The Impact of Credit Derivatives on Securities Markets

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This report has been commissioned by ISMA with a view to informing its members of the impact of credit derivatives on securities markets. All opinions expressed herein represent the personal opinions of the authors and do not represent the opinion of ISMA, which has not taken an official position on the matters discussed herein.

Foreword

The exponential growth in the use of credit derivatives, during the past couple of years in particular, has had a profound impact on the pricing and trading of credit. The effects of such growth remain, however, relatively unknown outside the realm of the larger international securities houses and major domestic and global regulatory agencies.

For this reason, the board of ISMA commissioned Professor Brian Scott-Quinn and Julian K. Walmsley CFA from the ISMA Centre, The Business School for Financial Markets at the University of Reading, UK, to produce this study entitled *The Impact of Credit Derivatives on Securities Markets.*

As markets continue to evolve, not least as we head towards European Monetary Union which is to all intents and purposes a *fait accompli,* this report provides a timely overview of a highly important, but frequently misunderstood, segment of increasingly complex financial markets.

John L. Langton
Chief Executive and Secretary General
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Executive summary

This report assesses the growth and development of the credit derivatives market and its linkages with the securities markets. Some of its key conclusions are:

1. The market's growth will be, on balance, beneficial to financial markets.
2. One long-run implication of the use of leveraged credit-linked notes could be to allow a substantial transfer of credit risks from the banks to securities markets while the assets are kept on banks' balance sheets – a reverse of the securitisation process. Examples of this are discussed, including the Bistro transaction which illustrated the possibilities this might offer. This depends, however, on regulators recognising partial hedges.
3. An important long-run impact of the growth of the credit derivatives market will be its contribution to transparent pricing of credit risk and to allowing more active management of credit risk. This in turn will inevitably lead to a reassessment of the Basle Committee rules on capital adequacy for credit risk. If not, as the market becomes more sophisticated, there will be increasing arbitrage round these rules (which is already taking place to some extent).
4. Work on credit pricing is discussed, and work on models such as CreditMetrics and CreditRisk+. The report concludes that these models represent important steps forward, but that the underlying data quality limitations are such that their immediate value is limited. Rather they form the framework for developing appropriate databases over the next few years for second-generation pricing models. At present the models are little used by traders in everyday trading.
5. There are potential specific problems arising from the structural effects of credit derivatives on trading in an individual firm's credit. An example might be trading in a firm's credit derivatives by another firm during a take-over bid. Company A and Company B are interested in buying Company C. Company A banks with XYZ Bank but does not currently borrow from them. Company B might approach XYZ's capital markets group and indicate that for various normal commercial reasons it wishes to buy a large credit risk put on A. Next B launches its bid for C. A approaches XYZ for finance to put together a counter-bid. It discovers that XYZ is unable to agree the loan in the time available, because the proposed loan exposure, combined with the credit derivative, puts A over its existing limit.

   Even without a deliberate attempt to fill up bankers' credit lines to a company, active trading in credit derivatives on a corporation might result in its having difficulty in raising finance when it wished to do so. This could arise if all the banks which were familiar with its credit had already sold credit protection on the company. If now the company requires a substantial new credit, perhaps to finance a diversification into another line of busi-

ness or to invest in some new production technique, it might find bankers reluctant to take on further exposure. Thus the credit derivatives tail has ended up wagging the dog: a genuine financing requirement has been obstructed by credit derivatives activity.

We recognise that ours are purely hypothetical examples. Many uses of credit derivatives will be entirely positive and we do not wish to focus purely on the negative. But we would point out that past experience is that new derivative markets often create the potential for abuse and unforeseen problems as well as for improved risk management. In our previous report, *Derivatives in the Context of a Single European Securities Market,* we pointed to some possible dangers arising from the fact that equity derivatives were regulated differently from equity trading; the subsequent incident regarding SBC's trading in the Trafalgar House/Northern Electric take-over was a classic example of this type of problem.

Careful attention by banks to conflicts of interest and the old-style approach to 'relationship banking' may prevent problems emerging. But in an era of transaction-style banking some firms may be unduly aggressive. Credit derivatives undoubtedly offer many benefits. But, as with OTC equity derivatives, the structural linkages between the derivatives and the underlying may require careful analysis and, in some cases, preventive action rather than allow inadvertent damage to existing financial structures or deliberate market manipulation.

6. The capital adequacy implications of credit derivatives are discussed. The report welcomes the recent French moves to allow risk offsets as improving the efficiency of the market, and expresses the hope that the Bank of England will follow suit in the paper it is expected to produce shortly.
7. The report discusses problems arising from the EU Capital Adequacy Directive (CAD), which was not designed with credit derivatives in mind. The point is made that CAD II, the revision of CAD to allow for internal models and other developments, is inadequate to handle credit derivatives properly and a CAD III will be required. The report concludes that it is becoming increasingly urgent to review the whole CAD framework, which is inevitably rigid and legalistic and requires repeated legislation in some countries.
8. With this in mind, the report repeats the recommendation of the ISMA Centre's 1995 risk management standards report: that the CAD should be amended to consist of a small legal core, coupled with a body of secondary regulations which could be amended at the administrative level rather than requiring passage through a number of national legislatures each time a new derivative instrument is created or some other financial innovation occurs.

Introduction

This report addresses the likely effects on the securities markets of the introduction of credit derivatives. It looks at the direct effects in terms of their impact on the type of securities issued, and at the indirect effects in terms of their impact on the relative role of securities and banking markets. Specifically, it looks at whether the arrival of credit derivatives might set in motion a reversal of the process of securitisation of risks which was in large part triggered by the Basle Committee rules of 1988. It also considers the longer-term implications of credit derivatives for those rules, and for the measurement and management of credit risk generally.

It may be helpful to start with a definition of a credit derivative. For the purposes of this report, a credit derivative is an instrument – typically a swap, an option or a security embedding such an instrument – in which one or both parties' payments are based on the payments on (or value of) a loan or bond or a basket of loans or bonds. (Henceforth, in this report, we will use the terms "debt" or "credit" to include both bonds and loans).

The most common credit derivative is the default swap. This is a contract in which one counterparty (the protection buyer) pays a fee – usually in basis points per annum on the notional amount. In return they receive a payment triggered by the default of the underlying credit. (Note: as with other swaps, there is the possibility of terminology being confused. The buyer of protection is sometimes referred to as the seller of the credit risk, and vice versa. Where we refer to buying and selling we mean the purchase and sale of protection, unless otherwise specified).

A variant of this approach is the "total-rate-of-return (TROR) swap". One party pays the other the total return on a debt or group of debts, receiving in exchange another payment which is usually LIBOR based. The total return includes the interest payments on the underlying debt, plus or minus changes in the underlying value of the debt. The exchange of payments mostly takes place quarterly. In practice real TROR credit swaps seem to be rather rare; they are generally used for short-term synthetic repo trades (see below).

The third common derivative is the credit-linked note. This is an on-balance sheet structured note (unlike the other two instruments, which are off-balance sheet). Often it will be issued by a special purpose vehicle. The note represents a synthetic corporate bond or loan, because a credit derivative (credit default or TROR swap) is embedded in the structure. For example, the buyer of a credit-linked note with an embedded default swap may receive only 70% of the par value if a reference credit defaults.

The nature of these various instruments is discussed in more detail in the Appendix, to which those not familiar with the concept of credit derivatives may wish to refer before reading further.

While on the subject of the instruments themselves, we note an interesting recent development: the proposed launch of futures and options on default risk

in the US consumer credit market. The Chicago Mercantile Exchange filed for regulatory approval at the start of April 1998 to create contracts based on the Quarterly Bankruptcy Index (CME QBI). The contract will be aimed at providing risk management tools to credit card companies, banks and other consumer lending institutions. The CME QBI will be based on the number, in thousands, of new bankruptcy filings in US bankruptcy courts. Futures will be for an amount of $1000 times the CME QBI.

The CME QBI will be the first exchange-traded product designed to specifically target the credit derivative market. It could well open the way for further developments; for example, one could conceive of a contract based on the default rate among the universe of BBB bonds. While this contract could never be used to hedge the specific risk of a given BBB credit, it might be useful to hedge away the macroeconomic factors pushing up default rates generally in a given class of credits. Clearly, as with the interest rate swap market, the ability of the futures market to provide a generic market risk hedge would then allow much more rapid growth in the custom-tailored OTC derivatives markets.

As many people have observed, the market for credit derivatives has enormous potential. At the same time, its growth has been rather slow, leading some to question whether the market has been 'over-hyped'. One of the problems with the credit derivatives market is the almost complete absence of adequate data.

It is this which, in part, has suggested that the market has been 'talked up' by the advocates of credit derivatives.

One of the reasons, it would appear, for the lack of data is the continuing linkage of much credit derivatives activity to the bank loan market. Traditionally, this has been an over-the-counter market, with no incentive or interest to publish transactions.

The question arises whether an increase in credit-linked note activity might, by being in itself more visible, encourage growth in credit derivatives transactions. It seems to us that one of the issues here is the question of the so-called signalling effect, which has been a factor in holding back the growth of securities issues where a credit derivative is used to create a lower credit risk than the issuer. For example, suppose that the World Bank were to issue a bond whose rate of return were linked to the performance of an Indonesian state entity. While the World Bank is, of course, AAA it is unlikely – in the light of recent events – that the Indonesian state entity would be awarded such a standing. Clearly, the bonds are likely to be of the level of BB or below.

A very large number of issuers have apparently held back from issuing such bonds because of the fear of 'contamination'. That is to say, in the case chosen, supposing that the Indonesian credit were to default, the World Bank bond would then become valueless. This would probably have a negative effect on investor perceptions of the World Bank – send a negative signal about the World Bank – as issuer. Accordingly, it seems likely that concern over this signalling effect, or 'contamination', will mean that there are inherent restraints on issuance of this type. Conversely, where firms do issue securities of this type, one of the rating agency participants in this study raised a pointed question:

"Would a bank support one of its credit-linked notes in difficulties?"

The same person noted that in a number of cases banks had offered "voluntary" support for securitisations. If this model were to be followed, there must be questions about how much of the risk had really been

transferred. Another pointed comment by this participant raised the question of how much real demand there was for the credits involved:

"We see the same credits over and over and they are usually the ones people want to unload."

Market data

This brings us to the question of the true size of the market. This is difficult to assess. A survey by the British Bankers' Association estimated the total size of the London market for credit derivatives in 1996 as approximately $20 billion notional amount. They found five institutions having a 'book' of £1–5 billion notional amount. Their estimate of the pattern of usage was that amongst leading firms credit default derivatives accounted for 22% of volume, credit spread derivatives 30%, total return swaps 23% and credit-linked notes 24%. Participants indicated that they expected in future the dominant instruments to be credit default and credit spread trades. The most recent BBA survey, flash data on which were published on June 18, indicated an estimated market size for the global market of $170 billion of which $148 billion in the United States. These data are calculated on a different basis from the OCC numbers quoted below.

In the global context, hard data are difficult to find. However, we reproduce in the table below left the most recently released US data from the OCC, which refer to the end of 1997. We include selected other derivatives data for comparison purposes.

The OCC data report a total US market size of $54.73 billion, of which $54.38 billion are accounted for by the top ten banks – and, strikingly, over 60% of which is accounted for by one bank. It should, of course, be noted that these data do not include the major US investment banks which will also have been involved in credit derivatives activity. But it is clear that the US market is highly concentrated.

A recent report by Moody's on the European market[1] notes that the supply of credit protection (primarily from the large credit derivatives dealers) generally exceeds demand. They expect that this will probably continue to be the case for some time, as many banks are still in the initial stage of assessing the economic value of credit derivatives. At the same time, the sort of high-risk credits that banks would wish to eliminate from their portfolios (such as pockets of middle-market credits, commercial real-estate loans, etc.) are in general not suitable for being hedged with credit derivatives. The report notes:

"Not surprisingly, some market observers estimate that at least half of the outstanding notional amounts of credit derivatives are currently linked to sovereign risks."

Bank name	Total assets $m	Total derivatives $m	Total credit derivatives $m
Chase Manhattan	297 061	7 614 618	7 526
JP Morgan	196 794	6 143 284	34 654
Citibank NA	262 500	3 024 256	6 922
Bankers Trust	110 039	2 127 945	3 337
Nationsbank	200 668	1 694 956	755
Bank of America	236 982	1 592 775	339
First Chicago	58 483	1 248 971	40
Republic NY	50 238	270 628	0
Bank of NY	56 154	205 272	0
Bank Boston	64 954	145 739	810

December 31, 1997
Source: Office of the Comptroller of the Currency

[1] *Modern Credit-Risk Management and the Use of Credit Derivatives: European Banks' Brave New World (And its Limits).* Moody's, London March 1997

The report makes the point that there is often a very long road between the "laboratory" stage of these techniques and the implementation in the real world of a bank's day-to-day activities.

It appears that while the specialists might well be sophisticated regarding the use of these instruments, and senior managers aware of them and possibly even enthusiastic about them, there will typically be structural resistance within most banks to pricing loans consistently according to these models or even to using credit derivatives to hedge away known exposures, on the argument that the end result could ultimately be that the bank will "price itself out of the market".

The report concludes:

"We believe that this concern remains legitimate in most European markets, at least as long as many banks are still entrenched in the old mode of market share-growth strategies, with little regard to the negative economic effect of ignoring credit risks when pricing loans. To be sure, some large universal banks with a diversified revenue base (such as a large Swiss or even UK bank, for example), could afford to see their domestic market share shrink somewhat if risk-based pricing is consistently implemented, and still be comfortable with their earnings base. However, this is not so for most commercial banks throughout the Continent, which continue to be highly dependent on traditional margin income from lending to generate revenues. Many of them view a strict implementation of a rigorous loan-pricing policy as unduly punitive, and offering an unfair advantage to less cautious and more aggressive competitors."[2]

In sum, the evidence so far suggests that the market remains at present embryonic. However it does have potentially very important implications, some of which we explore in more detail below.

[2] Moody's op. cit.

Section 1
The role of credit derivatives

Credit derivatives are a way to split credit risk from the other risks in a transaction and to transfer all or part of that risk. They therefore add a new level of flexibility both to the banking market and to securities markets. Insofar as they allow a more systematic way to assess and transfer credit risk, they offer several benefits to financial institutions. First, banks can now begin to manage their credit risk exposure to selected counterparties dynamically. They can, for example, reduce concentration of loans to a specific sector. Second, these adjustments can be made without some of the disadvantages of cash market transactions, such as transaction costs, or unfavourable tax treatment. Third, credit derivatives can be used to allow lenders or investors to take on exposures not otherwise available to them. For example, a small US regional bank may not easily be able to lend to a private German company. But by buying a credit derivative it may be able to obtain that exposure, if it wished. Fourth, an aspect of the credit derivatives markets is that they have the ability to smooth out banks' risk/return profile. The typical commercial bank credit book has a small upside (LIBOR plus spread income) and a large downside (total loss of principal). Credit derivatives allow a smoother profile of payoffs to be created, by allowing a bank to profit on the downside via its hedging.

In much of this report, we will focus on problems or risks arising from credit derivatives. This is not because we believe these instruments are dangerous. We believe that, on balance, credit derivatives are inherently beneficial to the financial system as a whole, like other derivatives. It is because we believe in their value and importance that we focus on possible problems. We believe that growth in the credit derivative market will be made easier if possible problems are discussed at an early stage and perhaps thereby avoided.

We believe that the growth of credit derivatives has important implications for the securities markets. Their impact, in the long run, may be as great as that of securitisation; but in reverse. That is, the growth of credit derivatives may allow the commercial banks to win back from the securities markets some of the business which was lost to securitisation. Clearly, the full effect of securitisation will never be undone. The 'technology' has been developed and can continue to be used. But, at the margin, credit derivatives may well allow commercial banks to compete more effectively against securities issues. The contrast between the two approaches is that with securitisation, the assets come off the balance sheet, but often the first-loss credit risk remains with the bank. With credit derivatives, the asset can be kept on the balance sheet, but the risk is sold off. Thus the assets are not sold into the securities markets – only their risk.

At the same time, credit derivatives will themselves have direct effects on the securities markets. They will allow, for example, the creation of securities based on borrowings not otherwise available to the

market. A related point, not yet perhaps widely discussed, is implicit in a thought-provoking comment made by one market participant:

"Credit derivatives allow you to create synthetic maturities."

Although this may seem far-fetched at the moment, one could conceive of an IBM yield curve by analogy to the Treasury curve, with points on the yield curve where no security is trading being filled by credit derivatives. If ever the market evolved to this point it would have interesting implications for new issue pricing.

A second effect of these instruments is already being seen in some markets: the volume of derivatives activity on the underlying credit has in some cases outstripped the cash market volume. As an example, the trading activity in the Korean Development Bank 2006 Eurobond is anecdotally suggested to have been much less than the volume of credit protection transactions on the bond in November/December 1997, during the period when the country appeared to be going to collapse.

One participant in this study stated:

"You had a much more two-way market in the swap. The swap traded 290-230-220-260-320-280 and then collapsed to 450-500, while the cash was trading 190-210 over Treasuries through all this."

However, this liquidity was quite localised. Another participant commented that during the generalised Asian crisis:

"There was some attempted activity in Indonesia and Thailand but the majority was in Korea… mainly on KDB – I think we saw one trade on KEB. You had people going short of KDB in the morning and closing the trade in the afternoon… People were only doing default swaps… no one had the guts to do TROR."

There are some possible negative implications of this, discussed below. A positive implication is that the increased activity in credit derivatives in this example may have improved liquidity in the underlying instrument, just as the growth in equity index futures has generally had a positive influence on market activity in individual equities. Furthermore, the increased activity in credit derivatives almost certainly contributed to increased transparency in the market – at least, for those able to track credit derivatives prices.

The general impression is that after the market survived the test of the Asian crisis its role in price signalling is set to grow further as the range of prices available and trade sizes continues to increase. One participant commented:

"Today I've seen default swap prices on Japan, Turkey, KDB, BAT, Volvo… I could easily go and get 20–30 prices in a standard size of $10–20 million."

Another commented:

"A year ago $10 million was normal, $15 million was large, now we don't look at anything less than $10 million and I've seen $100 million; a year ago we would do three trades a month: now it's three trade a day… these things will be the oil for the other markets, allowing you to trade other instruments more freely."

Some applications of credit derivatives

In this section we illustrate some specific applications of credit derivatives. One which is widely discussed is their use by banks to reduce concentration risks. For example a bank may hedge a concentration risk by buying credit protection against a specific borrower's default. If a prime corporate relationship is filling up available credit lines, to the point perhaps where 'large exposure' limits are in danger of being

breached, it may be that the only way to continue doing business with the client is to sell down some of the risk. Rather than syndicate out the banking business, a bank may prefer to issue a credit-linked note whereby the risk is passed to investors. This approach is used, for example, in the Bistro and Glacier trades discussed further below.

Another way banks can adjust their credit profile is by buying credit protection against borrowers in an industry where they do not want exposure; and they can sell protection (i.e., take on risk) in another industry where they want to be exposed. Portfolio management techniques can allow banks to increase the return on a portfolio, for a given level of risk, by structuring the portfolio to diversify credit exposures.

Suppose Bank A lends primarily to large industrial firms, while Bank B lends primarily to small agricultural borrowers. Bank A and Bank B agree to swap with each other payments received on a basket of each bank's outstanding loans. By doing this they diversify the industry concentration of their respective portfolios.

There are undoubted benefits to this approach. Some go further, and claim that use of credit derivatives allows banks to attain the 'efficient frontier' – i.e. to optimise the trade-off between risk and return. One regulator who participated in the study was cynical on this point:

"The banks claim to make frequent estimates of the efficient frontier – but we know already from the investment community that there is a real problem with the concept of applying the efficient frontier in practice. A small shift in the expected return, or an estimated correlation, turns it over a saddle-point and you get a major swing in the optimum proportions."

In addition to the diversification benefits referred to above, banks are making a number of other uses of credit derivatives that allow them to manage their balance sheets more efficiently. Undrawn credit lines can be used, possibly in combination with asset swaps. Indeed, one firm commented that they viewed the credit derivatives and the asset swap business together as part of their overall credit trading. They estimate 20–30% of their credit trading is, in option terms, embedded into asset swaps; 20–30% in the form of credit derivatives.

Clearly there are areas where the use of credit derivatives is implicitly embedded in asset swaps, sometimes without being explicitly recognised. Firms might buy a bond at LIBOR plus 20, together with the right to put the bond back at LIBOR plus 20 within 364 days. Another frequent activity is TROR swaps for 364 days: they are structured so that the protection premium rises sharply, say by 400% on day 365. For reporting purposes a claim is made that the maturity of the deal is "really" less than one year.

Another, very similar structure is to hold a five-year bond and sell out the first year of the credit risk using a default swap.

For example, a correspondent banking customer of the selling bank might be able to get only a one-year line for Argentina. They would buy one-year default risk protection from the bank who would hold the underlying five-year Argentine bond. (Alternatively, the selling bank could just go short of the credit).

In emerging markets, as with equity derivatives, credit derivatives offer important benefits in improving cross-border access: they can be used to insulate investors from the operations risks of emerging market securities for those who would like the credit. One firm mentioned that they had been active on behalf of clients lending to Turkey and the Ukraine. The transfer risk is passed on to the investor. Naturally, the typical

transaction size is rather smaller than the OECD market, usually $5–10 million.

While much of the focus of what we discuss here is the use of credit derivatives by financial institutions, a quite different application of credit derivatives which is of considerable interest for the longer-term future, we believe, is their use by corporations to hedge exposure to each other. One participant commented:

"We are seeing corporate customers hedging receivables – perhaps 5% of our book. We expect to see more of this if there is a recession."

Clearly, in the long term, the widespread use of such derivatives at the corporate level may well prove a considerable improvement to the efficiency of financial markets. As a flexible alternative to the letter of credit or the bank guarantee (i.e. they can be entered into after entering the underlying exposure and possibly even traded on the secondary market) such a hedging tool offers interesting possibilities.

Leveraged credit derivatives

Credit derivatives have also been used to create leveraged credit-linked notes. Typically, a Master Trust uses the note proceeds to purchase US Treasury securities and simultaneously enters into a swap with a bank, under which the bank pays the coupon flows on a loan portfolio, plus or minus price changes and receives floating interest cash flows from the trust. The investor receives the cash flows from the Treasury security plus or minus the trust's net receipts under the swap with the bank.

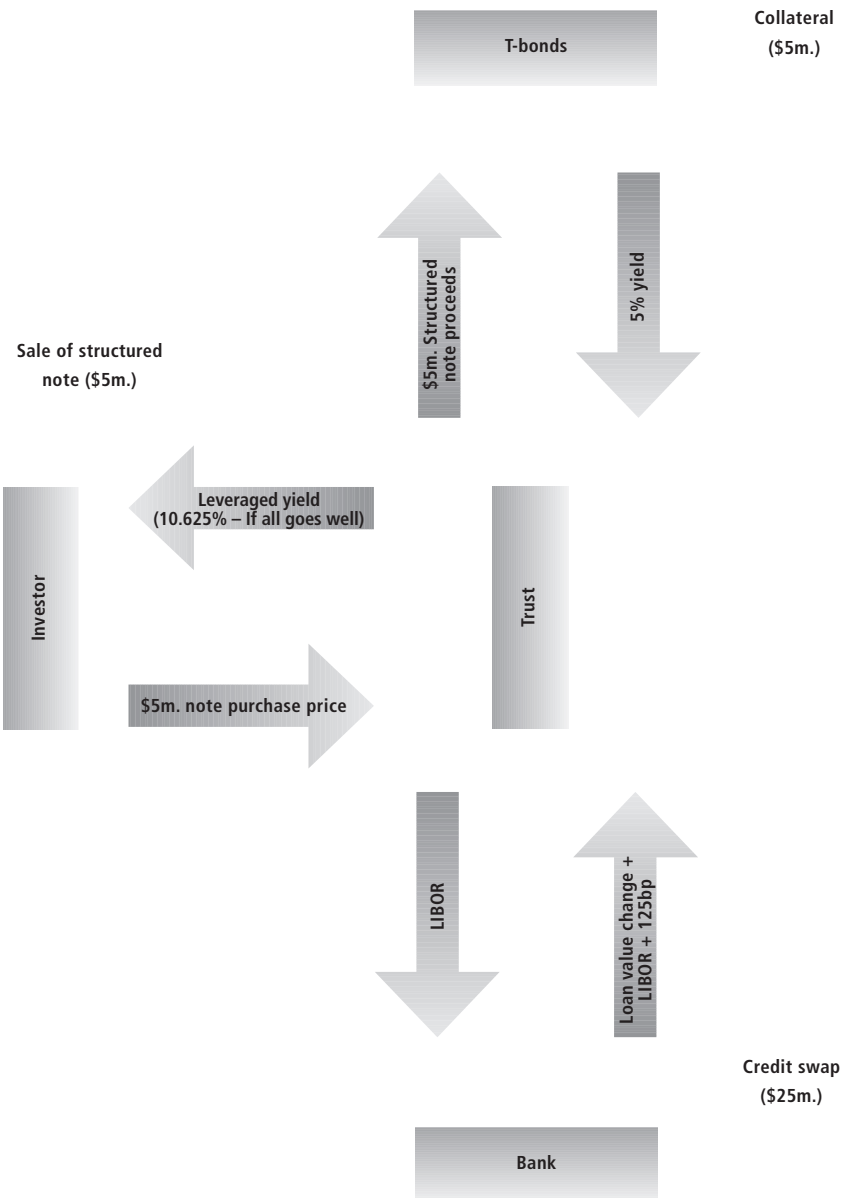
Reasons for doing such trades include the following:

- Some US investors, such as life insurers, who are required to use swaps for hedging purposes only, can gain the same economic result via the notes which are an allowable investment.
- The Treasury collateral earns the note an investment grade rating.
- The investor earns the banking spreads built into the pricing of the loan portfolio and gets a leveraged upside with downside protection.
- The leverage can be tailored to match the investor's risk appetite.
- The bank sells off a large part of the credit risk in its loan portfolio.

Figure 1, opposite, illustrates such a deal. In this deal, the note value is $5 million, while the underlying loans total $25 million, so the investor's upside is leveraged five times. Thus, if the value of the loans does not change, the investor earns a return of 10.625% (5% from the Treasury note plus five times the 1.125% spread on the swap with the dealer). However, the note is not without its risks. Because of the leverage, a decline in the value of the loan portfolio by 2.125% (caused, for example, by a default) is enough to wipe out the investor's return for a year.

Leverage is used in a different way in another approach, the Bistro issue, discussed below. We believe that the use of leverage is very important at the systemic level. There are clearly dangers in badly structured leveraged products. But it is also the case that the use of leverage allows the banking system collectively to shift much larger amounts of credit risk into other market sectors. These purchasers may, provided they have sufficient appetite for the risk and understanding of the dangers, in turn allow the banks to rebuild and extend their customer relationships by taking on more new business. This may, to some extent, allow banks to replace lending business lost to securitisation. However, the growth of this technique will be restrained until the regulators recognise partial hedges (see the discussion on the Bistro transaction).

Figure 1


T-bonds
Collateral
($5m.)
$5m. Structured note proceeds
5% yield
Sale of structured note ($5m.)
Leveraged yield (10.625% – If all goes well)
Investor
Trust
$5m. note purchase price
LIBOR
Loan value change + LIBOR + 125bp
Credit swap
($25m.)
Bank

Although securitisation was underway before the imposition of the Basle Accord, its primary arena at that stage was in the mortgage-backed securities markets and commercial paper. The most rapid growth in securitisation took place after the imposition of the Basle Committee ratios forced banks to account properly for the cost of capital on loans. Now the use of leveraged credit-linked notes may allow the banks to undo the effects of this by using these notes to pass on relatively large quantities of credit risk via moderate sized securities transactions, as illustrated in the Bistro transaction to which we now turn.

Glacier, Triangle and Bistro: Credit-linked pool structures

The Bistro transaction is one of several recent transactions in the credit-linked note area which have pointed towards significant potential developments in the markets. The first of these was the Glacier transaction carried out by SBC Warburg in September 1997. Two tranches of floating-rate notes were issued totalling $1.74 billion. These were backed by an initial collateral pool consisting of 130 credit-linked notes, each of which was tied to the performance of a firm which had borrowed from SBC. SBC is required to maintain the weighted average credit rating of the pool, as well as a high level of industry and country diversification. Assets in the pool are cross-collateralised so that the bonds reflect the performance of all the notes in the pool. Although the bonds are non-callable, SBC retains the right to recall the underlying credit-linked notes in the pool of collateral in order to reflect its current credit exposure. There is additional credit enhancement on the deal, derived from an element of excess spread and a subordinated first-loss security. The total measure of credit enhancement relating to the senior notes runs to 8.25% of the nominal deal size. This level of protection is necessary because the identity of the obligors whose credit is being securitised is not known to the investor.

Some interesting consequences flow from the fact that the Glacier transaction is structured to prevent knowledge of the borrower becoming available. Glacier buys credit-linked notes from SBC New York branch. Each note is a senior unsecured obligation of the bank. Each note is linked to the credit of a specific borrower. Glacier does not know the identities of the borrowers: SBC New York branch keeps a register identifying the borrowers, but does not disclose the identity to Glacier. Glacier's relationship is only with SBC New York branch, not with the borrower. Glacier has no rights in any obligation of any of the underlying borrowers. It has no rights to acquire from the bank any interest in any obligation of a borrower. Glacier and the trustee have no right to inspect any records of the New York branch. The entire operation, therefore, depends purely upon SBC's word for it that any given credit-linked note is in default: no independent verification is possible. This transaction was followed by a transaction by CSFB called Triangle Funding, broadly similar in nature.

In December 1997 JP Morgan launched a $700 million transaction called Bistro. Under this transaction, a special purpose vehicle issued $460 million of AAA rated senior notes, together with $237 million of junior Ba2- rated notes and $32 million of deeply subordinated "equity" paper. The special purpose vehicle enters into a credit default swap with a notional principal value of $9.72 billion which is referenced to a portfolio of commercial loans, corporate and municipal bonds, and to counterparty credit exposures arising out of derivative contracts. The equity is funded through excess spread payable on the default swap over the course of the first five years of the transaction. A block

of US Treasuries further collateralises the deal during the first five years of its life. Only when the treasury collateral is liquidated is Morgan entitled to offset portfolio losses against payments of interest and principal due on the bonds.

An interesting point is that the reference credits were publicly listed (unlike the Glacier transaction) and, further, again unlike the Glacier transaction, will remain constant throughout life of the deal. Therefore Morgan in fact shorted some credits into the vehicle in anticipation of future exposure.

The effect of the overall structure is that the Bistro transaction is highly leveraged. Effectively, Morgan has bought protection for about 7% of a $10 billion credit portfolio through the issue. Under the typical CBO/CLO transaction (as illustrated in the Appendix) the bank putting the transaction together retains exposure to the vast majority, often 90%, of the economic loss likely to occur on the underlying collateral. In the case of the Bistro transaction the reverse is the case. Morgan has sold off most of the first loss (with the possible exception of the $32 million in equity). The assets, however, remained on Morgan's balance sheet. We understand that Morgan was not granted regulatory capital relief on this transaction. This is because the US Federal Reserve requires an exact match between the loan and the credit derivative, not merely as to obligor, maturity and seniority but also as to size. In other words, if we have a $100 million loan to Fiat and we buy protection on $50 million, we are granted no allowance to reflect a reduction in exposure. This approach does not seem rational.

Balance sheet uses ("synthetic repo")

A growing use of TROR swaps as synthetic repo was mentioned by one participant in the study.

"There is now a new sector of the investment community that has the analytic skills to buy the credit but do not want the funded instrument."

This firm does collateralised TROR swaps with hedge funds. We note that this use of credit derivatives to split the funded instrument from the risk has an exact parallel with interest rate swaps. These liberated the trading of interest risk from the taking and placing of deposits or the purchase and sale of bonds; credit derivatives likewise allow a wider range of participants to trade credit risk. At the same time, since the motivation of the hedge funds will usually be different from the traditional lending bank relationship, there are the seeds of problems here, to which we return in Section 4.

Another use of TROR swaps has been to manage balance sheets. One technique has been the use of total-rate-of-return swaps to create short-term funding vehicles. A participant in the study familiar with the activity of the rating agencies commented that:

"there have been a lot of short-term trusts – six weeks, two months – set up which applied for ratings."

A typical example might arise when an investment bank creates a trust to which is transferred $2.5 billion of investment-grade bonds. It would appear likely that the legal costs of creating such a trust, if the trust is one of a series which is being repeatedly created and then dissolved so that the legal documentation becomes standardised, might be of the order of say $50 000. Similarly, it is likely that the rating agencies, if called upon to rate such trusts repeatedly during the course of the year, might be persuaded to reduce the standard rating fees. Let us suppose that the cost of arranging a rating for such an entity is also $50 000. Broadly speaking, therefore, the aggregate costs of setting up such a trust might be say $100 000. Supposing that the aggregate amount of the trust is

$2.5 billion, then for a two month period, if we can achieve a saving of three basis points on our funding, we will save (neglecting day-count considerations) the sum of $125 000. Thus the operation becomes worthwhile if we can save three basis points on our funding costs. This is by no means impossible if we bear in mind that the trust as a separate entity might well be attractive to some investors with large exposures to investment banks. The trust will have a short, defined life; it will not be engaged in any of the speculative trading typical of some investment banks. If the underlying securities are Treasury bonds, it would probably not be difficult for the trust to achieve quite a good rating, even in the presence of a total-rate-of-return swap between the trust and investment bank to pass the market value of the position back to the investment bank.

A quite separate use of such structures is also fairly well known in the marketplace, namely the use of these trusts by Japanese entities to 'park' assets in them over balance sheet dates. Such 'window-dressing', to be effective, does require generous accounting treatment and therefore is probably of less use to entities from a number of other countries.

Equity-linked finance using credit derivatives

A recent example of the use of credit derivatives in obtaining equity finance has been the use of special purpose vehicles coupled with credit derivatives contracts. A company would set up a special purpose vehicle in a low-tax jurisdiction. It would transfer a portfolio of equities to the special purpose vehicle. The latter would use the portfolio as collateral to issue, say, a five-year floating-rate note. The special purpose vehicle enters into an option contract with the company to sell the portfolio back after five years. Thus the company has funded its portfolio for five years. The floating-rate note is made acceptable to investors by adding a credit derivative: a bank would write a credit default option on the floating-rate note.

It appears that a good deal of this was done for Korean names[3]; the credit protection was provided by Korean banks. As this example illustrates, the credit protection is only of as good quality as the quality of the credit derivative provider: recent months have shown that the credit protection given by Korean banks may have very little value.

Credit spread applications

An interesting application of credit derivatives to spread trading was seen in 1994, when several dealers started to trade Brady bond contraction swaps. These were structures aiming to exploit a perceived discrepancy between the credit risk premium embedded in the pricing of two Argentine bonds. One was the benchmark Brady bond issued by Argentina, the so-called "Par bond", issued in March 1993. This is a US dollar security maturing in March 2023. The other was an Argentinean domestic issue known as the Bocon Pre2. The Bocon Pre2 is a dollar-denominated amortising floating rate note issued by the Republic of Argentina, paying a coupon based on one month LIBOR, with a final maturity date of April 1, 2002.

Several steps were needed. First, the principal payment at maturity (which is collateralised by US Treasury zero coupon bonds) must be stripped out. To do so, the implied value of the Par bond's coupon flows was worked out as the difference between the Par bond price and the value of the US Treasury zero maturing closest to March 31, 2023. The second step was to use the resulting difference to find an internal rate of return for a synthetic

[3] *Asia Risk,* December 1997 p38

investment in the coupon payments only. The third step was to isolate sovereign credit risk by comparing this rate to a US Treasury yield. Suppose we assume the duration of the resulting coupon flows is similar to that of a 10-year Treasury note. Then the Argentine credit spread is found as the difference between the IRR of the coupon flows and the yield to maturity of the ten-year Treasury note. For the other bond, the Bocon Pre2, we must convert the floating interest flows into fixed flows in order to find a yield to maturity.

At one point, the Bocon Pre2 spread was in the 900–1 000 basis point range while the Par bond spread was in the 600–700 basis point range. The higher spread on the Bocon Pre2 was caused by illiquidity in the local market, and by the fact that yield investors did not want the Bocon Pre2, which was not scheduled to pay a coupon until 1997. Over time, it was argued, the spreads would converge. In order to exploit this apparent arbitrage, several dealers began marketing 'contraction' swaps. Under these, the customer paid the Bocon Pre2 spread and received the Par bond spread plus a fixed amount. If the two spreads came into line, the customer received this fixed amount as profit on the trade. The flows are illustrated in figure 2, overleaf.

This type of arbitrage has been widely used between domestic and international markets in a number of emerging markets where similar credits were available domestically and internationally but in different legal structures.

Other structures are of course possible – clearly, all of the existing technology from other markets can equally be applied to the credit derivatives market. In many cases, these specialist structures are likely to be highly illiquid.

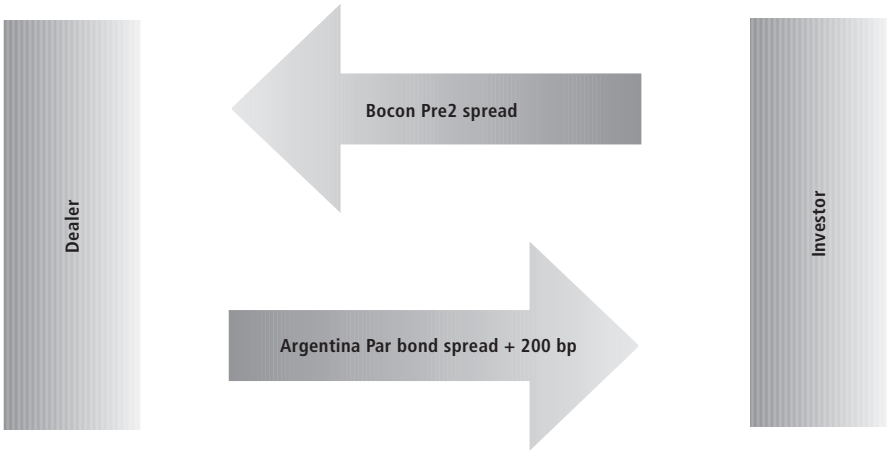
For example, a structured note embedding a credit derivative collar can be constructed to allow an investor to combine a low level of interest rate risk with a credit spread view. Consider a bond issued by ABC Inc which currently trades at a spread of 250 basis points over Treasury bonds. The bond is a five-year bond. The investor wishes to hold a short-maturity asset, but has a view that the spread on ABC will probably improve in the short term. We could construct a two-year structured note issued by a AAA rated firm which pays a coupon, say, of LIBOR plus 0.25%. The principal redemption on the bond would be structured so as to be linked to the credit spread on ABC's bond. Specifically, the note could embed a two-year zero cost credit spread collar. Thus, in addition to the note, the investor in effect buys a spread call. This pays off if spreads tighten, struck at the current spread level of 250 basis points, financing the purchase by selling a spread put struck at 280 basis points. If the credit spread improves, the investor will benefit; if it weakens beyond 280 basis points, the principal value of the note will decline.

Another structure would be for the investor to write a credit spread put if he felt that he would be willing to acquire a given bond at a given spread which is not currently available. Suppose the investor considers that XYZ Inc's bond, trading at a spread of 215 basis points over the ten-year Treasury, is too expensive. However he would be happy to own the paper at a spread of 250. One way of accomplishing this would be for the investor to sell a one-year European-style credit spread put struck at 250 basis points in exchange for an up-front fee. The investor here takes no interest rate risk, since he does not own the bond; it is a pure credit bet.

Transfer risk note

One last structure which is worthy of note is an innovative "limited recourse debt issuance programme" which was set up by Rabobank of the Netherlands in March 1997. These are medium term notes which

Figure 2



have embedded in them the country risk of a specific country. That is, payments of principal and interest may be restricted if the government of the specific country imposes any kind of exchange control which prevents transfer of the local currency; or if there is a banking moratorium; or nationalisation or confiscation of foreign bank assets; or any war, revolution, insurrection or any hostile act which interferes with exchanges or transfers of the local currency. We note that BNP issued some similar notes in November 1997, launching a $500 million MTN programme of "Limited Recourse Dept Instruments", with the first issue linked to Brazil.

This is an interesting innovation which allows the transfer of country risk to other investors. On the other hand, it is not yet clear how much investors will actually want to buy such a risk, and whether they will be prepared to do so at cheaper rates than the banks currently charge for doing so.

Links to secondary loan trading and securitisation

It is clear that trading in credit derivatives is inevitably intimately linked with the wider growth of trading in the secondary loan market; and as we have indicated earlier it is to some extent a substitute for securitisation. We touch briefly on these topics here. Trading in the US market has been active since the mid-1980s when emerging markets loans began to be traded; a secondary market in investment-grade loans and "highly-leveraged transactions" began to develop in the US in the latter part of the 1980s. Steps were taken to formalise the structure of the market in the US in 1995, when the Loan Syndication and Trading Association was formed. London's Loan Market Association held its first meeting in December 1996. At about the same time the rating agencies began to rate some individual loans, a step which

facilitated the further growth of secondary trading.

We note also that the growing use of credit derivatives for loan asset management has prompted the Loan Market Association in London to create a subcommittee dedicated to portfolio management. Clearly the two marketplaces will remain intimately linked.

Securitisation through the use of collateralised bond obligations (CBOs) or collateralised loan obligations (CLOs) has also become an increasingly important technique and offers an alternative way for banks to manage their balance sheets. A classic example of the CLO was the securitisation by National Westminster Bank of $5 billion of corporate loans in October 1996. The issue, for Repeat Offering Securitisation Entity Funding No. 1 Ltd. (ROSE Funding) securitised over two hundred loans advanced by NatWest Markets to companies in 17 different countries. The transaction was divided into eleven tranches: six senior; four mezzanine and one junior. The senior and subordinated tranches were further carved up into sterling- and $-denominated portions. The most senior notes, Class A1a, totalled $750 million of five-year floating-rate notes paying a coupon of LIBOR plus 8 basis points.

The £600 million issue of senior sterling notes, Class A1b, had a similar five-year maturity and paid a similar coupon of three month sterling LIBOR plus 8 basis points.

The issue securitised around a sixth of NatWest's large corporate loan book, freeing up credit lines for further lending. To preserve the bank's relationship with the companies that it lends to, the transaction was structured as a sub-participation and not a true sale. That imposes a ceiling of the bank's own rating on the transaction, as in the event of a bank default the ROSE bondholders would become general NatWest creditors. It also meant that NatWest continues its existing banking relationship and is obliged to continue to operate that relationship as if it had not entered into the sub-participation. Further, no notification had to be given to the borrowers and individual borrowers are unaware of whether or not their loan has been included. No information on individual borrowers will be passed to the trustee.

A number of issues arise in this context which recur with credit derivatives. For example, when NatWest Markets introduced its ROSE deal, it faced the delicate problem of upsetting relationships with corporate treasurers. Outside the US, many corporate treasurers still take a dim view of losing contact with their lenders. Treasurers argue that they want to know who their creditors are. Not only do they want to be able to monitor the demand for their risk, but they want to be able to have direct access for renegotiating terms of loans.

However, there are some signs of flexibility here. A recent $8.5 billion syndicated facility for ICI contained flexible assignment language; it is estimated that one hundred trades worth $1 billion in the paper were executed in the days immediately after the loan was signed. BAT Industries followed suit with its $8 billion syndicated facility by permitting the loan to trade. We return to this point below when looking at some of the potential problems of credit derivatives.

Section 2
Risks associated with credit derivatives

Credit risk

As with other derivatives, credit derivatives pose multi-dimensional risks. Obviously the key risk is credit risk. For the seller of the credit derivative, the main risk is to the reference credit, and so for a credit default swap or option its risk is almost as though that reference asset itself were on the bank's balance sheet. For TROR swaps, however, the protection seller may be in a position (if the credit improves) where it is due to receive the appreciation from its counterparty. Therefore, in these transactions, the protection seller incurs credit risk for both the reference credit, and to a lesser extent, the counterparty.

As an example of how regulators see the risk, we consider the Federal Reserve. When it looks at a credit derivative, the Fed views the party that has transferred the credit risk as the "beneficiary". It views the party which has assumed the risk as the "guarantor." The guarantor has to hold capital against its exposure just as if it had exposure under other off-balance sheet direct credit substitutes such as stand-by letters of credit. (For credit derivatives that include periodic payments for a change in the value of the credit, such as total-rate-of-return swaps, the Fed lets the guarantor reduce the exposure by deducting the amount of depreciation paid to the beneficiary from the notional amount of the contract.) Under the Fed's rules, 100% of the face amount of a guarantee is taken as the risk exposure. Other regulators' views are broadly similar on this.

It should be noted that the exact credit risk involved depends in part on how the trade settles. Depending on contract terms, if there is a default of the reference credit, protection sellers often can choose to make a payment equal to the fall in value of the reference asset; or they can buy the asset at the notional contract amount and try to recover its value. The choice between cash-settled and physical-delivery default swaps raises important issues and debate has swung back and forth on the point.

The right answer depends on the circumstances. The main issues are whether the underlying is a loan or a bond, and whether there is a liquid market for the underlying or not. One participant took the view that as far as bonds were concerned:

"Four years ago every trade was physically delivered… now, typically, if you've got a liquid underlying you would use cash settlement."

However, if the market is not very liquid, there is generally a strong preference for delivery. Cash-settled trading implies finding a fair value for the bond, and a seller of the bond could damage the price. If the underlying is a loan, on the other hand, other issues arise. Typically, where loan documentation provides for the assignment of loans to another buyer, it will do so on the basis that assignment of loans "will not be unreasonably withheld". Yet one participant made the point that if the loan has been sold to a hedge fund, the agent bank might perfectly reasonably say that this was undesirable. In this case,

perhaps, the fall-back alternative might be a sub-participation with no voting rights – but this would probably be unpalatable to the investor. This trader commented:

"A lot of trades I have seen have been done by people who either haven't addressed these issues or don't care about them."

Counterparty risk

For the buyer of credit protection, the primary risk is counterparty exposure. The protection buyer will lose money if its counterparty (i.e., the "guarantor") does not fulfil its obligation. It follows that credit derivatives can never completely remove credit risk. This counterparty credit risk is similar to that of other derivative contracts, such as swaps, forwards and options. (Guarantors may also be exposed to credit risk of a counterparty if the trade is a total-rate-of-return swap, since if the asset goes up in value they will expect to receive a payment from the counterparty.)

For the beneficiary, if it is a bank, the Fed reduces the amount of capital it must hold for the credit. Assume that the Fed agrees that the credit protection is enough to allow treatment of the derivative as a guarantee. Then the bank may assign the asset to the guarantor's risk category; for example, 20% if the guarantor is a bank from an OECD country.

One market participant argued that this treatment was a good deal stiffer than it looked. The policy neglects the fact that if I buy DEM 100 million of protection on Daimler risk from Barclays it requires both Daimler and Barclays to fail. Provided there is no correlation between the protection seller and the underlying credit (an important provision, as those who bought protection on Korean credits from Korean banks will attest) the combined probability of the two failures is quite low.

Counterparty risk is found from the mark-to-market value of the credit derivative and an 'add-on' factor representing potential future credit exposure. Under the Basle rules, the add-on factor is a specified percentage of the notional amount, depending on the type and maturity of the deal. To work out a capital charge for counterparty risk for credit derivatives, an appropriate add-on factor is needed. However, the current matrix of add-on factors in the Basle Accord does not include a specific factor for credit or other derivatives for which the underlying transaction is a debt instrument. The Fed has decided that the equity add-on factors are to be used when the reference asset is an investment-grade instrument (or equivalent), or where the reference asset is unrated but well-secured by high-quality collateral. The commodity add-on factor is to be used when the reference asset is either below investment grade (or equivalent) or is unrated and unsecured. The Bank of England approach is generally to use the equity add-on.

The treatment just mentioned would not apply if the guarantee is limited in any material way. This might happen if the credit derivative agreement adopts a restrictive definition of a credit event, or if it sets a materiality threshold that requires a large loss to happen before the guarantor must pay. In that case the protection is severely weakened.

In effect, the rules require regulators to make a case-by-case decision on whether a particular credit derivative has effectively transferred the credit risk. This approach has created uncertainty about the regulatory treatment of a particular transaction; but it is hoped that as documentation is standardised this problem will diminish.

Transaction risk

In a credit derivative the extent of credit risk transfer depends on the specific deal (unless it is done under the newly introduced ISDA documentation, and even here there is a good deal of scope for negotiation). One credit derivative, therefore, can transfer a much higher share of the credit risk than another. For example, some credit derivatives pay out only when a previously defined default or downgrade occurs. Others might make a payment only for the loss in value beyond a threshold. Some might specify a reference asset that is similar, but not identical, to an asset the bank owns. Hence we need to look carefully at correlation between the owned asset and the reference asset specified in the credit derivative.

One market participant commented:

"The problem is that no two trades are the same… there is bid/offer risk in the documentation, basis risk in the documentation – if when you sell protection you have ten credit events, and only one when you buy, you are setting yourselves up for problems… Negotiations for our trades still take weeks… deals unravel all the time... there are a lot of flakes out there."

A point arises here that there might be specific problems where the trigger events differ between derivatives bought and sold. This is a risk which traditional risk reporting systems are not well adapted to identify. If the credit protection proves to be illusory, because the credit risk reporting system has failed to capture the risks fully, the total risk might be far greater than the firm ever intended to run. Firms' management may optimistically believe that all credit risks are safely hedged and thereby end up taking bigger gross positions than they previously would have done. The new world of credit risk protection may create an artificial sense of security. One participant described this risk – parallel to a similar danger with other derivatives – as:

"*the peril of matrices replacing minds.*"

Another trader noted that the market's documentation standards were beginning to change:

"I think one of the worrying trends is that the market is getting rid of materiality clauses: what happens in the case of technical default? Does the trade just collapse?"

Finally, a credit derivative may provide protection against loss on loans to the reference credit for a shorter period than the remaining maturity of the underlying. This is an important point to which we will return, as there has been a good deal of argument about how to treat this case.

Liquidity risk

For firms holding credit derivatives strictly for hedging, liquidity risk is relatively unimportant. For example, consider a bond issuer who uses a credit option to hedge its future costs of borrowing. Because the option will be structured to expire on the borrowing date, the bond issuer will simply hold the option until expiry.

In contrast, liquidity risk is important for issuers of credit derivatives and for users of credit derivatives who plan to close out their position before the contract matures. Despite our earlier comments about liquidity holding up during the Asian crisis last autumn, it is clear that there is still significant liquidity risk in this market.

Compliance risk

Compliance risk is the risk arising from violations of laws, or rules and regulations. Because credit deriv-

ative instruments are new and evolving, there are uncertainties about some legal issues, the appropriate regulatory capital and reporting treatment, as well as other regulatory issues. For default swaps and credit-linked notes with embedded default swaps, the definition of a default and the determination of the payout following default are major issues to be thought through. We return to some of these risks in Section 3, below, on possible regulatory problems.

Legal and regulatory risk

Another source of risk for credit derivative users is legal risk. Legal risk is the possibility that a derivative contract may be deemed illegal or unsuitable. In part, the risk here is because in several countries there is still some uncertainty about the status of these instruments. Should credit derivatives be treated as securities, commodities, swaps, or insurance products?

This distinction is important in some countries, such as the US, because these contracts are regulated by different agencies and under different terms. Suppose that a firm enters a credit swap contract. If the regulatory status changes and the contract is subsequently regarded as a security, it would then be under the jurisdiction of the Securities and Exchange Commission. Since SEC regulations require additional disclosure, the contract could be considered illegal. A change in regulatory status could therefore potentially invalidate previously established credit derivative transactions.

A similar risk arises from the question of whether a country's legal framework will recognise the instrument. A well-known example of this problem was the swap defaults by Hammersmith & Fulham and other municipalities in the UK following a legal decision that they were not capable of entering into swaps because their governing legal framework did not recognise these instruments.

Pricing risk

This is the risk that the firm may systematically misprice a product line. Examples have been seen in other derivatives markets – such as the recent case where NatWest Markets systematically mispriced some of its interest rate option books. Clearly, there are potentially major problems in pricing credit risk accurately on a portfolio basis, which we return to later in discussing pricing models. The absence of historical data on defaults, and on correlations between default events, complicates the precise measurement of risk. In default swaps, the sellers of credit protection will tend to make infrequent payments. However, when they have to make them, those payments can be large. Also, because of the limited liquidity, dealers may find it hard to price deals and to hedge exposures. So dealers may find themselves more vulnerable to high volatilities of anticipated cash flows than with other financial derivative products.

As one regulator who participated in this study commented:

"They do a lot of innovative things to come up with the data where it doesn't exist… until they do have sufficient data, I think this will give us pause."

The view was echoed by an otherwise gung-ho trader:

"The market is very quickly getting to the point where the technology is out-stripping the data – there's been some very clever analysis done on pretty [poor] data."

Another crucial and perhaps not widely-discussed point was made by a regulator:

"The data here are not like interest or foreign exchange rates. Default rates on loans are partly driven by the management decisions of the banks: they are not purely exogenous."

Clearly, this has an important bearing on the modelling of loan risk and it is not a point which seems to have been widely thought through.

Reputation risk

There are obvious potential pitfalls with novel instruments using complex and unfamiliar documentation. This applies particularly to certain classes of credit derivative which are often not so well understood, for example basket trades. A participant recalled one instance of being offered a note which was issued linked to five Asian credits. If any one of these defaulted, the investor ended up with those bonds. The paper was being marketed as an "Asian investment grade basket note" which was hardly an accurate title.

Credit derivatives with leveraged payoff profiles pose particular reputation risks. Examples include binary default swaps, which require the protection seller to make a fixed payment upon default, without regard to any recovery on the reference asset. Clearly, firms' compliance teams will need to be sure that transactions are appropriate, and that the counterparty will be able to fulfil its obligations under the terms of the contract.

SECTION 3
REGULATORY CAPITAL FOR CREDIT DERIVATIVES

It is quite clear that this is a market where there are still relatively small volumes of transactions. In very large part, this can be attributed to the fact that the legal and regulatory aspects of these transactions have not yet by any means been finalised. It is clear that much work has to be done: for example, the Bank of England has been working on a paper which will reflect an update of its 1996 paper, the results of which are still awaited. The Commission Bancaire in France has only just produced a paper which follows up its original draft recommendations of 1997. The German position is apparently that almost nothing has been published officially, and to the extent that German banks are active in the marketplace, it appears that they are active primarily through London or New York. Other centres, such as Spain, Italy or other European countries, appear at this point to be to some extent awaiting a lead from other countries. In the Japanese case, of course, the regulators can be forgiven for placing a higher priority on other aspects, such as saving the remains of the banking system. However, despite the fact that the global picture is still by no means settled, enough has been set down by various regulators to raise a number of issues, and we now discuss some of these, beginning by setting out the position in those countries where explicit rules have been set down.

US position

The Federal Reserve's Division of Banking Supervision & Regulation, in its letter SR 97-18 (GEN) of June 13, 1997 began by dividing the risk into counterparty credit risk as defined earlier, and then into two other categories, consistent with the traditional Basle approach. These were the general market risk arising from changes in the reference asset's value due to broad market movements; and specific risk arising from changes in the reference asset's value due to factors other than broad market movements, including changes in the reference asset's credit risk.

It defined three position types into which the book should be classified:

1) open positions;
2) matched positions; and
3) offsetting positions.

Matched positions are defined as long and short positions in the same credit derivative structures over the same maturities referencing the same assets. They are matched only if both legs are either total-rate-of-return products or credit default products. Matching treatment also requires that default definitions include the same credit events, and that materiality thresholds and other relevant contract terms in the matched positions are much alike.

For the purposes of the Federal Reserve's letter, cash instruments are considered total return products. Hence, a long position in a bond and a short total-rate-

of-return swap of the same maturity linked to that bond is a matched position. If the maturities do not match, or if the swap is a credit default swap, the position is offsetting (as long as the reference asset has the same obligor and level of seniority as the bond).

Offsetting positions consist of long and short credit derivative positions in reference assets of the same obligor with the same level of seniority in bankruptcy. Offsetting positions include positions that would otherwise be matched except that the long and short credit derivative positions have different maturities or one leg is a total return product and the other is purely a default product (i.e., credit default swap). Positions that do not qualify as matched or offsetting are open positions.

The Fed view is that when the reference asset and underlying asset are different, the underlying will still be taken as protected as long as both the underlying asset and the reference asset are obligations of the same legal entity and have the same level of seniority in bankruptcy. Banks must show that:

1) there is a high degree of correlation between the two instruments;
2) the reference instrument is a reasonable and sufficiently liquid proxy for the underlying asset; and
3) the reference asset and underlying asset are subject to mutual cross-default provisions.

The table below left identifies which of the three risk elements is present for each of the three defined position types.

In summary, all credit derivative positions create exposures to counterparties and, thus, have counterparty risk[5]. For matched positions, counterparty risk is the only risk. The matched nature of the position cuts out the general market and specific risk of the reference asset. Both open and offsetting positions have all three risk elements, but general market and specific risk are much less in offsetting positions than in open positions.

Hence, matched positions will not be liable for specific risk charges. For offsetting positions, standard specific risk charges are to be applied only against the largest leg of the offsetting credit derivative and cash positions. That is, standard specific risk charges are not to be applied to each leg separately. (This differs from the Bank of England's approach and, until April, the approach of the Commission Bancaire). Open positions attract the same standard specific risk charges that a cash position in the reference asset would incur.

Bank of England view

The initial view of the Bank of England was that credit default products must be included within the banking book[6]. The Bank of England also took the view

	Counterparty credit risk	General market risk	Specific risk
Open position	Y	Y	Y
Matched position	Y	N	N
Offsetting position	Y	Y (some)	Y (some)

Y-risk is present; capital charge is indicated.

N-risk is not present; no capital charge is indicated.[4]

[4] SR 97-18 (GEN) p4

[5] An exception involves written options where the seller receives the premium in full at the start. Here, risk-based capital is not required, since there is no counterparty risk to the bank selling the option.

[6] November 1996 Discussion Paper: *Developing a Supervisory Approach to Credit Derivatives* p21.

that in total rate of return swaps, the EU capital adequacy directive did not permit the hedging of one credit risk with a slightly different credit risk. It commented that "this rather harsh result for 'close hedges' is hard-coded in the EU Capital Adequacy Directive itself, and is also reflected in the Basle market risk amendment standard method." However, the later adoption in September 1997 of the Basle specific risk modelling amendment appears to have resulted in a modification of this view.

The overall Bank of England approach is encapsulated in a series of flow charts which it included in its November 1996 document and which are reproduced here (figures 3, 4 and 5).

In June 1997 the Bank of England published the initial results of its consultation on the interim capital treatment of credit derivatives. The Bank announced that it would now allow most types of credit default products to be eligible for trading book treatment, as ISDA had requested in its February 1997 comment paper to the Bank. The Bank also said that it felt unable to provide scope for offsets in the trading book, due to the constraints of EU law, but now appears to have revised this view in the light of the specific risk modelling decision discussed below. Following the Commission Bancaire decision, discussed below, to allow partial offsets where the maturities of the two legs do not match, it seems likely that the Bank may also revisit this area. It has also established a practitioner group with the Securities and Futures Authority (SFA) to address matters relating to the capital treatment of credit derivatives and credit risk generally.

SFA approach

In April 1997, the Securities and Futures Authority (SFA) issued its Board Notice 414 "Guidance on Credit Derivatives". The notice stated that the variety of products covered by the term "credit derivatives" made it hard for the SFA to write explicit rules covering all cases and that it had provided guidance to firms on an ad hoc basis, and intended for the time being to continue to do so. Thus, the Board Notice was intended to "give a flavour of the capital treatments by way of… brief explanations and examples". The primary thrust of the notice was to emphasise the internal control issues which arose from credit derivatives. It makes the point that, traditionally, securities houses have rarely become involved in 'work out' situations and that if they become the ultimate owner of the credit risk of a counterparty, they will need to consider if they have the necessary skills in insolvency to make the best recovery possible. The paper also addresses the issue of back-testing actual trading results with expected outcomes. It points out that firms are familiar with the idea of checking whether their assumptions about the direction of markets have held, but have been slow to apply similar techniques to credit spreads, ratings migration and default. The paper states that it believes that most credit derivative transactions will be trading book items.

The paper goes on to say that "where a firm has a position in a credit default product that incurs only a specific risk charge, together with a position in the reference asset, the SFA may permit the two specific risk charges to be offset, provided that the credit events specified in the default product are to all intents and purposes the same as those specified for the reference asset".

Figure 3

Interim capital treatment: credit default options

For banking book only unless specific risk model has been recognised.

Source: Bank of England

Regulatory and Supervisory Policy Division

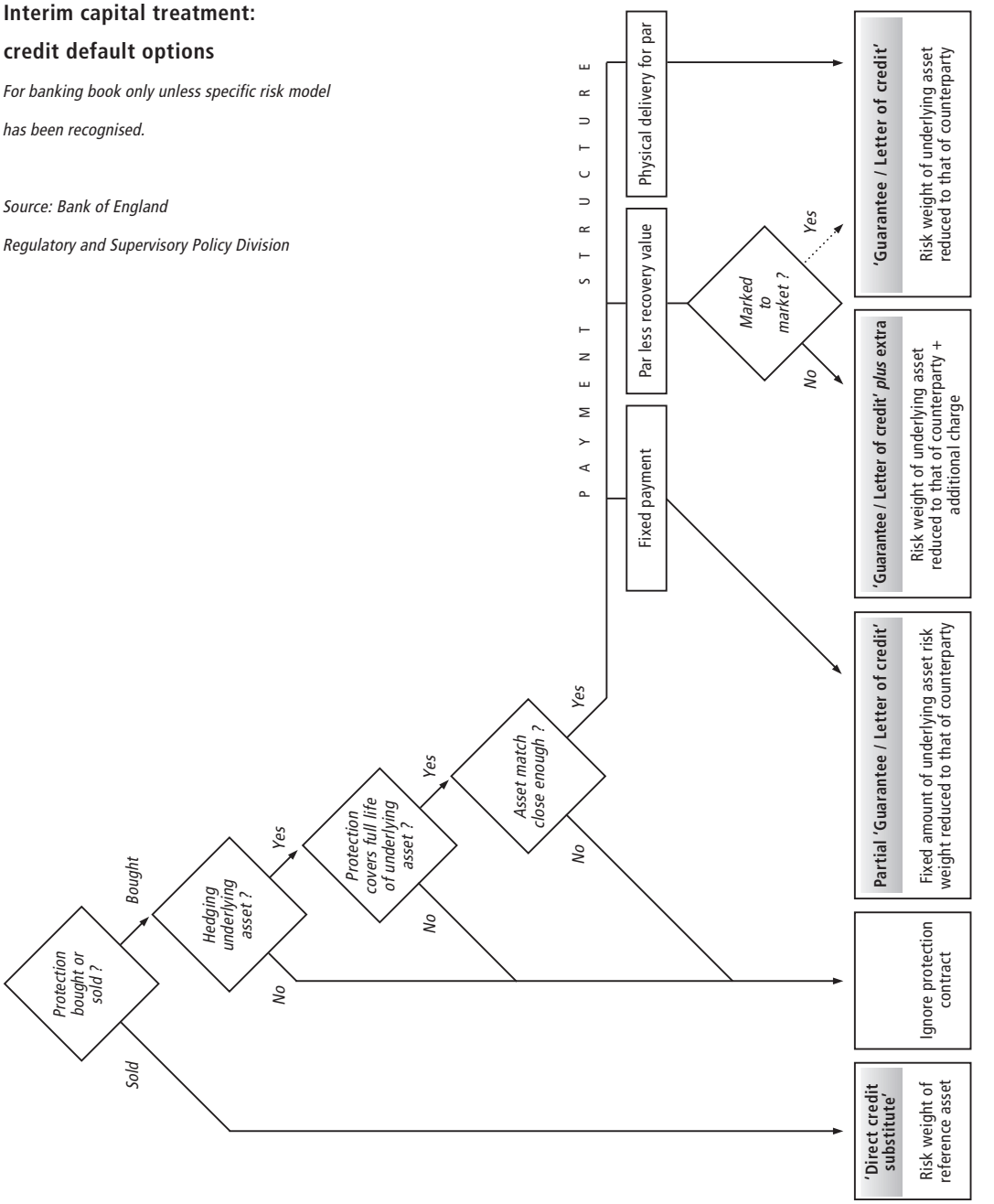


Figure 4

Interim capital treatment: total return swaps

Source: Bank of England

Regulatory and Supervisory Policy Division

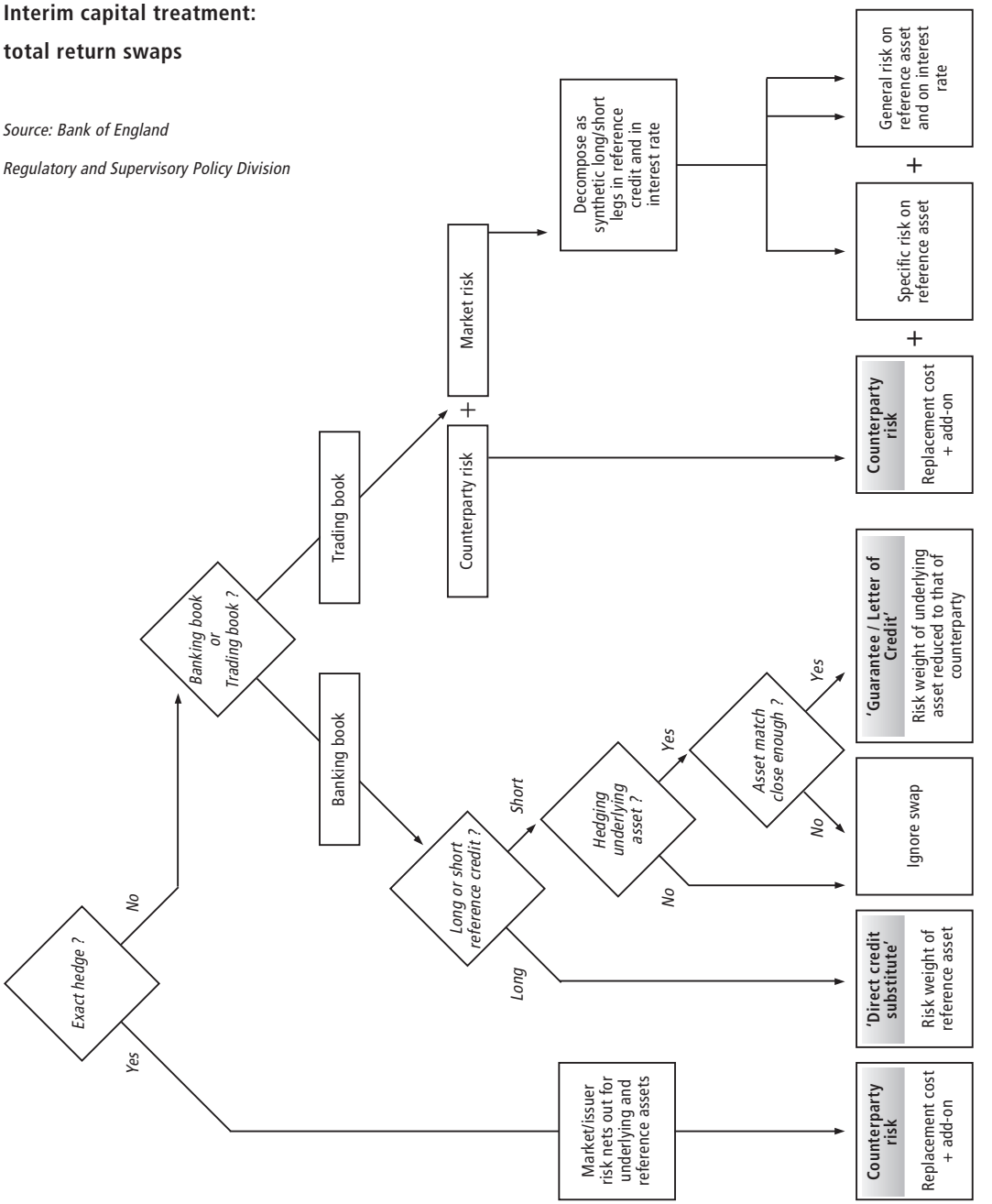


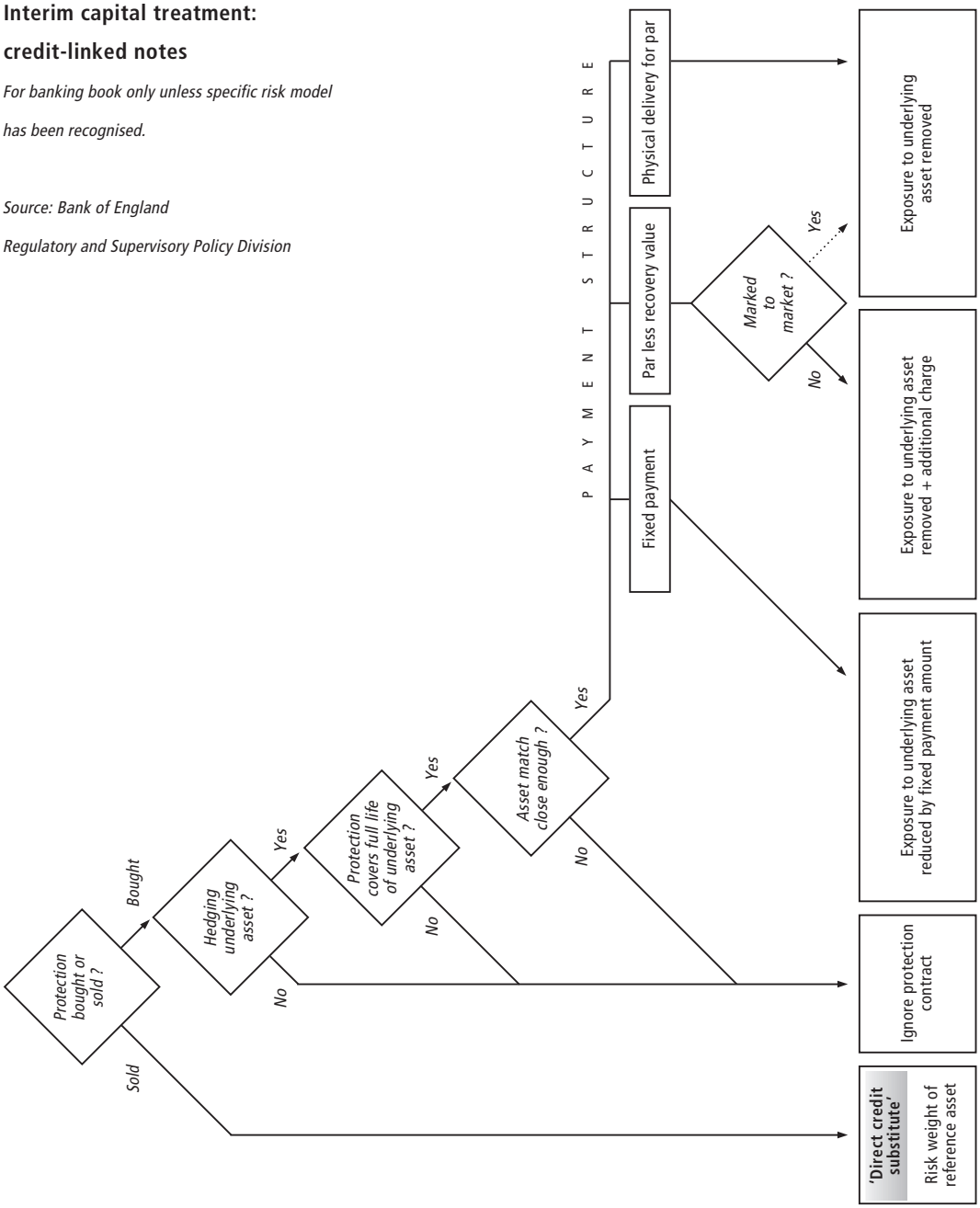
Figure 5

Interim capital treatment: credit-linked notes

For banking book only unless specific risk model has been recognised.

Source: Bank of England

Regulatory and Supervisory Policy Division



Suppose, for example, a firm has bought a credit default option which pays off if XYZ 8% 1999 bonds default. Suppose it holds the same face amount of the underlying bonds. Then no specific risk charge will be applied, though there will of course be a charge to reflect the interest risk of holding a bond (general market risk charge).

French approach

The most recent document from the French authorities[7] clarifies three major items: the criterion for classifying items between the banking and the trading book; treatment in the banking book; treatment in the trading book.

To be included in the trading book the instrument involved must be "the subject of an intention to trade" and it must also be "tradable".

To qualify for the latter requires that the underlying instrument must be quoted daily in a liquid market, or the subject of a recent rating from an independent and recognised body. Also, the firm involved must have sufficient experience and adequate valuation models before the instrument can be included in the trading book.

Treatment of risk in the banking book is fairly straightforward. The seller of protection is treated as being exposed to 100% of the risk. The buyer of protection, where the risk is matched, is granted relief (provided the protection is given by a credit institution or by an investment firm authorised to operate in France). The relief is subject to the protection being unconditional and well founded in legal terms with acceptable materiality clauses.

The innovation proposed by the French authorities arises in the case where the risk runs for longer than the protection. If the credit protection has a maturity of over one year, but the instrument being covered has a longer maturity than that, an extra charge of 50% of the underlying is added. Thus, suppose that we have a five-year FRF 100 million loan to Peugeot, but with protection purchased from BNP for only four years. The FRF 100 million protection requires a charge of FRF 20 million on the counterparty credit risk of BNP. The risk of the loan is offset, but a 50% charge is imposed for the mismatch. Thus a loan of FRF 100 million becomes an exposure of FRF 70 million. This is undoubtedly a step forward, compared with the previous position, where the FRF 100 million loan had to be added to the FRF 20 million of counterparty credit exposure on BNP, with no credit given for the purchase of protection from BNP. Thus, the measured exposure has been reduced from FRF 120 million to FRF 70 million. However, the point has been made that this fails to differentiate between protection bought for one year or four years, in our example. We would be no more favourably treated for buying four-year protection than for buying one-year protection.

The French paper also addresses the separate issue of basis risk in the banking book. Where the credit protection uses a different reference asset than the underlying exposure, even where it is the same issuer, the reference asset must be "sufficiently subordinated to protect the beneficiary". Provided this is the case, an offset is permitted but with a 'haircut' of 10% (20% if the underlying asset is in a different currency).

The treatment of credit derivatives in the trading book is as follows. The seller of protection is charged with the general market risk and the specific risk of the asset in question. The buyer of protection suffers, as in

[7] *Bulletin* No. 18, April 1998, Commission Bancaire, Paris pp8–14

the case of the Bank of England rules, harsh treatment in the case of 'close hedges'. In both cases, intelligent regulation is constrained by the inadequacy of the EU CAD framework, a point to which we return.

Finally, the document lays out the treatment of counterparty risk as follows:

Applicable to the seller of protection

Eligible underlying asset: interest rate add-on

Ineligible underlying asset: equity risk add-on

Applicable to the buyer of protection

Eligible underlying asset: equity risk add-on

Ineligible underlying asset: commodity risk add-on

It is quite clear that the calculations involved in this process are not particularly sophisticated. It is another case of the regulators having arrived at a rough-and-ready compromise. There is absolutely no 'scientific' basis for this approach. On the other hand, there does not at present appear to be any 'scientific' basis for any other approach, either. None of the alternative models are yet sufficiently well tested over a credit cycle for them to be considered fully reliable.

Thus the proposed approach must be considered a welcome step forward on an interim basis insofar as it grants some recognition of offsets where the maturities do not match, and where there is some basis risk in the banking book. In due course, no doubt, we can expect more sophisticated analysis to have been developed and tested over a credit cycle.

Once this tested analysis has been in place for some time, it may be time to revisit the question of offsets.

Canadian approach

The Canadian authorities have also published a statement (Policy for Credit Derivatives 4, October 31, 1997) which essentially applies a guarantee-like treatment. It provides that claims must be explicit, irrevocable and unconditionally guaranteed by qualifying institutions to be weighted according to the risk weight of the guarantor. In addition, such guarantees should cover the full term of the instrument (or reference asset) and be legally enforceable.

The seller (provider) of protection will take an exposure to the reference asset which should be treated as if it were a guarantee or direct credit substitute. This treatment also applies when looking at concentration risk to a counterparty for "large exposure" requirements. When the reference asset is different from the underlying asset, the risk weight to be applied will be the higher of the two. These principles are applied to all credit derivatives, except for total-rate-of-return swaps, where the provider of protection can deduct the amount of depreciation already paid to the beneficiary from the notional.

The institution that receives the guarantee may reduce the risk weight on the asset to that of the guarantor. For example, the reduced risk weight will be 20% if the guarantor is an OECD bank. This is the same principle that applies to all guarantees and direct credit substitutes.

The OSFI rules also cover credit derivatives on a basket of reference assets which provide protection on only the first asset that defaults. Here, the beneficiary may only treat the asset with the smallest dollar amount and lowest risk weight in the group as being protected. Conversely, a firm providing credit protection on a basket must assign the credit exposure to the highest risk category.

Criticisms of the regulatory approach to credit derivatives

A severe criticism which has been made of some regimes, such as the UK and Germany for example, is that banks may find that hedging credit risk actually increases their capital requirements. Suppose a credit derivative in the trading book based on a particular reference asset hedges a slightly different underlying asset. Under current rules, this hedge is not recognised. The specific risk from the credit derivative cannot be offset against banking book credit risk from a loan, or trading book specific risk from the slightly different bond.

This actually provides a disincentive to hedge positions. Using a credit derivative to hedge a position may create an extra capital charge. A bank is therefore being punished for hedging its credit exposure. This approach is currently adopted by the Bank of England and until recently by the Commission Bancaire in France, whereas in the US the Federal Reserve normally only imposes a capital charge on the largest of the two positions.

In addition to this restriction on offsets where the instruments are different, they are also restricted if there is a maturity mismatch, even when the instruments are identical. A ten-year bond hedged by a nine-year credit default option with exactly the same bond as reference asset is allowed no benefit of offset. Clearly, the protection is by no means complete; yet equally clearly, it is non-zero. In contrast, for non-credit risk elements of the capital rules of such as interest rate risk, partial offsets are permitted even when there is only a partial maturity match. Presumably the Commission Bancaire's lead will be followed on this at some stage.

ISDA has argued[8] that for sophisticated institutions that have developed credit risk models, an internal-models based approach to the recognition of offsets is the most appropriate way forward. Even this, however, will still have its limitations given that it will be adopted within a framework that distinguishes between banking and trading books.

ISDA also argues that it would be desirable to develop standardised rules for offsets. First, because any action by the Basle committee on internal risk modelling is unlikely to resolve the problem of the split between banking and trading books. Secondly, standardised offsets would help institutions which have not yet developed internal credit models. They argue that the most straightforward approach would be to adopt a 'straight line' or 'sliding scale' method for maturity mismatches. Thus, offsets would be allowed to the extent that the maturity of the hedge covers the underlying. For example, a ten-year bond hedged by a nine-year credit default option on that bond would be treated as 90% offset. Clearly, this approach does not address the question of whether the residual exposure is at the 'front end' or 'back end', and ideally the regime should address these issues. However, ISDA argues in favour of simplicity and conservatism at this stage, as the price for developing fairly quickly a regime which could be put in place to eliminate some of the worst problems currently existing. ISDA also argues in favour of standardised rules for instrument mismatches. Where bonds are issued by the same issuer but of differing seniority, they propose that a simple rule of thumb be employed to permit full offsets in any case where the short position is of more junior, or

[8] *Credit Derivatives: Issues for Discussion in Interim Prudential Treatment* October 6, 1997.

equal, ranking than the underlying long position. This is because, if the issuer defaults, the holder of the underlying bond will receive a better recovery rate on the senior debt (for example 10% of $100 million principal). They will receive a credit event payment amount of the full principal amount which is reduced only by the smaller recovery level on the more junior form of debt (for example $100 million reduced by a 5% recovery amount of $5 million). This ensures full protection (in this case $5 million recovery on the underlying and $95 million payout on the hedge). This approach resembles that adopted by the US banking agencies in the rules for recognition of credit derivatives as banking book guarantees. ISDA argues that where the underlying is a loan and the credit derivative hedge is referenced to the same loan, then there is a clear case for permitting full offset. The default events and payout levels will be identical. ISDA argues that the banking book rules should be adapted to provide a derivatives capital adequacy approach (rather than that for guarantees). Thus, in this case the short credit risk from the credit derivative would offset the loan credit risk on the loan, leaving only a remaining counterparty risk charge to the provider of the credit derivative.

In regard to the case where one side of the trade is a loan (or loan-based derivative), while the other is a bond (or bond-based derivative), ISDA argues that the approach outlined earlier should apply. That is, the seniority rules should be applied by looking to the relative seniority of the loan (since in most cases loans are deemed equivalent to senior unsecured debt or better, given that they are treated as being on equal footing – "*pari passu*" – in recovery).

In the case of credit risk arising from counterparty credit risk exposure, but hedged by a credit derivative, ISDA argues that the seniority approach should also apply. Since swap claims are typically treated as *pari passu* with senior unsecured debt in insolvency, there should be scope to offset underlying counterparty exposures arising from swaps books with credit derivatives which are referenced to assets that are of equal or lower seniority.

The longer-term horizon: rewriting the Basle Accord

Beyond the specific question of how to treat credit derivatives is the question of what the arrival of these instruments means for the traditional credit risk framework. It is perfectly plain that the growth of credit derivatives, and growth of modelling techniques to measure credit risk, pose a threat to the existing 8% Basle committee ratio. As more 'scientific' measurement techniques develop, the ratio is starting to appear increasingly arbitrary.

ISDA has produced a paper[9] on the Basle committee approach to credit risk. It focuses on a number of weaknesses in the existing regime:

- limited and arbitrary differentiation of credit risk (risk weightings of 0, 20, 50 and 100%);
- the fixed 8% ratio, which is a static and arbitrary measure of the risk;
- no distinction between a one-day and a ten-year loan;
- limited recognition and safeguards for collateral use;
- a simplistic method of calculating future counterparty exposure; and
- failure to allow for the effects of diversification: capital charges are the same for a single $100 million loan and for a hundred $1 million loans.

[9] *Credit Risk and Regulatory Capital,* March 1998

The approach recommended by ISDA is to introduce a three-tier framework. The existing structure would be kept, but firms would be allowed to use simplified credit models (to reflect the fact that not all banks have fully sophisticated credit risk management capabilities), or full portfolio credit risk models. They argue that this approach caters for the gradual extension of portfolio modelling by the most sophisticated banks, while also allowing for incremental improvements, short of full modelling, in the capital regime of other banks.

ISDA recognises that in the case of credit risk modelling, data requirements are more demanding than the market risk models, and the availability of data is much less. Accordingly, ISDA conducted an informal survey of credit data availability[10]. It admitted that "information is much less available for mid-market names and is generally weaker outside the US". In fact, this is rather an optimistic statement, since default data is publicly available only on US firms. Outside the US it is available only on bond issuers. ISDA also points out the difficulty of model validation in the credit risk context: "a statistically meaningful analysis of one-year default probabilities would involve an impractical number of years"[11].

A recent report from the Institute of International Finance's Working Group on Capital Adequacy agrees with the ISDA view that the 1988 Basle Capital Accord is no longer consistent with modern risk management practices. The report argues that bringing the regulatory framework into line with current practices will encourage all banks to strengthen and modernise their risk management systems. The aim should be to align economic and regulatory capital more closely than is possible at the moment. However, the IIF emphasises that their proposals are for an evolutionary process, not for overnight change.

The main recommendations of the report are:

- the 100% risk weight for private sector credits should be abandoned. Risk-weighting of private sector credits should reflect actual credit quality;
- the Basle Accord should be amended over time to permit banks to use their internal credit risk models to calculate the necessary level of regulatory capital, provided those internal models live up to certain standards. The report sets out ten general requirements that an internal credit risk model must fulfil to be deemed satisfactory.

Against these various criticisms, the regulators might argue that there are a number of advantages to the present Basle committee approach. First, the approach has the great merit of being simple. This makes it widely applicable, indeed applicable on a global basis. Any more sophisticated approach would inevitably be limited to the major operators. Second, and perhaps more important, the fact that the 8% is probably excessive in quite a number of cases means that it provides a cushion for other risks which are not separately measured or identified. In particular, the Basle ratios make no allowance for operations risk or legal risk.

Therefore, any move to replace the existing 8% regime by some more sophisticated measurement approach would in turn require the separate imposition of a new capital charge. This would need to cover operations risk, legal risk, and general uncertainty about the ability of the bank's management to protect it against all possible dangers.

[10] *Ripe for Reform,* M. Elderfield, Risk, April 1998

[11] *ibid.*

In this context a recent paper by David Jones and John Mingo of the Board of Governors of the Federal Reserve System[12] notes that although operating risk is not explicitly considered in the Basle framework, at many large banks the amount of economic capital allocated against operating risks is comparable to that allocated against credit risk. Those who argue that the 8% ratio is excessive might need to rethink their complaints: a separate capital charge for operations and legal risk might be a high price to pay for more 'accurate' credit capital charges.

Part of the regulators' problem, therefore, is that responding to the growth of credit derivatives means initiating the process of a rethink of the entire 8% Basle regime. This brings the attendant difficulty that any step forward which, in isolation, appears reasonable in the context of the credit derivatives discussion also needs to make coherent sense in the framework of the wider discussion. Otherwise, there is the danger of a series of ad hoc responses which simply complicate the longer-term reform of the agreement.

One of the trickiest regulatory issues raised by credit derivatives is the boundary between the banking book and the trading book.

Up to now, the fact that the trading book had a lot more flexibility than the banking book was not particularly critical. But in the specific area of credit risk, the trading book is much more generous than the banking book. There is thus a very strong incentive to move assets into the trading book to claim more favourable treatment.

One regulator commented that numerous banks were trying to argue that any given set of loans was tradable, but felt that the liquidity of the market was extremely questionable. This regulator recognised the argument that "it never will be tradable unless you allow it in the trading book" but felt that the mark-to-market process was by no means well established:

"We've not seen anything particularly reassuring on this – they can mark-to-model, but that's not quite the same thing."

The same regulator also commented:

"We are not seeing a lot of sensitivity analysis being done on these loan pricing models."

Clearly, abuses will need to be prevented, and this can probably be done without undue difficulty by requiring a satisfactory audit trail documenting the original intention to trade the underlying asset, together with evidence of some attempt actually to trade it. But there is a further long-run implication. The greater the proportion of banking assets which are handled out of the trading book – and if the credit derivatives market really begins to grow, presumably this proportion must rise – the greater the pressure to reconsider the whole practice of treating bank loans as an instrument that need not be marked to market.

This, in turn, has fundamental implications for the banking industry. Marking the whole loan book to market would be a very considerable upheaval. It would also cause immense problems unless the liability side of the banking balance sheet – i.e. deposits – was also marked to market.

A recent paper[13] discusses the impact of shifting the banking book, as well as the trading book, to a model-based approach. It makes the point that large

[12] *Industry Practices in Credit Risk Modelling and Internal Capital Allocations: Implications for a Models-based Regulatory Capital Standard,* D. Jones & J. Mingo, Board of Governors of the Federal Reserve System, March 1998

[13] Jones & Mingo, op. cit.

banks have substantially reduced their capital requirements by securitisation without materially reducing their overall credit risk exposures. It notes also that the Market Risk Amendment to the Basle Accord has created additional capital arbitrage opportunities where banks are able to shift assets from the banking book to the trading account and apply their own internal value-at-risk models for capital adequacy calculations on these credit risks.

In the authors' view, from a supervisory viewpoint the relevant issue is not how easily a sound bank could sell or hedge a single credit instrument of high quality. It is the extent to which a bank under stress could unload the credit risk of a large portfolio of weakened credits. Whereas the markets for secondary loan trading and credit derivatives appear to be expanding and are becoming more liquid, they have not yet been tested by any large bank under severe stress.

Another point made by this paper is that the sophistication of banks' estimation methods for assessing the loss rate, given default, varies considerably, particularly for complex financial instruments supporting securitisation activities.

"For example, it is not uncommon for banks to believe that, in the event of default, the [loss] for a subordinated loan functioning as a credit enhancement for publicly-issued asset-backed securities would be comparable to the [loss rate] of a corporate loan secured by some other assets (for example trade receivables or consumer credit). In the event of default, however, a $25 million subordinated loan supporting a $1 billion pool of securitised assets will tend to exhibit a much greater expected loss rate and loss rate volatility... than would a typical $25 million senior corporate loan secured by similar assets. This is because the former will generally absorb a disproportionate share, in some cases (by design) essentially all, of credit losses on the underlying asset pool. Given the growing importance of securitisation, the risk exposures of some banks arising from credit enhancements may loom large in determining their overall capital adequacy."

Finally, a key difficulty in respect of using internal credit risk models to replace the Basle committee approach to the problem is the fact that these models are likely to prove extremely difficult to validate. At most large banks, the size of the banking book and the length of its relevant planning horizon are orders of magnitude larger than those of the trading account. Moreover, the banking book does not benefit from the relatively high liquidity and the discipline of the daily mark-to-market process which are additional comfort factors in the case of the trading book. Most important of all, errors in measuring risks for the banking book are much more likely to affect the overall survival of the bank.

The paper concludes that "in our view, rapid movement to an internal models approach for setting regulatory [capital] requirements against the banking book … would be premature given the current state-of-the-art". However, it argues that "the scale of the regulatory capital arbitrage undertaken by the largest banks is indicative of the distortions created by the Basle framework, and portends continuing erosion of the current [capital] ratio measures as useful indicators of bank safety and soundness".

Evolution of the Basle approach: specific risk modelling

There has been some movement in this area from the Basle committee, which decided in September 1997

to modify the Amendment to the Capital Accord which was issued in January 1996. The change has the effect of removing the so-called 'floor' which would have applied to banks using internal models to assess specific risk as part of the overall modelling of market risk. The original rules required that the specific risk capital charge of internal models be subject to an overall floor equal to 50% of the specific risk amount calculated under the standardised approach. The Basle committee decided that this could be abandoned, as it had seen enough similarity among methods used by banks to set general criteria for modelling specific risk (i.e., the variation not explained by the general market). But the Committee has not yet agreed that existing methods used by banks are adequate to capture event and default risk. The Committee's press release noted that approaches to measuring this risk differ widely at present and that modelling in this area is in the process of rapid evolution. They therefore felt it impractical "at this juncture" to set general guidance for capturing this risk.

Furthermore, it is clear that the authorities remain extremely cautious about moving much beyond this; in the same press release, the Committee goes on to state that:

"The Committee's desire to have banks refine their modelling techniques for capturing event and default risk in the trading book should not be interpreted as a precursor to a decision concerning credit risk modelling for the banking book. The Committee believes that the modelling of event and default risk in the trading book is very different from the modelling of the credit risk in the banking book. In this regard, the Committee emphasises that the modelling of event and default risk as an element of specific risk within the trading book focuses on the potential for occurrences such as default to lead to precipitous changes in market values over a short period. The easy availability of market prices, the daily marking-to-market process, and the ability to trade instruments and to hedge using liquid instruments readily distinguishes specific risk modelling of trading book positions from modelling of banking book positions."

So the decision to be more flexible about specific risk in the trading book should not be taken, for the moment at least, as a harbinger of a major reform of the Basle regime.

Implications for the CAD

In a previous report, *Risk Management In International Securities Markets: Are Today's Standards Appropriate?,* we pointed out the gross inadequacy of the CAD framework. The primary problem stems from the fact that this is an EU directive and so, before the directive can take effect, it must first be approved by the European Parliament, and then by national parliaments in those countries, such as Germany, where banking and financial regulation is a matter of law rather than administrative regulation. This is an extremely cumbersome and lengthy process.

The first version of the CAD was negotiated in the early 1990s, and took effect in 1993. It was only implemented in Germany in August 1997. Thus the period from negotiating the directive to taking legal effect can be up to seven years. This is hardly adequate in an environment where financial markets are dynamic and evolving rapidly. The CAD has already had to be amended once to take account of the change in the Basle committee approach to allowing the use of internal models. This second CAD is not yet in place, but it is already clear that it is out of date. Credit derivatives are not included.

The entire process is legalistic, long drawn-out and contorted. In our last report on this area, we argued that a far more suitable framework would be for the CAD to have a very small core. This should lay down the minimum legal framework required, and delegate to an agreed group the framing of administrative regulations required to implement the basic law.

It has been argued that the current ridiculous process is necessary for "democratic reasons". In reality, what happened at the time of the introduction of the first CAD is that the European Parliament chose to make the CAD a hostage to one of its periodic exercises of muscle-flexing in an effort to assert itself. Ever since, no one has been prepared to question whether this is in fact the most intelligent method of managing the situation.

It is, of course, necessary to have democratic supervision of the EU's financial framework. We submit, however, that a far more efficient way of exercising this supervision would be for the European Parliament, if it chose, to review the administrative regulations laid down by the "CAD committee" which we suggest should be responsible for implementing the detailed rules. If, at that point, the European Parliament feels that there is something fundamentally wrong, no doubt public hearings could be held and pressure brought to bear on the appropriate quarters. As it is, we have the ridiculous situation that both the Bank of England and the Commission Bancaire have stated publicly that they are unable to make what they considered to be prudent regulatory decisions because they are constrained by a CAD which was drafted before credit derivatives were even considered. Furthermore, in a dynamic market place, this problem will recur continually. In this context we note the continuing growth of catastrophe derivatives. The recent announcement by FIFA that it will securitise insurance for the 2002 World Cup is a case in point. We see nothing in the CAD which would cover this.

Section 4
Possible regulatory or other problems with credit derivatives

Clearly, there are possible risks and dangers arising from the development of the credit derivatives market. Some of these have much in common with traditional banking problems and to that extent present no specifically new problems; they are listed below for the sake of completeness. Others arise from the fact that, for the first time, it is possible to create credit exposure to an entity without that entity borrowing or indeed even knowing that credit exposure has been created. This is the genuinely new aspect of credit derivatives and one which may well raise a number of issues at the policy level.

Problems in 'workouts'

We begin by noting that the use of credit derivatives may, in some cases, complicate the process of 'working out' a default situation. This is not a new problem, in that it has had to be addressed already, in a slightly different guise, namely the trading of distressed loans or debt in the secondary market.

Clearly, credit derivative trading can provide a useful exit route for lenders unwilling to participate in what could be a painful restructuring. This leaves those with a genuine desire to add value to agree the terms of a restructuring. On the other hand, it could delay the process of achieving agreement on the terms of a workout, or even undermine it. A situation could be envisaged where a bank which has credit protection might choose to 'play hard-ball' to maximise its recovery, secure in the knowledge that if it does tip the borrower into bankruptcy it is covered by its credit protection. One possibility might be a bank which has covenants in a loan which normally it might consider waiving. It might decide not to waive them, in order to trigger a default and collect on its protection. Another possibility might arise if there were a 'basis risk play'. A bank which has credit protection linked to a reference bond might collect under the reference bond payout and then have incentive to play hard-ball in the loan negotiations, because they have already recovered their losses and the loan recovery would be pure profit.

There are other tricky issues. One participant asked:

"What happens if you are in the middle of a restructuring negotiation, and your credit default swap expires tomorrow? Do you trigger a default to safeguard your own position?"

The counter-argument is that "you could only get away with doing that once". On the other hand, bank managements under pressure have been known to focus purely on the short run rather than think about the long-term consequences of their actions.

The timing of trades could have an unsettling effect on restructuring discussions. While it might be helpful in the early stages of a workout, credit derivative trading might bring new banks in when discussions were well advanced. This could be disruptive since newcomers would need time to bring themselves up to speed on the situation and may want to go over ground already covered in earlier discussions. This is often not

a realistic proposition. For example, in the UK the lack of statutory protection against creditor demands has tended to introduce a pressure to conclude a workout as quickly as possible.

In the past it has been suggested that trading in the debt of a company which was the subject of a workout should be prohibited; the Bank of England in the London market has resisted this but the same issue might arise in respect of credit derivatives traded on such debt. It might be that the solution is for some form of convention to be drawn up for use when trading the debt of a company which is the subject of a London Approach workout. This might include, for example, keeping the lead bank informed of all trades during a workout.

Negative aspects of credit trading

Other cases could arise where trading in credit derivatives might cause problems. We can start by pointing out three possible situations where these could arise:

- Carpet-bombing a credit;
- Crowding-out a credit; and
- Creating/manipulating a credit price.

The first, carpet-bombing a credit, refers to a deliberate attack on the credit rating or quality of a company. Several possible situations might lead to this, among them a hard-fought take-over battle, or alternatively a deliberate attempt to weaken a competitor firm.

Take, for example, the case of Apples Corporation, which banks with XYZ Bank. Apples currently does not borrow, and so XYZ has large unused credit lines marked for them. Its major competitor is Oranges Corporation. Both firms are interested in buying Bananas Corporation. Oranges' first act is to approach XYZ's capital markets group and indicate that for various normal commercial reasons it wishes to buy a large credit risk put on Apples Corporation – say $500 million equivalent. This is allocated against Apples' credit lines and the bankers are delighted. At last some income from the unused credit lines for Apples, even if indirectly. Champagne all round. Next Oranges launches its bid for Bananas. Apples approaches XYZ for finance to put together a counter-bid. It discovers to its horror that XYZ is unable to agree the loan in the time available; because the proposed loan exposure, combined with the credit derivative, puts Apples over its existing limit. While it might be possible for XYZ to buy credit protection on Apples in the market, it might not be possible in the very tight timescale required in a bid situation.

For an example, which we stress is entirely imaginary, of how the technique could be used to attack a competitor let us consider a hypothetical large software company. Call it, for the sake of argument, Megasoft. Let us suppose that this firm has a successful small competitor in a specialised market niche, say widget design. Megasoft would like to buy the firm, but it is not for sale. However, the firm is struggling to finance the next generation of its software. A possible strategy would be for Megasoft to approach the firm's bankers and suggest that for various commercial reasons, Megasoft requires credit protection against the smaller firm. Consequently, Megasoft wishes to buy a credit default option on the company in a very substantial size. Megasoft might then recruit one or two key employees of the smaller firm, sufficient to slow its development and force it to seek further finance. If Megasoft have bought sufficient credit default protection to make the smaller firm's bankers reluctant to

lend more, the firm might be unable to obtain finance. It would have to file for bankruptcy. At this point Megasoft would be able to acquire the technology very cheaply.

The two previous examples were concerned with a deliberate attack – 'carpet-bombing'. The next possibility, of crowding-out a credit, arises from the fact that parties may be trading in a company's credit without its knowledge. Even without a deliberate attempt to fill up bankers' credit lines to a company, active trading in credit derivatives on a corporation might result in its having difficulty in raising finance when it wished to do so. This could arise if all the banks which were familiar with its credit had already sold credit protection on the company. If now the company requires a substantial new credit, perhaps to finance a diversification into another line of business or to invest in some new production technique, it might find bankers reluctant to take on further exposure. Thus the credit derivatives tail has ended up wagging the dog: a genuine financing requirement has been obstructed by credit derivatives activity.

One trader was enthusiastic about the possibilities:

"The next good business will be renting a line from someone else who can't use it well."

On hearing the proposition that the corporate might be concerned to hear about this, the response was robust:

"Nonsense – every time we buy GMAC bonds we don't have to tell them – but it has a big impact on our available lines to them. Why should this be any different?"

We recognise that ours are purely hypothetical examples. Many uses of credit derivatives will be entirely positive and we do not wish to focus purely on the negative. But we would point out that past experience is that new derivative markets often create the potential for abuse and unforeseen problems as well as for improved risk management. In our previous report, *Derivatives in the Context of a Single European Securities Market*, we pointed to some possible dangers arising from the fact that equity derivatives were regulated differently from equity trading; the subsequent incident regarding SBC's trading in the Trafalgar House/Northern Electric takeover was a classic example of this type of problem.

The third issue is the creation/manipulation of a credit price. The problem here is slightly different: the market for banking credit is not regulated at all. Of course banks are regulated: but unlike the stock market, nobody takes responsibility for trading transparency in the market for credit. Thus the price at which a company commands credit is only visible if it comes to the public syndicated credit market. Once the transaction is done, the only means of tracking the price is through occasional reports in the trade press. For large multinationals the pricing presents little difficulty, but below say the top 250 companies in most countries, the picture becomes distinctly murky. There is thus considerable room for manipulation and also room for accidents to happen. Earlier in this report we referred to the 'signalling' effect. In this market, it is easy to imagine cases where the wrong signals about the price of a credit could be sent, accidentally or deliberately.

Careful attention by banks to conflicts of interest and the old-style approach to 'relationship banking' may prevent problems emerging. But in an era of transaction-style banking some firms may be unduly aggressive. Credit derivatives undoubtedly offer many benefits. But, as with OTC equity derivatives, the structural linkages between the derivatives and the underlying may require careful analysis and, in some cases,

preventive action rather than allow inadvertent damage to existing financial structures or deliberate market manipulation.

Securities law considerations

Securities laws are relevant in two main ways to credit derivatives. First, an offer or sale of a security may be involved. This can happen either through the credit derivative itself in some cases or through the physical delivery of a bond, note or participation interest in a loan in settlement of a credit derivative. Therefore, the compliance procedures used in selling a security may be needed. Similarly, the party which is selling the credit risk needs to follow its usual compliance procedures regarding any material non-public information known to it. Second, if after entering into a credit derivative transaction, one of the parties obtains any material non-public information, disclosure to the counterparty may break the relevant securities laws. Clearly, the management priority must be to make sure that securities law compliance procedures are adapted to take into account credit derivatives transactions, where appropriate.

We note with interest that one US participant commented that:

"If ever there's a question of physical delivery of the underlying security the major US investment banks tend to book the trades out of London. They don't want their unregulated subsidiaries falling into the SEC's net."

SECTION 5
PRICING OF CREDIT DERIVATIVES AND CREDIT PRICING

The pricing of credit derivatives is still primarily driven by traders' 'gut feel', since the underlying data are not available with anything like the length of history that are available for interest and exchange rates, or with the transparency of equity markets.

Pure forward-based products such as credit swaps can be priced much like other swaps. The net present value of each leg is computed using the risk-neutral pricing assumption that the 'expected' cash flow in each period equals the forward rate or price. Options on price or yield differentials have been priced using the Margrabe model, or some adaptation. Although the Margrabe model works well for things like cross-currency options, and equity out-performance options, its use in this circumstance has its limitations.

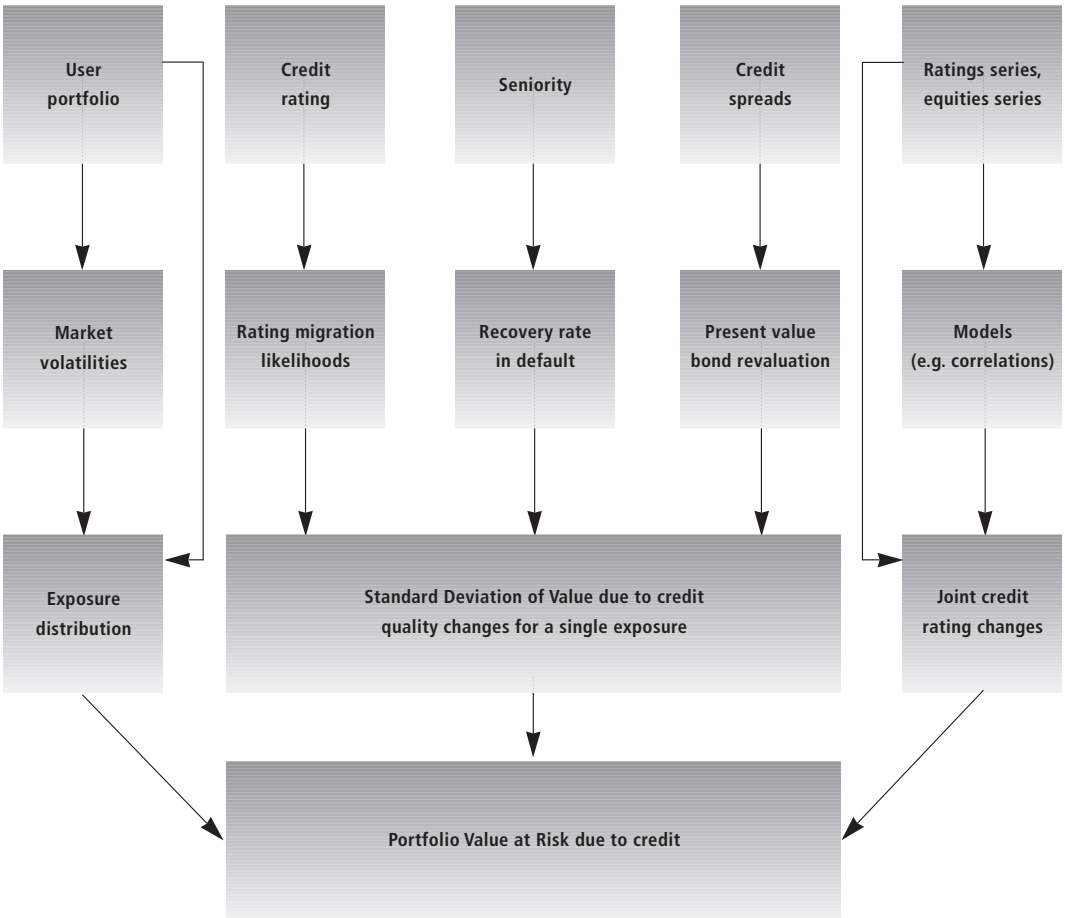
Other techniques are being developed to provide an integrated credit valuation framework, of which the best known is probably CreditMetrics. CreditRisk+ and the work of the KMV Corporation are also widely known and are discussed below.

CreditMetrics

CreditMetrics was introduced in April 1997. It is a framework for quantifying credit risk in portfolios of traditional credit products (loans and letters of credit), fixed-income instruments, and market instruments subject to counterparty risk, such as swaps and forwards. The concept was launched by JP Morgan jointly with Bank of America, BZW, Deutsche Morgan Grenfell, SBC, and UBS, together with a firm specialised in credit risk analytics, KMV Corporation. The approach has some resemblance to the approach taken in RiskMetrics, but there are some key differences. RiskMetrics can use daily price observations from liquid markets; CreditMetrics must construct what it cannot directly observe: the volatility of value arising from credit quality changes. Whereas RiskMetrics is primarily concerned with fitting distributions to observed data, CreditMetrics must focus on proposing models which explain the changes in credit instruments.

The basic technique employed is migration analysis. That is, the study of changes in the credit quality of names over time. In essence, CreditMetrics looks to a specific horizon and builds a distribution of estimated credit outcomes. Each credit quality migration is weighted by its likelihood (transition matrix analysis). Each outcome has an estimate of change in value. Estimates of correlation are then applied to aggregate volatilities across the portfolio. Figure 6 illustrates the overall process.

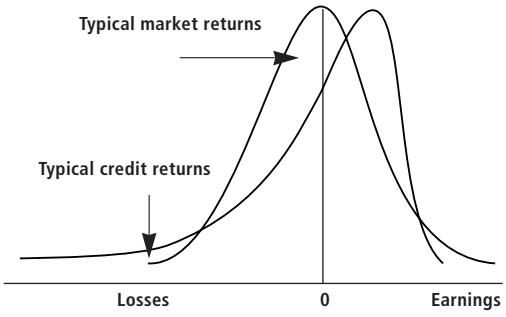
Figure 6 CreditMetrics process



Source: CreditMetrics Technical Document p.iv

The key feature of CreditMetrics is that, instead of focusing on individual credits, it takes a portfolio approach. This has the major benefit that it allows managers to consider questions related to risk concentration in a more sophisticated way than before. However, there are a number of problems to overcome. Whereas returns in equity and foreign exchange markets are reasonably well approximated by normal distributions, credit returns are highly skewed and have 'fat tails'– i.e. a higher probability of extreme events.

Figure 7 Credit returns vs. market returns



This long down-side tail of the distribution of credit returns is caused by defaults. The lending business consists of a good chance of earning a relatively small income from interest spread, coupled with a small chance of losing a lot. Across a large portfolio, there is likely to be a blend of these two forces, creating the skewed distribution in figure 7.

A second, and far more difficult, problem is that of modelling correlations. For securities and foreign exchange, correlations can be directly estimated from liquid markets. For credit quality, the lack of data makes it difficult to estimate any type of correlation from history.

Let us start by considering a single BBB bond which matures in five years. We will consider risk over a one-year horizon. So we want to know the possible spread of values for the bond at the end of one year. From historical data we can assume the following:

Table 1, probability of credit rating migrations in one year for a BBB bond

Year-end rating	Probability (%)
AAA	0.02
AA	0.33
A	5.95
BBB	86.93
BB	5.30
B	1.17
CCC	0.12
Default	0.18

Source: JP Morgan, op.cit., quoting Standard & Poor's

In other words, there is a 86.93% chance that the rating will not change, a 5.95% chance it will improve to A, and so on. The next step is to calculate the value that the bond will have at the end of the year. This means calculating the present value of the cash flows remaining; this is done by using the forward interest rate curve applicable to that rating. Suppose this results in the following values:

Table 2, calculation of year-end values after credit rating migration from BBB ($)

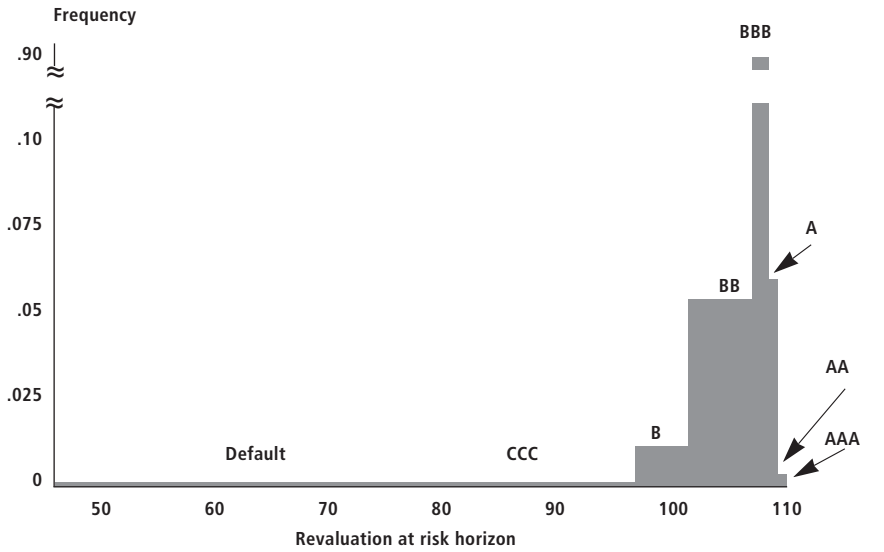
Rating	Coupon	Forward value	Total value
AAA	6.00	103.37	109.37
AA	6.00	103.10	109.10
A	6.00	102.66	108.66
BBB	6.00	101.55	107.55
BB	6.00	96.02	102.02
B	6.00	92.10	98.10
CCC	6.00	77.64	83.64
Default	0.00	51.13	51.13

The value distribution is shown in table 3 and Figure 8. The vertical axis represents the probability and the horizontal axis the value of the bond.

Table 3, Distribution of value of a BBB par bond in one year

Year-end rating	Value ($)	Probability (%)
AAA	109.37	0.02
AA	109.19	0.33
A	108.66	5.95
BBB	107.55	86.93
BB	102.02	5.3
B	98.1	1.17
CCC	83.64	0.12
Default	51.13	0.18

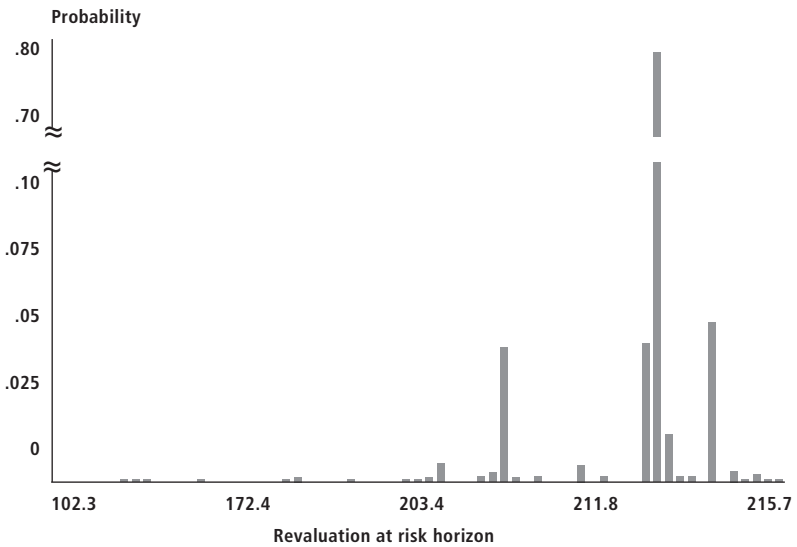
Figure 8 **Bond value distribution at risk horizon**



Source: JP Morgan, op.cit.

The next step is to add another bond. Again, we can have eight possible outcomes. Then we can combine the two, resulting in 64 possible outcomes. We can find the portfolio's value at the risk horizon in each of the 64 states by simply adding together the values of the individual bonds. However, this approach is too simple, since the outcomes on the two bonds are not likely to be completely independent. Credit ratings are affected, at least in part, by macroeconomic factors which will have an impact on each bond. Therefore, we need to estimate the correlation between the migrations. For the moment, let us simply assume a correlation equal to 0.3. With this information, we can calculate the joint probability for each pair (for example, the probability that the BBB bond stays unchanged, and its A counterpart likewise; or the probability that one bond rises a grade and the other falls a grade). We will arrive at something like the following (see figure 9).

Figure 9 **Distribution of value for a portfolio of two bonds**



Source: JP Morgan, op.cit.

Obviously, this process rapidly becomes very complex. Here we have 64 possible outcomes; with three bonds, the possible outcomes come to 512 and, in general, for a portfolio with N assets there are 8N possible outcomes. Therefore, for larger portfolios, it is much more practical to use a simulation approach. Outcomes are sampled at random across all the possible joint rating states.

It should be noted that the concepts used so far have been applied using bonds, but the approach is general. It can include loans and other kinds of credit risk. Only the calculation of future values is different for the different instrument categories. The likelihood of being in each credit quality state is the same for all instruments, because it depends on the name of the counterparty, not the instrument.

One objection to the use of rating agencies as a source of underlying information, at least insofar as concerns the international markets, is the fact that they have historically been very heavily concentrated on the US market. Indeed, foreign issuers were nearly as large a percentage of the Moody's rated universe in January 1930 (15%) as they were in January 1990 (18%). The international component has only really grown in the last seven or eight years, standing at 35% at the start of 1997. This is not exactly a long history with a broad base.

Another issue that needs to be considered is the question of general trends through time in the credit quality of the Moody's-rated corporate universe. To calculate annual rating drift we subtract from the total number of upward rating changes (weighted by the number of ratings changed per upgrade) per year, the total number of downward rating changes (similarly weighted) per year. We then divide this difference by the number of non-defaulting issuers at risk of rating changes during the course of the year. Rating drift

measures the overall increase or decrease in the credit quality of the rated universe as a percentage of one rating grade per issuer. Since 1920, annual rating drift has averaged –6%. This was heavily influenced by the 1930s figure of –24%; and the –9% from 1980–96. From 1940–79 the figure was only –1%.[14]

The introduction of CreditMetrics, like that of RiskMetrics, represents a considerable step forward in developing a framework for credit analysis which will undoubtedly play an important role in further development of the credit risk market. The primary difficulty in credit risk derivatives has been the heterogeneous nature of the underlying assets. By starting the process of developing a coherent framework for analysing credit portfolios, CreditMetrics has contributed to strengthening the analytical framework for credit derivatives.

KMV

A firm whose products are widely known in the credit arena and which has been involved with development of the CreditMetrics product is KMV. Its primary analytical tool is the Expected Default Frequency (EDF). It gives the probability that a company will default within one year, where "default" means the failure to make scheduled debt payments. The EDF, in essence, represents the default information which is contained in the company's stock price.

KMV calculates EDFs for firms with traded equity, and provides methods for calculating EDFs for firms without traded equity, as well as methods for updating firm default probabilities as a result of new transactions or changes in equity prices.

[14] Source: Moody's

The model lets banks rate and review the credit of some 5,000 publicly traded borrowers, based on the recent movement of their stock prices. It also provides a method for assessing and tracking the credit status of privately held firms. The thinking underlying the model is that companies default if the market value of their assets falls below the book value of their current liabilities. What concerns the bank lender is the value of the borrower's assets when his bank loan comes due. Either the value of the assets is greater than the amount of the bank loan or it is less. In the first case, the firm can repay; in the second, clearly it cannot. Unfortunately, the lender cannot directly observe the market value of his borrower's assets. But the market value of the assets is conceptually equal to the value of the liabilities – the firm's debt and its equity. The KMV method measures the market value of assets of public firms by tracking the price of the stock and using this information to imply a market value of the debt.

KMV works out the default probability for an individual firm using information derived from the firm's stock price and its liabilities. Equity is modelled as a perpetuity, and the default point as an absorbing barrier. An initial guess is made at the asset volatility, and from this the underlying asset value is derived. From the asset value series is derived a volatility which is used as the input into the next iteration, a process which continues until the iteration converges.

The liabilities of the firm are used to determine the firm's default point, namely the business market value at which the firm would be unable to service its obligations. The relationship between the current value of the business and the default point is restated in standard deviations using the volatility of the business, yielding a consistent measure of default likelihood across firms in different industries and countries. Historical data on

actual default experience is then used to assign a numeric probability to the distance to default.

Suppose, for example, a firm has an average stock price of $30 per share. Suppose, further, the volatility of this equity value is 20%. Assuming that the behaviour of the share price is such that it is normally distributed, we would expect that 68% of the time it would be within one standard deviation of the average price (i.e. it would range between $24 and $36 two-thirds of the time). The KMV model works out how much volatility would be needed to cut the value of the equity to the level where, together with the implied reduction in the value of debt, the market value of the company's assets is equal to or below the face value of the current debt. This amount of required stock volatility is termed the "distance from default". That gives us an expected probability of default, expressed in percentage terms.

In the above example, suppose that a fall in the company's stock price of just over $12 would be enough to drive the value of the liabilities, and therefore of the assets, below the face amount of current debt. We know from standard statistical theory that a normally distributed variable will stay within two standard deviations of the mean approximately 95% of the time. Two standard deviations in our example is $12. There is therefore a 5% chance, in our example, that the share will move outside the band $18–42. We are only interested in the chance of its falling to the bottom end of the range, so our risk in this example is 2.5%.

Having found the probability of default, the lender arrives at his expected loss by adjusting for the likely recovery rate. This depends in part on the quality of the collateral. To this must be added the cost of funding the loan if it does default, and any cost incurred in managing a bankruptcy if it occurs. The resulting figure is the bank's risk factor.

In essence, EDFs represent a way of extracting credit information from equity prices. Because equity prices contain considerable information about the value and volatility of the firm's underlying business, EDFs are quite good predictors.

The KMV model can be adapted to analyse the credit quality of private firms by using 'comparables'. The argument is that one can usually find among the KMV coverage of 5 000 publicly traded companies at least one, if not more than one, firm which operates mainly in the same industry and has roughly the same financial characteristics. The expected loss probability of this publicly traded firm is then viewed as a surrogate for that of the middle market firm under analysis. KMV also provides a supplementary method of assigning default probabilities to private firms. It produces what is called an implicit debenture rating.

By a regression analysis, we can isolate the values of various key accounting ratios that explain most of the differences between the different levels of credit rating provided by the rating agencies. Thus one can estimate with considerable accuracy the likely ratings that private firms which have these financial characteristics would have obtained, if they had issued publicly traded debt. Once one knows this 'shadow' bond rating, one can infer an expected probability of default.

The KMV private firm model was built initially by observing the link between cash flow and asset values for public companies. To estimate the value of a private firm's assets, the model uses the median value from firms in the same region and industry that have similar cash flow. For each region, KMV estimates from public market data a relationship between increasing asset size and decreasing asset volatility by industry. This median volatility is called "modelled volatility". This

volatility is then modified by a few characteristics specific to the firm.

KMV recognises that errors in estimation could have a measurable impact on the estimate of credit quality for a private firm, since overstating the asset value or understating the asset volatility will lower the risk of a default. However, they argue that their research on public companies suggests that companies that have above-median asset values tend to be companies with higher growth opportunities. The model will underestimate the asset value if it chooses the median value, thereby overestimating the risk. These same companies, however, tend to have above-medium volatilities – a normal characteristic of growth companies. The median model underestimates the asset volatility by selecting the median. These effects are offsetting.

KMV have tested the private company model by using it to predict what would happen to publicly traded companies (ignoring the information available for publicly-traded companies in the form of securities prices). Whereas the full public company model predicted 53% of defaults, the private firm model estimated 44%, thus performing reasonably well.

The CreditRisk+ model

Another widely-known system which has been put forward as an alternative to CreditMetrics is the so-called CreditRisk+ model. This approach incorporates a number of interesting techniques used in the insurance industry. It considers default rates as continuous random variables and incorporates a volatility of default rates in order to capture the uncertainty in the level of default rates. By contrast, CreditMetrics treats the default rate as a discrete variable. The possible path of the default rate is modelled using a rating transition matrix. The difference between the two alternatives can be illustrated visually (figures 10 and 11):

Another difference in the CreditRisk+ approach is how it handles the way in which defaults may be correlated, even though there is no causal link between them, for example because of the state of the economic cycle. The effects of these background factors are incorporated into the model through the use of default rate volatilities and sector analysis rather than using default correlations as explicit inputs into the model. The developers of the model would argue that modelling systematic risk factors, to capture general levels of default risk, and using the Poisson model for modelling individual, is a better technique.

The primary reasons why this approach has been taken is that default correlations are generally unstable. Although a similar instability problem may arise with default rate volatilities, it is much easier to perform scenario analysis on default rate volatilities. This is because a model which uses volatilities rather than correlations is generally more analytically tractable. In addition, there is little empirical data on default correlations. Defaults themselves are infrequent events, so there is insufficient data on multiple defaults with which to calculate explicit default correlations. Some approaches use asset price correlations to derive default correlations, but this can only be considered a proxy.

The method used in this model relies on the fact that the economic risk of a portfolio of credit exposures is like the economic risk of a portfolio of insurance exposures. In both cases, losses can be suffered from a portfolio containing a large number of individual risks, each with a low probability of occurring. Typically, in the insurance industry, the distribution used to model this situation is the Poisson distribution.

Figure 10 **CreditRisk+**

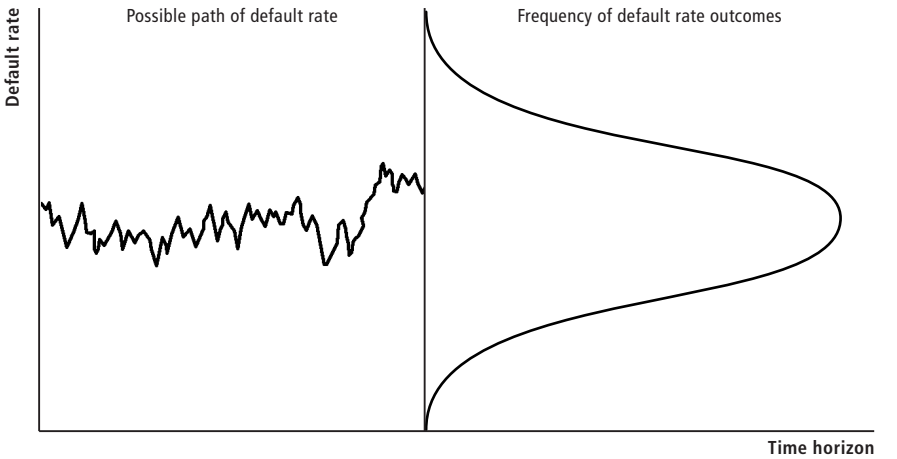
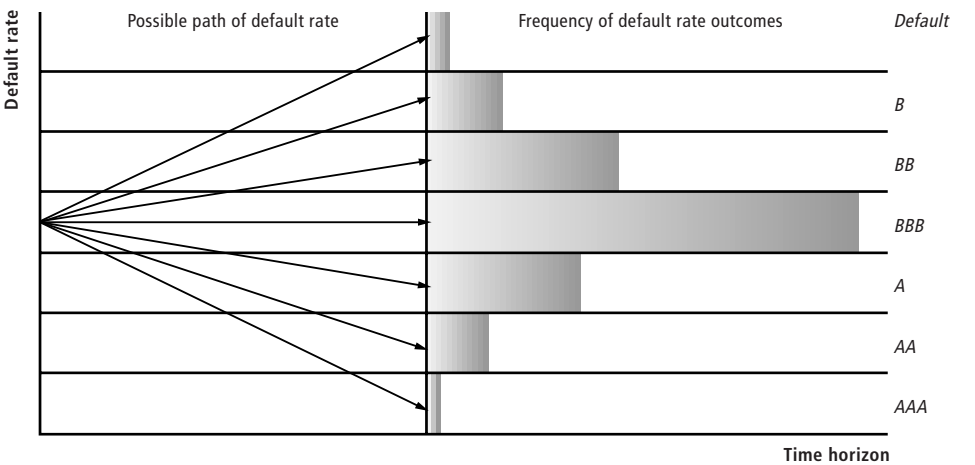


Figure 11 **CreditMetrics**



Source for figure 10: Credit Suisse Financial Products. *CreditRisk+.* 1997 p8

Source for figure 11: ibid. p9

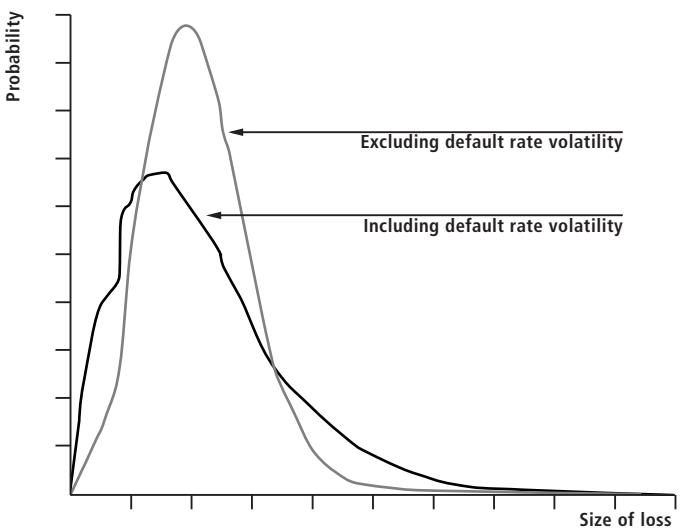
We begin by looking at the distribution of a number of default events in any given time, such as one year. If we do not build-in the volatility of the default rate, the distribution of the number of default events will be closely approximated by the Poisson distribution. But as is well-known, default rates are not constant over time. Hence the variability of the default rate needs to be included in the model. The CreditRisk+ approach is to model this by specifying a default rate and a default rate volatility. From this, we can build a curve predicting the number of expected default events. Given this, we can now consider the distribution of losses in the portfolio.

The distribution of losses differs from the distribution of defaults because the amount lost in a given default depends on how much has been lent to an individual borrower. The variation in exposure size results in a loss distribution which is generally not the Poisson. But, we can assume that the exposures in the portfolio are independent. Thus we can break the portfolio up into a set of 'exposure bands' which are independent of each other. We can derive a function to generate the distribution of losses.

Figure 12 illustrates the default loss distributions calculated with and without default rate volatility. Those distributions have the same level of expected losses, but the distribution incorporating the default rate volatility has a fatter tail. Thus, there is now more chance of experiencing extreme losses.

Also, since the tail of the distribution has become fatter while the expected losses remained unchanged, we note that the variance of the distribution has increased. This rise is due to the pairwise default correlations between borrowers. (If default rate volatil-

Figure 12



Source: CSFP op. cit.

ities are set to zero, the default events become independent and hence the pairwise default correlations are also zero.)

Portfolio diversification in this model is handled by, in essence, a factor sensitivity analysis. In this model a small number of factors explain the systematic volatility of default rates in the portfolio. The default rate of an individual borrower will reflect one or more of these factors. Also, specific factors are applied to each borrower.

The model also allows us to look at the risk of the portfolio on a hold-to-maturity time horizon. This captures any default losses that could occur until maturity. For example, because the one-year average default rates for investment-grade borrowers are relatively small but the exposures may be large, a one-year time horizon may not be the best measure for active portfolio management. Hence the model allows us to work out multi-year loss distributions. We break the exposure profile over time down into separate elements. The present value of the remaining exposure in each time period is assigned a marginal default probability relevant to the maturity and credit quality.

The McKinsey model

Another model has recently been announced by McKinsey and Co. Their approach differs in two important respects. First, it explicitly links credit default and migration behaviour to the economic drivers which determine the bulk of the systematic risk of any credit portfolio. Second, it is designed to be applied to all customer segments and product types, including liquid loans and bonds, illiquid middle market and small-business portfolios as well as retail portfolios such as mortgages or credit cards.

Appendix
Credit derivative instruments

Credit-linked note

A credit-linked note is an on-balance sheet, cash-market structured note. Often it will be issued by a special purpose vehicle. The note represents a synthetic corporate bond or loan, because a credit derivative (credit default or TROR swap) is embedded in the structure. Depending upon the performance of a specified reference credit, and the type of derivative embedded in the note, the note may not be redeemable at par value. For example, the buyer of a credit-linked note with an embedded default swap may receive only 70% of the par value if a reference credit defaults.

Investors in credit-linked notes take the credit risk of both the reference credit and the underlying collateral. The special purpose vehicle is generally collateralised with high-quality assets to assure payment of contractual amounts due.

The start of the market was in 1992/3 when firms such as Bankers Trust began selling notes whose redemption value depended on specified default events. In some cases the notes were linked to several entities. The investor received a healthy spread over LIBOR – 80 to 100 basis points – but if any of the entities underlying the note were to default, the investor took the coupon and principal losses. In effect the notes passed Bankers Trust's risk on its lendings to the entities through the buyer of the notes.

The market developed substantially in the following years. In most cases the pattern was similar. Typically the instruments are issued by special purpose vehicles. They combine the features of a standard fixed-income security with a credit option. Interest and principal are paid as normal, but the credit option allows the issuer to reduce interest payments if a key financial variable specified in the note's documentation deteriorates.

As we discuss in the report, the technique has been used for portfolios such as Bistro, Glacier and others, and for individual credits. For example, JP Morgan issued in September 1996 a $594 million ten-year note linked to Wal-Mart, the US retailer. The structure was that a special purpose vehicle was set up to issue the notes, entering into a total return swap with the bank. As will be seen below, one of the key issues in these structures is the definition of a "credit event". In this transaction, Morgan specified that the spread on the company's debt relative to LIBOR must weaken by at least 150 basis points before a credit event is declared. The bank has also set up a rigorous price discovery mechanism to help establish the recovery value of the debt if the company fails. Morgan would conduct a dealer poll of five leading market makers every two weeks for three months to establish a market value for the company's debt after default.

In December, the same firm followed up with the placement of $459.65 million structured note issued by a custom repackaged asset vehicle (CRAVE). The deal was for ten years, with an average life of six years.

Default swap

The most common credit risk derivative is the default swap. This is a contract in which one counterparty (the protection buyer) pays a periodic fee – typically expressed in a fixed amount of basis points on the notional amount. In return they receive a variable payment contingent on the default of one or more third party credits. This payment is designed to mirror the loss incurred by creditors of the reference credit if it defaults. It is usually calculated as the fall in price of a reference security below par at some pre-designated interval after the reference credit has defaulted. Default swaps are now covered by standard ISDA documentation.

An example of a five-year default swap might be as follows. XYZ Bank has lent extensively to Japan and Japanese entities. It wishes to free up its credit lines to that country. Accordingly it enters into a five-year default swap using a Japanese government bond as the reference security. XYZ Bank pays a premium to the counterparty of, say, 8 basis points per annum. The counterparty makes a payment in exchange only if Japan defaults on its debts. In this case the payment might be par less the final price of the Japanese government bond, multiplied by the notional principal amount of the swap. So if Japan defaulted, and the reference bond fell to 85%, XYZ Bank would collect the 85% by selling the bond, and the remaining 15% from its swap counterparty. This type of synthetic asset reallocation trade allows the hedging institution to free credit lines in their loan or derivative portfolios to permit them to do new business.

Typically, the reference credit has a borrowing relationship with the bank that is buying credit protection. The bank may want to diversify its portfolio by reducing its exposure to the borrower; the swap lets it do so without disturbing its relationship with the customer. The methods used to fix the amount of the payment that would be triggered by the default vary by instrument. In some contracts, the amount of the payment is agreed upon at the start of the contract. In others, the amount paid is fixed after the default event and is based on observed prices of similar instruments of the borrower in the corporate bond market. A default event must often exceed a materiality threshold to trigger a payment under the swap contract.

Total-rate-of-return swap

A variant of this approach is the "total-rate-of-return swap (TROR)". Conceptually the total-rate-of-return swap is simple. One party pays the other the total return on a credit or group of credits, receiving in exchange another payment which is usually LIBOR based. The total return comprises the periodic interest payments on the underlying loan, plus other fee revenue such as commitment fees, plus or minus changes in the underlying value of the loan or group of loans. The exchange of payments generally occurs quarterly. At that time the swap payer would pay the swap receiver the interest payments accrued and paid during the quarter plus any fees accrued during the quarter. In return the swap receiver would owe the swap payer LIBOR plus or minus a spread on the total amount. Finally, price settlements can be done at the end of the swap or more often. If there has been a rise in the value of the loan, the swap receiver would have a gain, conversely the payer would gain if the value has fallen. The final price fixing usually provides prices to be set by an independent third party using actual market quotes.

The more frequent price settlement, evidently, has the merit of ensuring that the swap never builds up its own substantial potential credit risk. In the preceding default swap example, we have a 15% exposure to the

swap counterparty by the time it comes to be closed out.

Although the hedger has transferred the risk of the asset, it does not transfer the asset itself. It retains the customer relationship; it must continue to fund the asset. TROR swaps may, but need not, terminate upon a default event.

Key issues

Some of the key issues which arise in respect of credit derivatives include:

1. Definition of a credit event.
   Among the chief things to be defined in a credit default swap or option is the "credit events" which trigger a valuation of the reference credit and a payment by one of the parties. Some deals provide for only two credit events: a payment default on a reference credit or an insolvency of the reference credit. While these credit events are fairly easy to verify, other transactions use a list of a half dozen or more credit events. These range from a credit rating upgrade or downgrade to a default by the same obligor on a different credit ("cross-default") or a restructuring of agreements relating to the reference credit. Some swaps provide for payouts if the credit spread over Treasuries changes. This broader set of events may give more protection to the buyer of credit protection. But their occurrence may be hard to confirm. The description of the events in the agreement is often vague. It may need subjective judgements about, for example, "material adverse effect".
2. Establishing that the credit event occurred.
   Credit derivative documents sometimes set out what is needed to prove a credit event has occurred. If an agreement includes a list of credit events that go beyond payment default and bankruptcy, it may be hard to produce clear evidence of a credit event. The agreement may have a materiality threshold. Or it may say that the credit event must be confirmed by third-party evidence such as publication of information about the default in a recognised source. This can lead to disputes if the agreed third-party source does not publish the information or if there is a delay in publication while the credit status of a reference company continues to decline.
3. Rights to the reference credit.
   Some credit derivatives specify the rights of the parties regarding the reference credit. For example, a credit derivative (particularly forwards and some types of options) may provide for physical settlement through delivery of the reference credit. In some trades, the party holding the reference credit in its portfolio may agree not to accept certain changes to the reference asset without the counterparty's consent. However, it is more common for the agreement to leave the owner of the reference credit free to sell it, exercise its voting rights or take other actions, giving the counterparty no control rights over the reference credit.
4. Sharing of information on the credit.
   If one party to a credit derivative holds the underlying reference credit, it may receive confidential information from the borrower (or from the agent for the syndicate or the trustee for security holders). There may be strong reasons for it not to disclose this information to the derivative counterparty. These might include confidentiality obligations under the credit agreement or securities laws. There might be a concern that premature

disclosure might make it hard to restructure the credit. Hence it may be best, from its viewpoint, not to include in the credit derivative documentation any obligation to transmit information it receives, and to limit the credit events to those which have been publicly announced. On the other hand, from the viewpoint of the party taking the credit risk in the derivative, such information is clearly material. The question of insider trading may become relevant.

Example

Although the pricing of credit derivatives presents complexities, it is unlikely that these will limit the development of the market. Hedging, however, is a different matter. To date, the difficulty in hedging has limited the size and cost effectiveness of many types of products. By way of looking at the workings of the market, it may be helpful to look at a specific example.[15] We will look at the 7.95% K Mart bond maturing February 1, 2023 and the 7.125% US Treasury bond maturing February 15, 2023. Consider a situation where an investor expects K Mart's credit quality will improve over the next year. He enters into a credit spread swap with a dealer.

The dealer will enter into a series of deals to hedge the exposure created by the swap. The initial hedges are shown in the figure 13 below.

As can be seen from the diagram, the trades needed are as follows:

1) Borrow the Treasury bonds, in order to
2) short-sell the Treasury bonds,
3) borrow additional funds, and
4) use the proceeds to purchase the underlying K Mart notes.

The size of the K Mart note trade and the Treasury bond trade depends upon their respective durations. In this example, the face amount of K Mart bonds bought is around $1.44 million, for a cash price of $1.08 million. The face amount of Treasury bonds shorted is about $0.82 million. Hence the need to borrow $0.26 million to make up the cash shortfall.

A few comments should be made here.

- The diagram shows the initial hedging only. The hedge must be dynamically managed. Because of convexity (i.e., the non-linear relationship between prices and yields), the hedge is adjusted as the yields of the underlying instruments change.
- The above deals do not leave the dealer perfectly hedged. In particular, during the time the dealer holds the K Mart bonds, it receives the coupon payments on them (7.95% per annum). But if the K Mart bonds default, the dealer loses these coupon flows. This is typically solved by the dealer charging the investor a premium for that risk.

The existence of the credit derivative does not change the fact that in order for the investor to take a view on K Mart's credit, the underlying bonds must be bought. The key difference is that the dealer, rather than the investor, does the actual purchase. This is why leveraged transactions, as discussed in the main body of the report, are the only way to get round the fact that the volume of corporate credit derivatives is limited by the size of the underlying market.

[15] This example is drawn from *Credit Risk Derivatives* by Capital Markets Advisers, 1996

Figure 13

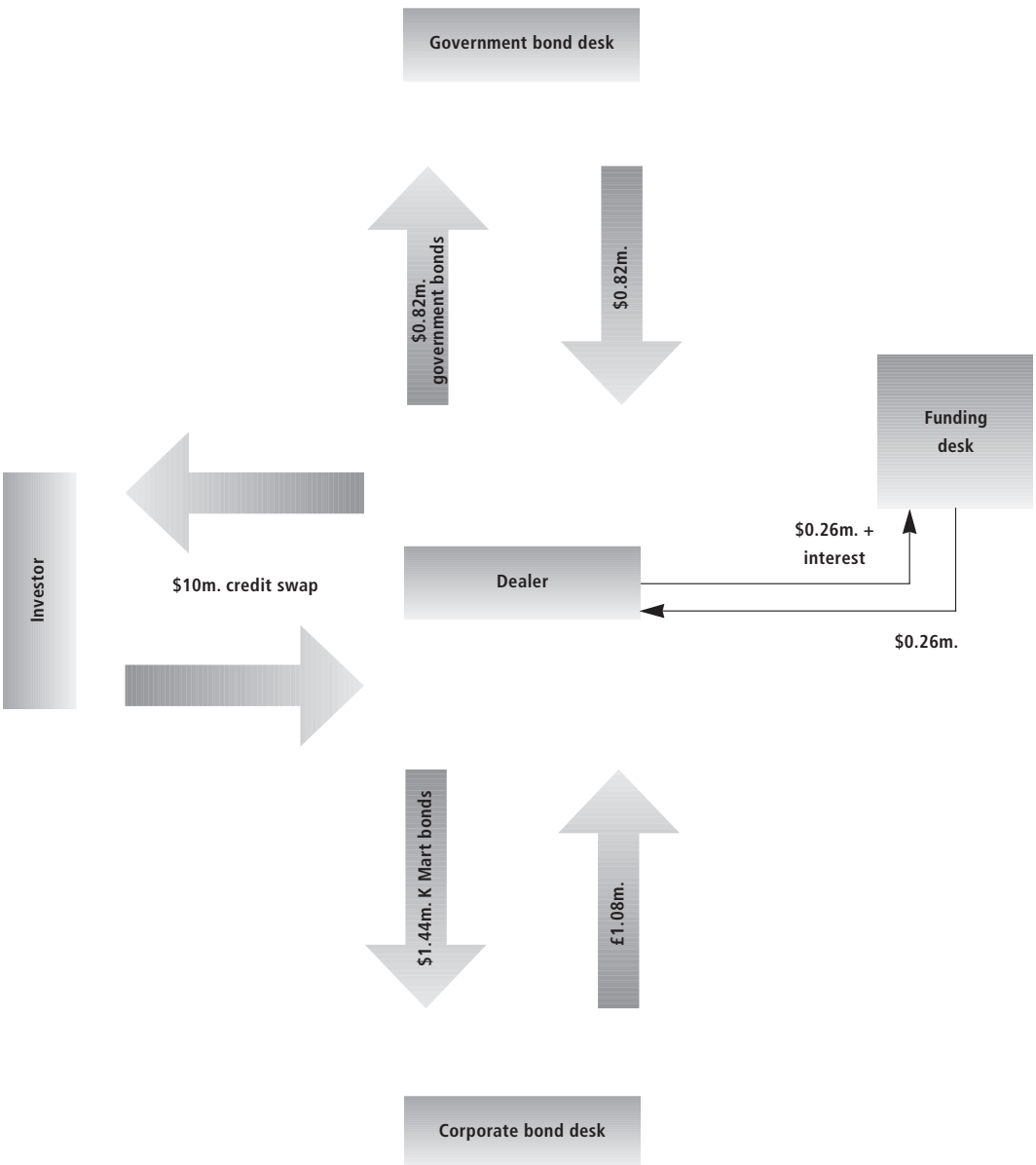
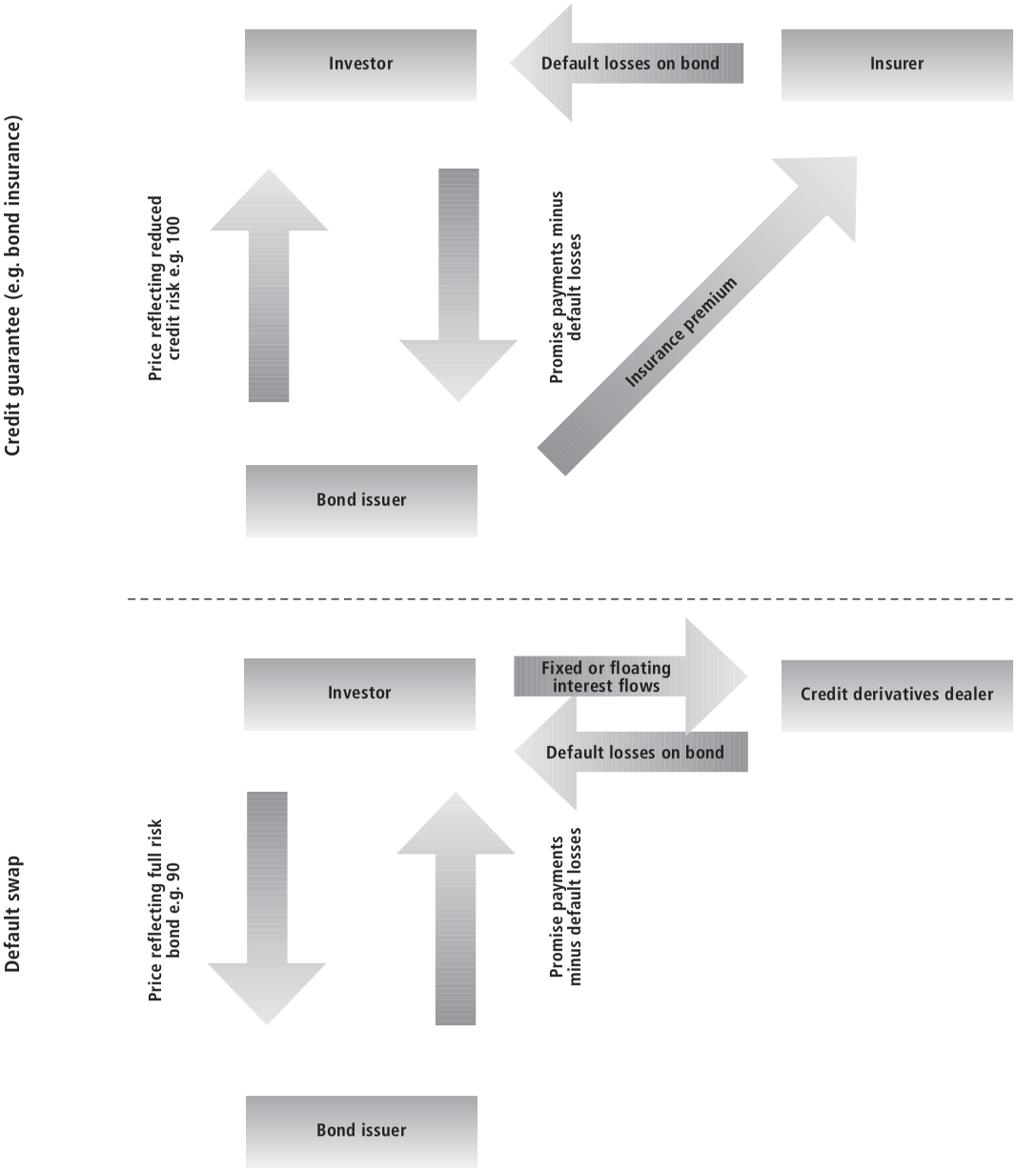

Government bond desk
$0.82m. government bonds
$0.82m.
Funding desk
Investor
$10m. credit swap
$0.26m. + interest
Dealer
$0.26m.
$1.44m. K Mart bonds
£1.08m.
Corporate bond desk

Figure 14



Source: *Credit Derivatives*, Capital Market Risk Advisors, Inc.

Predecessors

Before modern credit derivatives, there were financial arrangements which were economically similar, if not identical. An example is bond insurance, under which an issuer pays an insurer to guarantee performance on a bond. Bond insurance is used widely in the US municipal bond market, where by 1993 some 35% of the issues were insured. A similar arrangement is the letter of credit, or LC, where a bank, effectively, insures the bond.

Both LCs and bond insurance are similar to default swaps, as they provide for protection against non-payment (figure 14). There are, however, important differences, the most important being that LCs and bond insurance are contracts between the issuer and guarantor, so are not tradable separately from the underlying obligation.

Corporate issuers also embed credit derivatives in their debt securities. For example, puttable floating rate notes (FRNs) give the investor the right to force an early redemption. This could be considered a type of credit derivative: changes in credit quality determine whether option exercise is advantageous.

A third credit derivative predecessor is the spread-lock. Spreadlocks were developed in the late 1980s, and soon joined swaps, caps, floors and swaptions as plain vanilla derivative structures. A spreadlock is a contract which guarantees a market participant the ability to enter into an interest rate swap, at a pre-determined spread over treasuries. An example of a spreadlock is a contract under which the parties agree that in one year's time, they will enter into a five-year swap under which one party pays LIBOR and the other pays the five-year Treasury yield as of the start date, plus 30 basis points. Spreadlocks may be viewed as credit derivatives because one of the factors which drives the underlying swap spread is the general level of credit spreads.

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