.

³: See ISDA's comments at www.bis.org/bcbcs/ca/isda.pdf.

date have referenced portfolios of loans to companies of relatively high credit quality.

The proposals to reform the Basel Accord announced in January 2001 may have important consequences for the market (see Box 2). The intention is that, by aligning capital requirements more closely with economic risk, the proposals will reduce the purely regulatory motive for portfolio transactions so that transfers of high quality corporate loans might decrease. But, importantly, the Basel Committee on Banking Supervision decided that credit risk modelling has not progressed far enough to recognise default correlations in setting bank capital requirements. Banks may still therefore have an

incentive to transfer the risk on portfolios to protection sellers able to adjust their capital requirements to reflect greater diversification¹³.

Non-financial companies

Judging from the Bank's regular contacts with UK companies and market intermediaries, corporate involvement in the credit derivatives market remains limited to a handful of large multinationals. Intermediaries do, however, see potential for a number of applications as the market matures. For example, companies could use CDS to buy protection against credit extended to customers or suppliers – an example might be the extension of so-called 'vendor finance' to telecom operators by telecom

¹³: Unless supervisors actively take account of portfolio diversification when setting required bank capital ratios under Pillar 2 of the Basel proposals.

equipment manufacturers, where CDS might usefully be used to reduce the size and/or concentration of the resulting credit exposures¹⁴.

Insurance companies

Insurance companies are net sellers of protection and their participation in the market seems to be increasing. An insurance company can sell protection both through investment in securities such as CDOs or credit-linked notes on the asset side of its balance sheet and, on the liabilities side of its balance sheet, by entering into single-name or portfolio default swaps, writing credit insurance or providing guarantees.

The greater prominence of insurers is clearly an important explanation for the increasing volume of portfolio transactions. Many insurance companies have regulatory or legal restrictions on their ability to enter into derivatives contracts. But most life and general insurance companies can invest in credit-linked notes and CDOs alongside equities, bonds and other asset classes. EU insurance companies, in particular, are said to have been significant investors in CDO tranches in order to gain greater exposure to the US high yield market as part of the diversification of their portfolios since European Monetary Union. These are often structured as 'principal-protected' notes in order to meet the requirements of some insurance regulators to treat them as bonds rather than equities for capital adequacy purposes. For example, contacts say that German insurance companies have been major investors in principal-protected equity and mezzanine tranches of CDOs. Some insurance companies are said to have begun by investing in senior tranches of CDOs and then added higher-yielding mezzanine tranches as they became more familiar with the asset class.

Significant participation on the liabilities side of the balance sheet appears currently limited to a relatively small number of large, international property and casualty insurers and reinsurers, together with specialists such as monolines and Bermudan reinsurers. US insurance regulators¹⁵ agreed in 2000 to treat transactions using

derivatives that replicate the cashflows on a security, such as a corporate bond, in the same way as the replicated asset. The agreement has been implemented in a number of states, including New York, where insurance companies have been allowed to hold up to 10% of their investments in replicated assets since January 2001. This may give US insurance companies greater scope to sell protection using credit derivatives.

But some property and casualty and reinsurance companies clearly have entered the market on a relatively large scale since 1998/9. Their motivations are said to have included low premiums in their traditional property and casualty businesses, apparent opportunities because they are not subject to the same regulatory capital requirements as banks and the possibility that credit risk might further diversify portfolios. Portfolio default swaps and baskets are potentially attractive to these insurers because they are based on diversified portfolios and offer the potential for differing degrees of leverage depending on the tranche held. Some have gone beyond portfolio transactions and sought to put together a portfolio of single-name default swaps. A few are active traders and intermediaries. More typically, insurance companies are looking to put together a large and relatively static book of portfolio and perhaps single-name positions, using credit modelling and/or actuarial techniques to price the risk. Until recently, non-banks have found it difficult to put together such portfolios because they have been limited to acquiring (on the asset side of their balance sheets) bonds that companies decide to issue. Credit derivatives, in effect, reduce the transaction costs for non-banks of constructing a diversified credit book. Some large insurers appear to have focussed on super-senior or senior tranches, making use of their high credit ratings. Other companies, such as the Bermudan-based reinsurers, have reportedly been sellers of protection on mezzanine tranches of CDOs, baskets and on single names.

Insurance companies also provide financial guarantees on the senior tranches of CDOs, a practice which is long established in the asset-backed and US

¹⁴: See the International Financial Markets section of the *Financial Stability Conjecture and Outlook*.

¹⁵: Insurance regulation in the United States is organised at state level. But regulators cooperate through the National Association of Insurance Commissioners. Its Spring 2001 National meeting included a discussion of US insurance companies' involvement in credit derivatives markets. See *Credit Derivatives*, Shanique Hall-Barber, pp 3-5, SVO Research, NAIC, Volume 1, Issue 2, 15 February 2001 available at www.naic.org/1sv0/index.htm.

municipal bond markets. Such credit 'wrappers' are used to improve the rating of the tranche (credit enhancement) in order to meet the needs of investors. They typically provide an unconditional and irrevocable guarantee that principal and interest payments will be made on the original due dates. But they do not provide cover for accelerated payment following default. A few AAA-rated insurers, known as 'monolines' because they specialise in credit insurance, dominate the market¹⁶, although some of the major property and casualty insurers have also begun to offer such policies. Monolines are also said to be the largest sellers of protection on super-senior tranches of CDOs. Annual accounts suggest that they, in turn, reinsure around 15-25% of their exposures.

Pension/investment funds and hedge funds

Similarly to insurance companies, pension and investment funds are also important investors in CDO tranches and credit-linked notes. The nature of the fund tends to determine the seniority of the investment. For example, leveraged debt funds might buy higher-risk, mezzanine tranches whereas senior tranches might be sold to pension funds.

A few hedge funds are also said to specialise in investing in the first loss and mezzanine tranches of CDOs. But hedge fund participation in credit markets appears to remain relatively small compared to, for example, equity markets. In particular, hedge funds are thought to be little involved in arbitraging CDS, loan and bond markets.

Hedge funds are, however, active users of single-name CDS in order to hedge other trades. Probably the most significant example is convertible bond arbitrage, where hedge funds use CDS to hedge the credit risk on the issuer of the bond. Traders say that CDS premia can spike upwards if a company issues convertible bonds, as funds seek to buy protection. They can, it is suggested, be relatively insensitive to the cost of hedging the credit risk, as their goal is to isolate the embedded equity option. Over the past year, hedge funds have become large end-buyers of protection on

some entities that have issued convertible bonds, typically lower-rated US companies¹⁷.

A particular category of investment fund manager is the collateral managers of CBO funds. Typically they invest in the first loss, equity tranches of the CBOs that they manage. The track record of the collateral manager is said to be a key consideration in attracting protection sellers for the mezzanine and senior tranches.

Intermediaries¹⁸

Most of the large global investment banks and securities houses have developed the capacity to buy and sell protection in the single name CDS market in order to provide liquidity to customers and trade for their own account. Many are bringing together their CDS and corporate bond trading desks with a view to encouraging traders to identify arbitrage opportunities between the two markets. This parallels moves to integrate, to a greater or lesser degree, government bond, swap and repo desks during the 1990s.

Intermediaries also use CDSs to manage credit risk in their other activities. In particular, they buy protection against counterparty risk arising in other OTC derivative transactions, such as interest rate swaps ('line buying'). In this context, CDSs are now established as an alternative to collateralisation. For example, an intermediary may prefer to buy protection from a third party than request collateral from a counterparty if it is a valuable corporate customer. The first collateralised debt obligation¹⁹ with credit events linked to payments by counterparties on a portfolio of OTC transactions was issued at the end of 2000.

One role of the intermediaries is to bridge the different needs of protection sellers and buyers. An example is the legal or regulatory restriction in a number of countries against insurance companies using derivatives (except to hedge insurance business), so that these insurers cannot sell protection directly using ISDA documentation. They

16: The four largest monolines are Ambac Assurance Corporation, Financial Guaranty Insurance Company, Financial Security Assurance and MBIA Insurance Corporation.

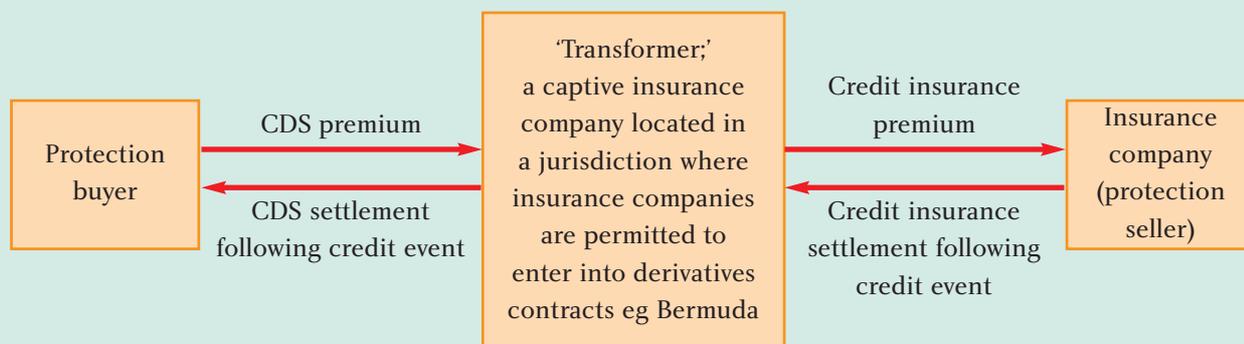
17: See Box 5 in the *Financial stability conjuncture and outlook* for a discussion of convertible bond issuance and convertible bond arbitrage.

18: Intermediaries include banks and securities houses. The distinction drawn here between commercial banks and intermediaries is functional rather than institutional. Indeed some of the largest players in the market are involved both as 'commercial banks', looking to buy and sell protection on a credit portfolio, and 'investment banks', acting as intermediaries and traders.

19: Alpine Partners LP, a US\$700 million CDO arranged by UBS Warburg.

Diagram 5:

Use of a 'transformer' to convert a credit default swap into credit insurance



can, however, sell insurance to other insurance companies against their credit exposures on nearly identical terms. Some intermediaries have therefore established captive insurance companies (known as 'transformers') in financial centres such as Bermuda that do allow insurers to enter into derivatives. The transformers typically sell protection to banks using CDS and simultaneously purchase back-to-back protection from insurers under insurance policies (Diagram 5).

Another, probably more significant, function of intermediaries is the bundling of single credits to create portfolios. As explained earlier, demand by insurance companies to sell protection on portfolios and investment funds to purchase CDOs and credit-linked notes has increased recently. It is apparently outstripping the supply from commercial banks looking to buy protection on their loanbooks. Intermediaries have responded by putting together synthetic CDOs and portfolio default swaps in which the sellers/investors specify the mix of credits that they want to hold. Moody's rated thirteen such synthetic transactions in 2000 but seventeen in Q1 2001 alone²⁰. Traders say that demand from banks and securities houses to sell protection in order to hedge portfolio default swaps was one explanation for the general downward trend in premia in the single name CDS market in Q1 2001. Intermediaries might still be left net 'short' of credit risk ie protection bought exceeds protection sold. But it is possible that they will welcome this position as an offset to the inventory of corporate bonds that they typically carry from their

primary and secondary market activities. It might also be a natural hedge to the pro-cyclicality of investment banking revenues – for example, IPO and M&A activity tends to fall off during economic slowdowns when credit risk typically crystallises. A greater concern would be if an investment bank was unexpectedly net long of credit risk: for example, if it had constructed the hedges for a CDO before placing the transaction. Because of this balance of risks, portfolio transactions are typically only hedged after completion.

IV Pricing, liquidity and relationship with other credit markets

A single-name CDS is similar to an option exercisable if a credit event occurs²¹. The pay-off is the notional value of the CDS less the market value of the reference entity's debt following the credit event. Although the inclusion of credit events other than default complicates pricing somewhat, the key variables are the expected probability that the reference entity will default over the life of the CDS, the expected recovery rate on the debt and the required return on any economic or regulatory capital held by the protection seller against the risk of unexpected losses on the transaction.

In this sense, pricing single name CDS is little different to pricing loans or bonds. Most would be settled physically, so that the protection seller 'steps into the shoes' of the protection buyer following a credit event. In principle, therefore, the premium on a CDS should be similar to the credit spread on the reference entity's debt trading at par – or, more

²⁰: *First quarter 2001 Global CDO Review*, Moody's Investors Services, April 13, 2001.

²¹: Strictly it is not an option because the protection buyer has an obligation not a right to settle the transaction following a credit event.

precisely, the spread over LIBOR if the fixed return on that debt is exchanged for a floating rate return in an asset swap. An important characteristic of the market is that counterparty exposures on outstanding CDSs could increase sharply if credit quality within the corporate sector were to deteriorate and large numbers of companies were to move close to default.

The development of the CDS market is bringing closer together different credit markets that have previously been segmented. For example, contacts say that in 1998 loans to the Republic of Turkey were priced about 150 basis points above LIBOR, bonds were about 500 basis points over LIBOR, political insurance cost 300 basis points, and CDS were priced at 550 basis points. Prices on these different instruments are unlikely to converge completely. For example, loans may contain covenants and clausings that allow lenders to take pre-emptive action to protect their positions more easily than bondholders; or banks may under-price loans in order to develop a relationship with the borrower in pursuit of other ancillary business. Both factors may mean loans still trade at lower credit spreads than bonds. But CDS have the potential to encourage arbitrage and increase transparency for three reasons:

- CDS offer a relatively 'pure' exposure to credit risk, which, in principle, makes them an attractive instrument to hedge credit risk embedded in other instruments; and may make their prices a benchmark against which those of other credit instruments can be compared.
- Although the CDS market remains smaller than the bond and loan markets, it is more standardised. CDS trading is concentrated at certain maturities, principally five years, whereas bonds and loans have different maturities and coupons. This may make it easier for intermediaries to hedge CDS positions and encourage tighter bid-ask spreads, and so foster liquidity.
- Liquidity in the CDS market is less constrained by whether the reference entity decides to issue debt or whether existing debt holders are prepared to sell or lend securities – although these are needed for physical settlement following a credit event.

Market structure and liquidity

A number of large intermediaries publish indicative two-way CDS prices for the most-traded companies and sovereigns on their websites and on electronic data vendor screens. Trading in the inter-dealer market occurs through voice and internet-based brokers²². Services exist to provide reference prices for marking-to-market existing transactions, based on averages of prices supplied by dealers and/or on trade prices in the inter-dealer market. Traders say that liquidity in the single-name CDS market varies, with different entities and sectors having more activity at different times. In general, activity is said to increase when assessments of creditworthiness are changing, as banks look to hedge their risks and traders take positions. For example, telecoms reportedly became more liquid during 2000 H2. The corporate bond market is typically more liquid if a borrower has large, recent bond issues but CDS may be if the company is an infrequent issuer and/or long-term investors hold most of its debt.

The CDS market may also have greater liquidity for those looking to take a short position in a particular credit. In the bond market this means selling the bond short and borrowing it through reverse repo or stock borrowing. Especially in Europe, liquidity in the term stock borrowing (or repo) market for corporate bonds can be unpredictable, partly because not all holders are willing or able to lend securities. Taking a short position by buying protection using CDS can be more straightforward. Market participants say that the CDS market has had greater two-way liquidity than the bond market in some recent cases when a company's creditworthiness deteriorated sharply, such as Xerox and Pacific Gas and Electric.

Certainly market participants have been sufficiently confident in market liquidity that they have used CDS to take views on changes in creditworthiness, expecting to be able to close out the position and realise any mark-to-market profit by entering into an opposite trade in the future. A typical trade might be to take a view on the shape of the term structure of credit spreads. For example, a speculator may believe that the forward credit spreads implied by current premia on term CDS are too high or low. Such trading increases market liquidity for those buying protection to hedge credit exposures or selling protection as part of an investment portfolio.

22: Two of the main inter-dealer brokers are specialists called Creditex and CreditTrade.

In practice, market prices for CDS can be lower than, close to or higher than credit spreads on corporate bonds (the so-called 'default-cash basis'), both across different reference entities and for the same entity over time. Market participants say explanations for changes in this relationship include:

- Illiquidity in the term reverse repo (or stock borrowing) markets for corporate bonds can mean CDS premia move higher relative to credit spreads on bonds if demand to buy protection increases. This reflects the cost of taking a short position in bonds in order to arbitrage the two markets. Box 3 shows that this seemed to happen in the telecom sector in the second half of 2000.
- Some market participants (eg insurance companies or hedge funds) may not always have ready access to financing and prefer to take credit risk through an unfunded CDS than by purchasing a bond. Financing a bond position exposes the investor to some liquidity risk if its source of funding becomes more expensive or dries up. Demand to sell protection by such investors may reduce CDS premia relative to credit spreads on bonds.
- CDS may expose protection sellers to a little more risk than bondholders if they believe there is value in the option for the protection buyer to deliver various obligations of the reference entity following a restructuring. They may therefore require CDS premia to be a little higher.
- Compared to bondholders, protection sellers under CDS may require a premium because they have no contractual rights, such as covenants or information requirements, vis-à-vis the reference entity allowing them to monitor its creditworthiness or influence its decision-making.
- Protection sellers under CDS may be subject to different marginal tax rates than bondholders.
- Compared with bondholders, participants in the CDS market may require different liquidity premia against the cost of trading out of positions.

V Some questions about the credit derivatives market

The first four sections of this article have described the credit derivative markets. Like many new markets – for example, the government bond repo or interest rate swap markets in the 1980s – questions have arisen about the structure of the instruments, the risks to participants and the consequent redistribution of risks around the financial system. The Bank has been following some of these issues as part of its surveillance of financial markets²³. Given the current slowdown in the world economic outlook and the consequent rise in credit risk, market participants and the authorities need to understand and, where relevant, engage with them.

Will credit default swaps work for protection buyers when needed?

Buyers of protection using CDS commit to making a series of payments in exchange for a much larger payment if something relatively unlikely occurs – most reference entities are investment grade companies or sovereigns and credit events are infrequent. Failed or delayed payment by sellers of protection could leave buyers exposed to unexpected credit or liquidity risks on loans, bonds, CDS or other exposures for which the CDS was a hedge. Market participants need to assess both the prospective ability of the counterparty to pay (counterparty credit risk) and the likely timing of any payment. They must also be confident in their legal right to enforce the contract if necessary (legal and documentation risks). In general, risks are likely to be lower in funded than unfunded structures, where payment must be claimed and, if necessary, enforced *ex post*.

(a) Counterparty credit risk

Market participants manage counterparty credit risk on CDS in similar ways to other OTC derivative exposures: by monitoring the current (replacement cost) and potential future value of exposures, by setting limits, by taking collateral and by buying CDS protection on the counterparty. One particular consideration is that the value of, and hence the counterparty exposures associated with, CDS can increase sharply if a reference entity moves close to a credit event, meaning large margin calls may be needed if exposures are collateralised. Credit events are also more likely to occur in times of economic slowdown or financial crisis, when the protection

²³: See, for example, *Recent developments in financial markets: some implications for financial stability*, speech by Deputy Governor David Clementi at the Banca d'Italia conference *International Banking and Financial Systems: Evolution and Stability* 9 March 2000. Available at www.bankofengland.co.uk.

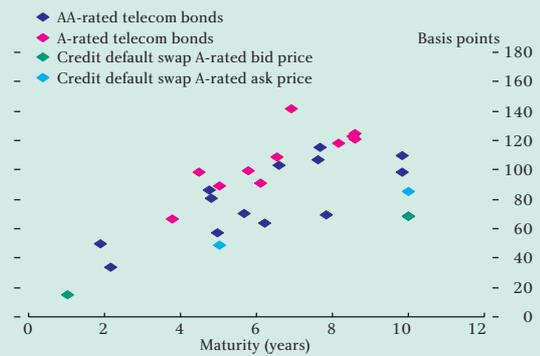
Box 3: Telecom credit spreads in the bond and credit default swap markets

Charts A-C compare observed spreads over a government bond yield curve on euro bonds issued by a number of A and AA rated telecom operators with premia on single name CDS referenced to British Telecommunications, Deutsche Telecom and France Telecom between September 2000 and January 2001. Bid and ask prices for CDS are taken from quotes on CreditTrade, an interdealer broker.

Telecom credit spreads increased in both bond and CDS markets in the second half of 2000 as credit ratings were downgraded and investors reacted to large increases in debt to finance acquisitions and 3G licences¹. For example, in September 2000, five year bond spreads and CDS premia for A-rated companies were in the range 50-100 basis points (Chart A). By November and January 2001 this had increased to 100-160 basis points (Charts B and C).

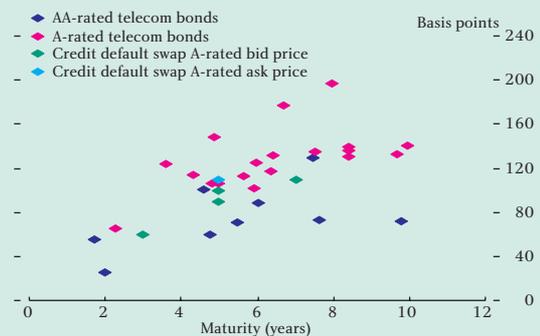
At the same time, CDS premia appear to have increased relative to credit spreads on bonds. In September, all bid and ask quotes on CDS were lower than bond credit spreads at the same maturity, including of AA-rated companies (Chart A). By November, CDS quotes were higher than credit spreads on AA-rated bonds (Chart B) and by January 2001 CDS premia were at similar levels to or higher than credit spreads on A-rated bonds. Contacts have suggested that the greater increase in CDS premia than bond spreads reflected demand from banks to buy protection against commitments to lend to telecom operators.

Chart A:
Credit spreads on bonds issued by EU telecoms compared to credit default swap premia, on 15 September 2000



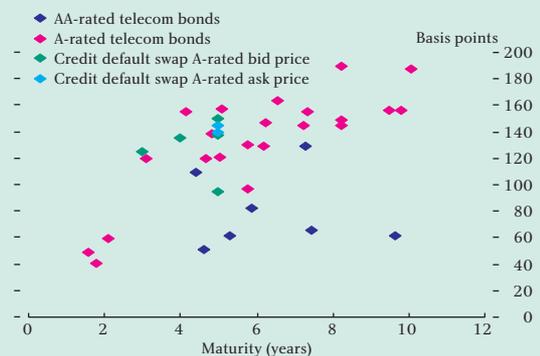
Sources: CreditTrade, Bloomberg and Bank calculations.

Chart B:
Credit spreads on bonds issued by EU telecoms compared to credit default swap premia, on 22 November 2000



Sources: CreditTrade, Bloomberg and Bank calculations.

Chart C:
Credit spreads on bonds issued by EU telecoms compared to credit default swap premia, on 23 January 2001



Sources: CreditTrade, Bloomberg and Bank calculations.

¹ See box in December 2000 *Review* (pp 41-43).

seller itself may become financially fragile. Some market participants say that they look carefully at the risk of correlation between the creditworthiness of reference entity and counterparty ('wrong way' risk) in order to limit this type of risk. For example, they might not purchase protection on Korean companies from Korean banks.

(b) Willingness to pay

Some market participants have expressed doubts about the willingness of some insurers to settle CDS promptly because they believe they face different incentives to banks and securities firms. Similar questions arise in relation to credit insurance and financial guarantees written by insurers.

In derivatives markets a reputation for timely payment benefits market participants because potential future counterparties are more likely to trade with them. In insurance markets, insurers also want to encourage new business – an incentive to pay promptly – but equally they want to discourage fraudulent claims – an incentive to challenge claims and delay payments²⁴.

Monolines are said to have stronger incentives than multiline insurers because their ability to sell financial guarantees depends on maintaining a reputation for prompt payment. Some think multilines may give greater weight to their reputation in other insurance markets, where fraudulent claims may be a greater risk. But others say it is well understood that prompt payment is required in derivatives markets and insurers are unlikely to be concerned about associations between their behaviour in derivatives and insurance markets.

Insurance companies might also delay payments because they need some time to arrange their own liquidity – for example, they may need to draw-down contingent bank lines or claim on reinsurance.

In July 2000 Standard and Poor's introduced Financial Enhancement Ratings (FER) on insurance companies to assist investors in evaluating their willingness and ability to make timely payments. In order to qualify for a FER, insurers must indicate their willingness to pay first, according to the terms of

the obligation, and seek to resolve any problems subsequently²⁵.

(c) Legal and documentation risks

If a protection seller were to dispute payment on a CDS, buyers must enforce the claim on the basis of the legal agreement underlying the transaction. Most CDSs are now made under the ISDA Master Agreement, using the standard 'short-form' confirmation and referring to the 1999 Credit Derivative Definitions. Market participants and lawyers have few doubts about the ability of a protection buyer to enforce payment following a defined credit event on the basis of a contract using this documentation under English or New York law.

One area of possible risk is that buyers may find that they cannot claim under the agreement in circumstances where they expected to be protected because of a misunderstanding of its detailed terms. This is related to the so-called 'basis risk' that a CDS on which an intermediary has sold protection is triggered whilst the corresponding hedge is not triggered because of differences in the wording of the agreements.

Use of a standardised contract is regarded as having reduced this risk considerably compared to the early days of the market when terms and conditions were negotiated bilaterally on each trade. But market participants may still be exposed to basis risk where they have outstanding pre-1999 trades. Furthermore the standardised documentation still leaves scope for mismatches – for example, whether restructuring is included as a credit event and on the 1998, 1999 or 2001 definition, different reference or deliverable obligations, cash or physical settlement etc – although such differences should be more transparent, leaving less room for the unexpected provided intermediaries check the terms of each transaction thoroughly.

Market documentation is also still evolving. Box 4 describes how it has been shaped by events in the market. The CDS market is still not mature and documentation is not yet fully tried and tested. The interest rate swap market was perhaps at a similar stage in the late-1980s.

²⁴: It is standard practice in insurance to review the validity of a claim before paying.

²⁵: *Standard & Poor's introduces criteria for insurer financial enhancement ratings*, Standard & Poor's, 18 July 2000.

Box 4: Key events in the evolution of CDS documentation

1998 Russian default

Prior to ISDA's agreement of the first 'long form' confirmation for CDS in early 1998, the terms of CDS were agreed bilaterally case-by-case. Russia's default on its debt in August 1998 revealed a number of ambiguities in these agreements. One dispute concerned a short delay in making payments on its debt by the City of Moscow. Some market participants had entered into CDS that did not include any specific provision for grace periods to allow for technical delays in making payment by the reference entity. The English courts ruled that the delayed payment was a credit event under the terms of these contracts and the protection seller should settle. The need to agree a common approach to grace periods encouraged market participants to agree the standard ISDA Credit Derivative Definitions in 1999.

Conseco debt restructuring

In October 2000 a US insurance company, Conseco, agreed a restructuring of its bank debt involving an extension of maturities. Some of its bankers gave notice of a credit event on their CDS and delivered the company's long-dated bonds to the protection sellers. The banks' economic loss from extending the maturity of the bank loans was considerably less than the gain from buying the lower-priced bonds in the market and receiving their par value through the CDS. The protection buyers' contractual right to act in this way was not challenged but many market participants agreed that CDS should not include a delivery option of this potential value. One alternative was to exclude restructuring as a credit event altogether – and some market participants, particularly US bond dealers and investors, began trading on this basis. Another alternative might have

been to limit deliverable obligations following a restructuring to the restructured loans. But this would expose protection buyers to the risk of a squeeze if they did not hold the loans. Following negotiations in April 2001, through ISDA committees, a restructuring supplement to the 1999 ISDA Credit Derivative Definitions was announced in May¹. It puts limits on the maturity of obligations that can be delivered following a restructuring notified by the protection buyer² and excludes restructurings of debt with less than four holders or where two thirds of the holders do not agree the restructuring.

National Power demerger

In November 2000 the UK power company National Power demerged into two successor companies – Innogy, a UK energy business, and International Power, an international power business. The 1999 ISDA Definitions allow for the possibility that a successor to a reference entity may assume all, or substantially all, of its obligations. But cases where the obligations of a company are divided relatively equally between more than one successor company are more difficult. Under the ISDA Definitions the decision is made by a nominated 'calculation agent', after consultation with the parties. This agent is typically the protection seller. Clearer conventions may well be needed for such cases, given the potential for disagreement between protection sellers and buyers if the successor companies have differing creditworthiness. Intermediaries might also want a common approach across the market in order to avoid mismatched positions where, for example, protection sold is referenced to one successor company and protection bought to another. ISDA is examining this issue currently.

¹: *Restructuring Supplement to the 1999 Credit Derivatives Definitions*, available at www.isda.org.

²: Deliverable obligations following a restructuring are limited to those with a maximum remaining maturity of less than the earlier of (i) 30 months from the date of the restructuring or (ii) the latest maturity of the restructured obligations. Although obligations will always be deliverable if they mature prior to the scheduled termination date of the CDS.

Partly this reflects the relative complexity of the instrument. Whereas most traded derivatives are based on a clearly-defined market price, credit events can be more ambiguous to define and observe. Protection buyers have a natural desire to broaden and protection sellers to narrow the definition of a credit event, so that achieving a standard contract that satisfies both sides in a transparent and predictable way is a difficult balance. Credit events on investment grade issuers are also infrequent and the market may take some time to evolve as market participants learn a little more from each major occurrence.

Another area of possible basis risk is the conversion of CDS into insurance contracts using 'transformers' (see above). Under English law, an insurer is liable to pay on an insurance contract only if the insured has suffered a loss. In the case of credit insurance, they must have an 'insurable interest' in the reference entity. Following a credit event, a transformer will have suffered a loss on the corresponding CDS with the intermediary, so its insurance claim should be valid. Some lawyers putting together these transactions have, however, been concerned that a court might conceivably decide that the transformer was an artificial construction and 'look through' to the intermediary, which might not have such an insurable interest. It has been suggested that one way to reduce this risk might be to have slightly different terms, amounts or payments between the CDS and insurance contract²⁶. But this would make the insurance contract less economically effective as a hedge.

Other mismatches may arise because of differences between the standard terms of an ISDA Master Agreement and financial insurance contracts. For example, the ISDA Master Agreement provides for close-out of the transaction if either party experiences a default or early termination event, with the party for which the swap is an asset receiving a payment equal to its current market value. Insurance policies, by contrast, are not typically 'marked-to-market' and closed out in this way.

More generally, documentation of credit derivatives can be relatively complex, especially in the case of portfolio transactions. Market participants need

effective systems and controls to avoid documentation errors, such as entering the wrong name for a reference entity. The rapid growth of the market also creates its own risks. Intermediaries have developed large trading and structuring operations relatively quickly. Some may not yet have fully implemented plans to introduce information and processing systems. They need to ensure that back and middle offices keep pace with front offices. Some market participants have reported backlogs of unconfirmed trades and delays in signing ISDA Master agreements with new counterparties.

To what extent might information asymmetries limit the development of the market?

One of the greatest potential benefits of credit derivative markets is that they might facilitate a more efficient distribution of credit risk. There are gains from trade if protection sellers are able to bear risk at a lower cost than buyers because of the different composition of their existing portfolios or differing degrees of risk aversion/neutrality. Economic theory predicts that such risk sharing works most effectively if the risk is independent of the two counterparties. In particular, the buyer should neither know more about the probability of a credit event than the seller nor be in a position to influence the outcome. If both buyer and seller have access only to public information about the reference entity, the CDS premium in a competitive market should be fairly priced, reflecting the expected probability of a credit event and the expected recovery rate.

Where the reference entity is less well-known, however – for example, if it is unrated or has no publicly traded debt – its bankers are likely to have better private information about its creditworthiness than other market participants. Such asymmetries of information, which underlie banking activity, may limit gains from trade and so impede efficient risk sharing²⁷.

Protection sellers may be concerned about adverse selection and moral hazard. Adverse selection arises where a protection buyer has hidden knowledge of the reference's entity's creditworthiness and an incentive to conceal unfavourable information from the protection seller in order to reduce the premium.

²⁶: See *Deriving value for insurance companies* International Financial Law Review, April 2001.

²⁷: See, for example, M Rothschild and J E Stiglitz *Equilibrium in competitive insurance markets: an essay on the economics of imperfect information*, Quarterly Journal of Economics, 90, 629-49, 1976.

Moral hazard exists where a protection buyer can influence the probability of a credit event after the CDS has been agreed through actions that cannot be observed by the protection seller. For example, if it is the reference entity's banker, it might observe deterioration in cashflow and decide whether or not to extend further credit.

Where restructuring is a credit event, its bankers have a clear influence over these decisions. In order to limit possible moral hazard in this case, ISDA has proposed to limit restructuring as a credit event to entities with more than four debt holders and where more than two-thirds agree to the restructuring (Box 4). In the case of CLOs, the bank that originated the loans and subsequently bought protection on them will often also be responsible for determining when a credit event has occurred and the severity of the loss. No public information may be available if the loans are, for example, to small or medium-sized companies.

Information asymmetries may be an important limitation on banks' use of credit derivatives because, in practice, the majority of their loan exposures are to unrated borrowers. One reason that European banks appear to have used CLOs to transfer risk to a greater extent than US banks may be that they have significant on-balance sheet exposures to large companies whereas in the USA such companies borrow through the capital markets to a greater extent.

A possible outcome is that protection sellers will require a premium against the additional risks. Indeed market participants say that the cost of buying protection using single name CDS is often higher than the equivalent cost of selling a loan in the secondary market. Another way sellers attempt to limit moral hazard is by requiring buyers to retain the first share of any losses. CLOs, for example, usually include a first loss tranche of 2-3% of the value of the portfolio. Some or all of this tranche is often retained by the bank that originated the loans and continues to collect payments from and monitor the credit quality of the underlying borrowers.

A further way of reducing problems of asymmetric information is to involve independent third parties in initial credit assessments, subsequent credit monitoring, verification of credit events and assessment of the severity of losses. For example, loss

severity can be tested against bids for the reference assets from other banks; and auditors may verify credit events. Selecting loans at random from the bank's portfolio may also decrease any moral hazard if bank loan officers are uncertain whether or not the risk on particular credits has been transferred. Some market participants have suggested that recognition of bank internal ratings by regulators following the implementation of the proposed changes to the Basel Accord would give protection sellers greater confidence in them, reducing information asymmetries. They thought this might make it less costly for banks to buy protection on first loss tranches.

A particular concern is that banks might try to reduce the cost of information asymmetry by giving protection sellers implicit assurance that they will provide compensation for any unexpectedly large credit losses. This might be more likely if a bank were motivated primarily by a desire to reduce the regulatory capital requirements against its loanbook rather than its economic exposure to credit risk. Even if a bank did not give any implicit or explicit assurances at the outset, it may in the event be unwilling to enforce the contract because of concerns that it might develop a poor reputation among investors, jeopardising future transactions.

All these factors are likely to make credit derivative transactions less straightforward where information is asymmetric. Gains from trade might be lower because the benefit of more efficient risk bearing must be greater than the cost of either preserving the buyer's incentives to act in the interests of the seller or compensating the seller for the risk that the buyer will not. Information asymmetries may be greatest where the reference entity's banker is the protection buyer. This might limit the value of the credit derivatives market to commercial banks, although it is difficult to assess how significantly.

Possible risks in portfolio transactions (CDOs)

As discussed above, the typical CDO comprises a portfolio of credit exposures (whether bonds, loan, single name CDS, portfolio CDS or a combination) on which the risk has been divided between a number of tranches, so that the first loss tranche is exhausted before the second loss tranche begins to bear losses etc. The risks on the different tranches depend on the loss distribution of the portfolio – the probabilities of losses of increasing severity given all the possible states of the world over the life of the transaction.

Box 5 shows how this loss distribution depends importantly on portfolio diversification.

The major rating agencies employ methods for measuring expected correlations of defaults on assets in portfolios and limiting concentrations in particular industries. For example, Moody's estimates a diversity score, which is considered to be the number of independent assets that have the same loss distribution as the portfolio²⁸. Moody's assume that the probability of default for companies within the same industry sector or region is imperfectly but positively correlated: for example six exposures in the same industry might equate to a diversity score of three. A lower diversity score equates to a higher assumed 'tail' risk of large losses on the portfolio. In this case, the junior tranches of a CDO will be required to bear a higher proportion of potential losses in order to obtain a higher rating for the senior tranches.

The published rating of a CDO tranche is based on a rating agency's assessment of the *expected loss* on that tranche the average of losses across all possible states of the world weighted by their probability. The risk to the holder of the tranche, however, depends not just on the expected loss but also on the shape of the loss distribution. For example, in the two portfolios illustrated in Box 5, senior tranches bearing any losses in excess of 10% of the portfolio would have approximately the same expected loss and prospectively the same rating. But whereas the senior tranche on the uncorrelated portfolio carries a relatively high probability of a small loss, the senior tranche on the correlated portfolio carries a greater 'tail' risk of larger losses.

In general, the tranches of a CDO have a higher average rating than that of the individual credits in the portfolio, reflecting the benefits of diversification in reducing expected losses on the 'non-equity' positions. But investors need to be aware that lower expected losses are not inconsistent with the possibility of very high losses in certain, low probability scenarios. It is

possible that such tail risks are different on investment grade CDO tranches than on investment grade bonds issued directly by corporate and sovereign borrowers. The importance of portfolio effects might mean that loss distributions on CDOs are shaped differently and perhaps show more or less variation over different transactions than loss distributions on different corporate or sovereign bonds.

More analysis of actual losses on the different tranches of CDOs is needed before such conclusions can be drawn. Unlike corporate and sovereign rating histories, the history of CDO ratings is relatively short. Moody's first study of the credit rating migration of CDOs²⁹, based on data from 1996 to 2000, found that CDO tranches have been relatively stable compared to corporate ratings but that they are much more likely to be downgraded than upgraded. With the US economy slowing and credit risk increasing in 2001 Q1, Moody's downgraded 40 CDO tranches and Standard and Poor's 10 tranches. No CDO tranches were upgraded by either rating agency³⁰.

A concern is that some investors might rely too much on agency ratings, considering them a sufficient basis for their own risk assessment, and not give enough consideration to the possible variances, skews and tails of the loss distributions³¹. Lack of data makes assessment of these risks difficult.

*What effect might credit derivatives have on corporate and sovereign debt restructuring?*³²

Unlike secondary markets in loans and bonds, credit derivatives need not involve transfers of the underlying borrower's debt until, in the case of physical settlement, a credit event occurs. This can be advantageous to both protection buyer (for example, if it wants to preserve a relationship with a borrower) and seller (for example, if it prefers to delay funding its position). But knowledge that debt will change hands following a credit event might affect the incentives facing a troubled company, its 'pre-credit event' creditors and its potential 'post-credit event'

28: See the June 1999 *Review* pp 107-109 'Moody's rating of collateralised bond and loan obligations' Jeremy Gluck, Moody's, New York.

29: *Credit Rating Migration of CDO Notes 1996-2000*, Moody's Investor Services, April 27, 2001.

30: *First Quarter 2001 Global CDO Review*, Moody's Investor Services, April 13, 2001; *Structured Finance Ratings Roundup Quarterly: First Quarter Performance Trends*, Standard and Poor's, 2 May, 2001.

31: The sensitivity of credit risk models to variations in the shape of the loss distribution was highlighted in some of the papers presented at a conference on credit risk modelling hosted by the Bank in Autumn 1998. See *Credit Risk Modelling*, Jackson, Nickell and Perraudin, June 1999 *Review*, pp 94-121.

32: See also P Brierley and G Vlieghe *Corporate Workouts, the London Approach and Financial Stability* November 1999 *Review*.

Box 5: Credit risk on CDO portfolios

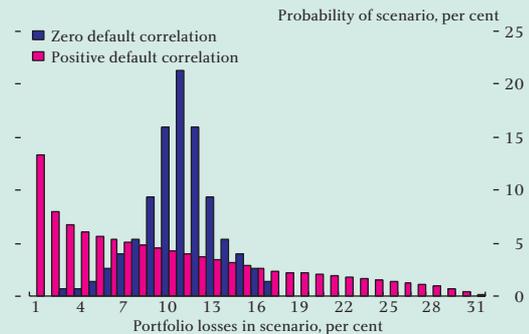
Similarly to debt issued by a single company, credit risk on CDOs depends on both the expected probability of default and the expected loss given default or recovery rate. A low expected recovery rate means the risk of a second loss position moves closer to that of a first loss position. Rating agency default statistics provide some basis for assessing these risks on the underlying credits within a CDO portfolio – although credit events on CDS, in particular restructuring, may be defined more widely than in the rating agency definitions of default.

In the case of CDOs, however, the number of exposures in the portfolio and the default correlation between them are also crucial. For example Chart A shows loss distributions for two portfolios with the same expected loss of around 10%. The shape of the distributions is, however, very different. The uncorrelated portfolio is centred on the expected loss¹ of 10%. The correlated portfolio includes a long tail of more severe potential losses.

Assume, for example, that the risk on these portfolios is divided into two tranches bearing the first 16% of losses (first loss) and any remaining losses (senior) respectively. Clearly the risk on the senior tranche is much greater in the correlated portfolio. At the extreme, if credit quality is nearly perfectly positively correlated across the portfolio, then the risk to the most senior tranche may be little different to that on the first loss tranche. Either nothing in the portfolio defaults and each tranche is free of losses or everything defaults and each tranche suffers a loss.

Lower default correlation (perhaps achieved via exposures to different industries in different countries) and a higher number of exposures in the portfolio mean the risks on the different tranches diverge. The first loss position becomes relatively more risky than the senior positions as the probability of a small loss increases and the ‘tail’ risk of a large loss decreases. Estimation of default correlation is thus absolutely essential to the risk rating and pricing of the different tranches. In general, default correlation increases empirically as the average credit quality of the reference portfolio falls.

Chart A:
Loss distributions on illustrative portfolios of uncorrected and positively correlated credit exposures



Source: Bank calculations.

¹: Defined as the average of losses across all scenarios weighted by their probability.

creditors in unpredictable ways. For example, a creditor's decision to support a debt restructuring or to seek bankruptcy might be influenced by whether it had bought protection using CDS that did or did not include restructuring as a credit event. Concerns about reputation may limit opportunistic behaviour. But, at the very least, an active credit derivative market might make it more difficult to identify and organise creditors in order to negotiate any debt work-out.

VI Credit derivatives markets and financial stability

Credit derivatives are one of a number of markets for the transfer of credit risk. Development of these markets has clear potential benefits for financial stability because they allow the origination and funding of credit to be separated from the efficient allocation of the resulting credit risk. This is likely to involve the broader dispersion of credit risk, including to non-bank investors with long holding periods, such as insurance companies and investment funds. If banks hold more diversified credit portfolios, they will be less vulnerable to idiosyncratic or sectoral asset price shocks. If they can transfer credit risk more easily, the supply of credit to borrowers will be less dependent on their willingness and ability to take credit risk, perhaps making credit crunches less likely.

The basic credit derivative is the credit default swap. It is being used extensively as a building block to put together synthetic CDOs, continuing the development of the CDO market as a means of transferring portfolios of credit risk. Much of this risk appears to be moving from banks and securities dealers to insurance companies and investment funds.

A primarily inter-dealer market in single name CDS on large, rated companies and sovereigns has also developed. Although apparently smaller than bond and loan markets, it is sometimes more liquid. Factors encouraging market liquidity include the greater standardisation of CDS documentation in recent years, its being straightforward to take both long and short positions in CDS and CDS giving a relatively pure exposure to credit risk. A liquid market might also benefit financial stability by providing valuable price information. As market mechanisms develop to disseminate prices more widely, this has the potential to improve the allocation of credit, particularly in lending markets where history shows banks have often failed to price risk appropriately.

Credit risk transfer markets also present some challenges and may carry potential costs. Separating the exposure to credit risk from the direct relationship with the borrower might lessen capacity and/or incentives to monitor creditworthiness and complicate any restructuring of a borrower's debt. It might also make it more difficult for creditors, regulators and the monetary authorities to assess the actual credit exposures of banks and of the banking system as a whole. Although credit derivatives are probably more likely to disperse credit risk, there is also the possibility that they could deliberately or inadvertently concentrate it. Market participants can set limits on their own counterparty exposures but not on the aggregate exposures that the whole market might have to a particular counterparty. For this reason, detailed disclosure of on- and off-balance sheet positions could be more important for institutions that make extensive use of credit derivatives.

Continued growth of credit derivatives markets could contribute to further increases in off-balance sheet exposures amongst international banks, securities firms and potentially insurance companies. By the nature of the instruments, these exposures increase as credit risk grows within the economy, so that they may be higher during economic slowdowns. The scale of counterparty exposures relating to credit derivatives is probably too small to be a systemic issue at present. But the apparently high degree of concentration in the market raises questions for the future. Although the institutions involved are generally very large, the dominance of a few banks, securities houses, reinsurance companies and property and casualty insurers does not appear to be decreasing. Obtaining better data on the scale and nature of these inter-bank and bank-insurance company exposures should be part of the work programme of financial stability authorities globally.

On balance, however, the range of new credit risk transfer markets has the potential over time to increase the overall robustness of the global financial system.