Credit derivatives: Just-in-time provisioning for loan losses

James T. Moser

Introduction and summary

Risk managers use a "peeling an onion" analogy to illustrate their prioritization of risk management activities. The resulting priorities have produced the contracting innovations needed to manage the outer layers of this risk onion. These tools are derivative contracts whose values are driven by changes in interest rates, equity prices, and foreign exchange rates. Having dealt with these outer layers, today's risk managers are paying increasing attention to the inner layers of the onion, most especially credit risk. Furthermore, globalization of the financial markets is increasing diversification opportunities. To remain competitive in the global marketplace, financial institutions whose borrowers are concentrated in certain business or geographic sectors are seeking methods to improve their diversification of credit exposures.

The efforts of risk managers are proceeding on two fronts. First, they are developing methods to measure credit risk exposures. Three of the better known procedures for measuring credit exposures are the *Expected Default Frequency* metric developed by KMV,[1] J. P. Morgan's *CreditMetrics*,[2] and Credit Suisse's *CreditRisk+*.[3] Second, risk managers are engineering derivative contracts to enable transference of credit risk exposures.[4] This article examines some of these contracts and compares this new risk management route with a traditional route for managing loan loss exposures.

Descriptions of growth prospects for the credit derivatives market in terms such as "the next interest rate swap" stem from a confluence of events. Smithson (1997) points out that the first steps came as over-the-counter (OTC) derivatives dealers began to recognize the need to manage their credit exposures to one another. This recognition led to efforts to quantify and then to create structures controlling credit risk exposures. One such structure is the derivative product company (DPC), in which derivative contracts are booked in a subsidiary that then books an offsetting position with its parent.[5] Such structures shift broad market exposures, most often to interest rates, from the subsidiary to the parent firm while retaining credit exposures to original counterparties at the subsidiary level. These structures are motivated by the need to raise the credit ratings of OTC dealers and improve their ability to compete for business. DPC structures isolate credit risk from other risk sources. This enables institutions to allocate capital directed at credit risk concerns. In addition, DPC structures motivate specialization in credit risk management.

Recently, attention has focused on transferring credit risk from one party to another using credit derivative contracts. Various contracting schemes are now labeled *credit derivatives*. The common feature of these risk management tools is that they retain assets on the books of originating institutions, while transferring some portion of the credit exposure inherent in these assets to other parties. This accomplishes several objectives. Originating institutions have a vehicle that transfers credit risk without requiring the sale of the asset. When asset sales weaken an institution's relationships with its borrowers, a vehicle transferring only the credit exposure permits the institution to retain its relationship. In addition, the ability to reshape credit exposures through derivatives can

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be used to improve diversification. For example, an institution with loan concentrations in a problem industry can lessen credit exposures by swapping its exposures in the problem industry for credits from a broader borrowing segment. Thus, following an oil price decline, the credit exposures from loans to oil exploration firms may be regarded as excessive. A credit risk swap reduces the institution's concentration in these firms to achieve a more diversified loan portfolio.

Current regulatory policy toward credit derivatives does not recognize their risk reducing potential. Instead, it emphasizes their potential use as risk increasing instruments.[6] Consequently, users receive only limited relief from regulatory capital requirements. Relief from regulatory capital requirements is available when credit derivatives are used to hedge assets held in bank trading books. For assets held in banking books, regulatory capital relief is less generous, limited to instances when the credit derivative gives a one-to-one match with the loss experience of individual banking-book positions. This treatment cannot be applied to portfolio positions held within the banking book. In addition, regulatory capital can be required for the credit derivative itself. If holdings of regulatory capital are costly, banks will generally find this treatment restricts their use of these contracts. In contrast, banks' holdings of provisions against loan losses, a traditional method for managing credit risk, can be used to fulfill their tier two capital requirements.

In view of the potential for more cost-efficient management of credit risk, current regulatory policy toward credit derivatives needs reexamination. In this article, I compare the outcome from a credit derivative contract with that of loan loss provisioning, the more traditional method of managing credit risk. The comparison illustrates that under some circumstances, credit derivatives obtain the same economic outcome and, in these circumstances, can be afforded regulatory treatment similar to that of the traditional risk management method.

Review of credit derivatives

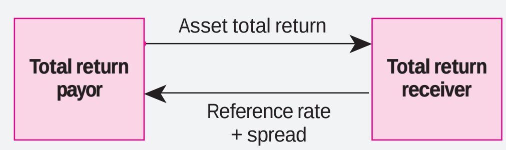
The variety of credit derivative contract forms can obscure the common role of these contracts as mechanisms to transfer credit risk between counterparties and the returns for bearing this category of risk. The British Bankers' Association (BBA) surveyed the London market in 1996. The credit derivatives it encountered fell into four categories. Below, I review two of the more important contracting formats encountered by the BBA survey: total return swaps and credit swaps.

Total return swaps

Figure 1 depicts the payment flows for a total return swap. The swap exchanges the payment configurations of two counterparties—actual payments made between the two counterparties being the net of the respective payment configurations. The *total return payor* pays out based on the return from its holdings of a risky debt obligation or a portfolio of risky debt obligations. Total return for risky debt is the sum of an interest income stream and changes in the market value of the debt. The risk of these returns is the variability in this sum. Of particular interest for credit risk managers are bond defaults and changes in the prospects for subsequent default. Box 1 describes the relationship between changes in default prospects and credit risk. Clearly, if a bond defaults, returns from the bond are affected by a curtailment of interest payments. In addition, the value of the debt will be affected by market assessments of value recovered through bankruptcy proceedings. Prospects for future default on the obligation are typically characterized as *ratings changes*. Yields for risky debt adjust according to changes in these prospects, rising when payment prospects worsen.

FIGURE 1

Total return swap



The counterparty to a total return swap, the *total return receiver*, bases what it pays on the returns from a default-free obligation less the negotiated compensation for taking on exposure to the risky debt. It receives the return from the underlying risky debt. The result of the swap is that the total return payor obtains the income stream appropriate for a default-free obligation and the total return receiver obtains the income stream appropriate for holdings of risky debt. The reconfiguration of income streams is accomplished contractually rather than by exchanging ownership of the respective debt obligations.[7]

Payments based on principal repayment are typically omitted in this contract format. Thus, the risk reduction for total return payors is largely the income loss from ratings downgrades, rather than the amounts recovered from defaults. Since vehicles to manage losses from changes in interest rates are well

BOX 1

Sources of credit risk

Panel A of the figure below illustrates the payout at maturity of a risky debt obligation. Points to the right of the "kink" represent the promised payout of the bond. When the firm's value exceeds the value of its promised payments, bondholders receive the full value of the promised amount. To the left of the kink, the owners of the firm default, ceding ownership to the firm's debt holders.

Panel B charts the probability for each possible value of the firm. The filled-in bars represent the distribution of probabilities based on initial information. The most probable outcome is well above the promised payment amount as indicated in panel A and the probability of a zero outcome approaches zero. The lighter-shaded bars represent a revised distribution of probabilities such as might occur after the release of negative news about the firm's future prospects. The most probable outcome is shifted downward to just about the level of the promised payment amount and a zero outcome is a nonzero probability event.

Combining these probabilities and their respective outcomes, one can calculate an expected (probability-weighted) payment amount. Visual inspection (correctly) suggests that the expected payment amount declines with the revised probabilities. To understand credit risk, consider that the amounts in panel A are contractually determined. Bond ratings are a rank-order measure of the probability that the firm's ability to meet its debt obligation will change; higher rankings imply less likelihood of a change within a given period of time. Hence, a rating downgrade implies a capital loss because it is more likely that the firm will be unable to meet its debt obligation.

known, I proceed with the assumption that the interest rate exposure of the risky debt obligation is fully hedged. This allows me to focus on the value fluctuations from changes in default risk.[8]

Suppose a bank's holding of single-A, floating-rate debt pays 200 basis points over the reference rate. If the reference rate is 8 percent, then the borrower is obligated to pay 10 percent for that period. A credit rating downgrade of the borrower that decreases the price for that debt by 8 percent implies a total return of 2 percent. The receiver of the total return swap is due to be paid 2 percent for that period. The total return payor is due to receive the 8 percent reference rate less a spread amount of say 25 basis points, totaling 7.75 percent for the period. Payments are the net of these amounts, so the total return payor receives 5.75 percent. Combining this receipt with the 2 percent obtained from the payor's debt holding gives a return of 7.75 percent. Therefore, the payor locks in a 7.75 percent return. The appeal for the total return receiver in the swap arrangement is the ability to participate in the return stream of the underlying debt obligation without investing in the bond itself.

As demonstrated, the total return swap increases cash flow certainty. The traditional bank management strategy achieves a similar end. Provisioning that invests some assets in default-free securities also achieves a lower bound for default losses. An important distinction is that the provisioning strategy maintains an inventory of liquid assets, while the credit derivative strategy delivers cash flows as losses are realized.

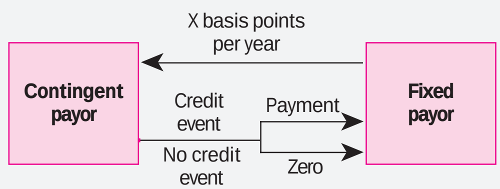
Credit swaps

Compared with the total return swap, the contingent payout feature of credit swap contracts comes closer to matching features usually associated with insurance contracts. As displayed in figure 2, fixed payors insure against credit events by making periodic payments of a fixed percentage of the loan's par value. On occurrence of a predefined credit event such as a loan default, the contingent payor makes a payment compensating the insured for part of its loss. Otherwise, the contingent payor pays zero.

Taking the defined credit event to be default on a debt obligation, a credit swap might be structured as follows. As before, suppose floating-rate debt rated at single A pays 200 basis points over its reference rate. The holder of this debt negotiates a credit swap to insure against loss due to default. The debt holder is a fixed payor in the contract, paying 10 basis points per period to the contingent payor. Should the debt issuer default on the obligation, the fixed payor receives a preset payment. Otherwise, the contingent payor pays out zero. The payment offsets the loss incurred due to the default. Contracts can be structured in many ways, for example, payment of a fixed amount on default or payment proportional to loss amounts.

FIGURE 2

Credit swap



In the case where the credit swap pays the difference between the loan principal value and the recovered amount, the credit swap limits the loss for the defined credit event to the value of loan principal. An investment policy combining default-free securities with risky debt can replicate this lower bound for loss. Thus, traditional loan loss provisioning combined with investing provisions in default-free securities can duplicate the benefits of a credit derivative. The difference is that the credit derivative delivers cash flows on a *just-in-time* basis, while the provisioning strategy retains cash inventories. Once credit derivatives are understood as an alternative to traditional provisioning and investing methods, the choice between the two alternatives is one of cost effectiveness.

Simple model for choosing between credit risk management tools

Credit derivatives fulfill purposes similar to those achieved through traditional methods of credit risk management. Suppose a bank decides its exposure to credit risk is excessive. To lessen its exposure, it reinvests some of its cash flow in default-free securities such as Treasury bills. These investments will be labeled provisions for loan losses.[9] In making this decision, the bank foregoes other lending opportunities. Therefore, its opportunity cost from the credit risk management decision is the foregone return from extending loans. I compare the bank's use of funds for the loss provision and the credit derivative. When the credit derivative can be had at a lower cost than the funds outlay for a loss provision, the bank has an opportunity to extend its loan portfolio. The expected return from investing this difference in loans can exceed the opportunity loss when banks invest in low-risk, low-return assets.

Opportunity cost comparison of credit derivatives and loan provisions

In one period a loan currently valued at L will have one of two values. In the up state the borrower repays the loan, giving the lender proceeds of uL. In the down state, the borrower defaults on the loan and the lender recovers the fraction d of the amount due from the borrower. A one-period risk-free investment can be made that returns r dollars for every dollar invested in the current period. It is natural to stipulate that in the up state the loan pays more than its current value and in default it pays less than its current value, so $uL > L > dL$. Further, since the loan is risky, its return in the up state is larger than a parallel investment at the risk-free rate, so $uL > rL$.

I assume an insurance contract can be purchased that pays the difference between the face value of the loan and its recovery value when the down state occurs (more on this later). The price of this contract is based on the current price of the loan, the payoffs in the up and down states, and the risk-free rate of interest. I label this contract $I(L, u, d, r)$. I consider two investment strategies, provisioning and credit derivatives (as shown in table 1).

Strategy 1 is the provisioning strategy. If the loan defaults, the loss will be $1 - d$ dollars per dollar of loan value for a total loss of $(1 - d)L$ dollars. Investing the amount $(1 - d)L/r$ at the risk-free rate, the one-period payoff from provisioning is $(1 - d)L$ no matter which state occurs. The portfolio includes the loan that pays off uL in the up state and dL in the down state. In the down state, proceeds from the provisioning investment match the loss realized on the loan. Therefore, the bank has *prefunded* the loss and locked in L, the face value of the loan. In the up state, the bank realizes gains on both the loan and the provisioning investment.

Strategy 2 uses a credit derivative contract to insure against cash flow disruption. Like the provisioning strategy, proceeds from the credit derivative match the loan loss realized when the down state occurs.

TABLE 1

Comparison of outcomes from provisioning and credit insurance contract

Investment made at time t	Payout at time $t+1$ Up state	Down state
1) $(1-d)L/r$ at riskless rate r plus the loan L	$(1-d)L + uL$	$(1-d)L + dL$
2) Purchase insurance contract $I(L,u,d,r)$ plus the loan L	$0 + uL$	$(1-d)L + dL$
Difference 1 – 2:	$(1-d)L$	0

With respect to the down state the bank is indifferent between the two strategies. Should the up state occur, the bank realizes uL from the loan but proceeds from the credit derivative contract are zero. Comparing strategies 1 and 2 in the up state, the difference is the amount of the loan loss.

The bank's decision requires comparing the time t costs of its alternatives to obtain the up state outcomes. To facilitate the comparison, I stipulate the existence of additional lending opportunities matching those of the loan considered above. The expected return from these lending opportunities is denoted r_L. The bank has three investment alternatives: provisioning, lending, and insuring. It can fund its provisioning account with an outlay of $(1-d)L/r$. If the cost of the insurance contract $I(L, u, d, r)$ exceeds $(1-d)L/r$, the bank rules out the insurance contract. This is because the outcomes from insuring and provisioning are identical in the down state and the up state return from provisioning dominates insuring for positive rates of interest.

When the cost of the insurance contract is equal to or below the outlay required for the provisioning alternative, the bank weighs the risk-adjusted expected return from investing in loans earning the loan rate r_L against the return from its provisioning alternative. The investable amount in loans is $[(1-d)L/r - I(L, u, d, r)]$.[10] The bank then chooses the larger of the risk-adjusted expected payouts from the two strategies. Since increasing its loans potentially improves diversification of the bank's loan portfolio, the risk increase from new loans can be negligible.

Thus far, the comparison demonstrates that two inventory management methods can fulfill risk management requirements. The loan provisioning strategy corresponds to a static inventory by choosing inventory levels in anticipation of future liquidity needs. The credit derivative strategy corresponds to a just-in-time inventory management style by contracting for deliveries as needs for liquidity arise.

There are two other ways in which credit derivatives can potentially add value, first by improving the efficiency of capital allocations and, second, by acting as a form of reinsurance.

Regulators require that banks retain 4 percent tier one capital holdings against risk-weighted assets. In strategy 1 the bank must hold capital to support both the risky loan and the default-free security. Strategy 2 also includes the loan asset, but replaces the security investment with a credit derivative. When the capital required to support this asset configuration is less than in strategy 1, additional capital is freed up to support further lending activity. Is this a plausible scenario? Consider that regulatory agencies require capital holdings against interest rate risk. The investment in the default-free security increases interest rate risk and requires that capital be held. Therefore, the bank's avoidance of credit risk increases its capital requirement for interest rate risk. The alternative, an insurance contract, creates no additional interest rate risk, therefore credit risk is managed on par with that obtained by the security investment but with a smaller required capital outlay. This rationale is similar to that for the DPC structure described earlier. In both cases, isolating credit risk from broad-market risks, such as interest rate risk, enables more efficient capital allocations.

Finally, credit derivatives can be seen as a form of reinsurance.[11] Reinsurance markets exist to shift risks between intermediaries. These markets become necessary when geographic or other restrictions prevent intermediaries from maintaining sufficiently well-diversified portfolios. For example, a Florida insurance firm has excessive exposure to hurricane damages and a California insurance firm has excessive exposure to earthquake damages. A reinsurance contract exchanging their respective exposures improves the financial performance of both firms by increasing the diversification of each contract participant. Diamond (1984) shows that derivative contracts used to control exposure to common risks enable institutions to improve their diversification and lower certain costs.[12] These reductions shift the margin for loans downward, increasing the level of loans taken by the intermediary. The reinsurance aspect of credit derivatives may provide an additional and possibly more efficient mechanism for achieving diversification.

Cost of insurance

Cox, Ross, and Rubinstein (1979) employ risk-adjusted probabilities to compute the expected payoff from an option contract. The risk adjustment is obtained by choosing probabilities that are consistent with an arbitrage replicating the value of the option from investments in the underlying asset and a safe asset. Since the arbitrage is riskless, the expected payoff from the option is discounted at the rate for the safe asset. Recognizing that the insurance contract above can be construed as a put option, the value of the credit derivative can be obtained using the binomial approach developed by these authors.

Considering the insurance as a one-period contract remains useful. Further, assume that the loan being insured is a one-period loan that matures on the same date as the option. Restricting the insurance policy in this way avoids the need to incorporate the covariance between the riskless rate and the rate for risky debt. Therefore, attention is focused entirely on the credit risk aspects of the loan rather than on any interest rate risk. Under these conditions, the price of the insurance contract is

$$I(L,u,d,r) = \left[I^u(L,u,d,r)\frac{r-d}{u-d} + I^d(L,u,d,r)\frac{u-r}{u-d} \right] / r,$$

where $I^u()$ and $I^d()$ are, respectively, the payoffs from the insurance contract in the up state and down state. Adding to the comparison between credit derivatives and loan provisions, the pricing model offers insight into the effect of interest rates on the credit derivative decision. As the level of rates for the safe asset rises, the level of funding required to provision against losses falls. In addition, the price paid for insurance declines. The rate of decline in the price paid for insurance is greater.[13] This implies that as interest rates rise, the credit derivative alternative becomes increasingly attractive vis-à-vis the provisioning alternative.

This pricing model assumes that the outcomes for loans are not influenced by the purchaser of the insurance contract. More likely, insurance contracts will have greater appeal when the insured has a higher expectation of loss than the insurer. These information asymmetries, or *adverse selection* problems, imply that a premium will be charged for insurance contracts that fail to protect the insurer against her information disadvantages. Denoting this adverse selection premium ρ, the price of insurance is $I(L, u, d, r) + \rho$. Smith and Warner (1979) show that joint benefits give the insurer and the insured an incentive to minimize adverse selection premia. My results suggest that the common interests of these counterparties lead to contracts that reduce the bank's opportunity cost by freeing up additional funds for lending.

However, resolving adverse selection problems is not without cost. Contracts structured on state variables determined outside the firm, such as a standard reference rate, can bypass adverse selection problems. However, use of a standard reference rate introduces *basis risk*. Basis risk for a credit derivative exists when the correlation between the *drivers* that determine payments due on credit derivatives does not match the loss experience for the insured debt. For example, a lender holding a loan issued by a specific corporation may find that the returns of a security within the same industry generally reflect the prospects of defaults within that industry. Such a security is likely to resolve the adverse selection problems. However, credit problems that are unique to the individual firm will not be reflected in the reference security so payments based on the reference security may not cover losses on the loans to the individual firm. So, the resolution of adverse selection problems is obtained at the cost of mismatches between payments on the credit derivative and loan performance. This situation introduces a margin between the cost of imperfect loss protection and premia paid for adverse selection problems. Understanding this margin enables an improved prediction of the types of credit derivative contracts that are most likely to succeed.

Rationales for loan provisioning

Kwan (1997) describes loan loss provisioning as a *contra* asset account. The size of the account is maintained at the level of losses the bank expects to realize. The size decision affects earnings in two ways. First, when a bank increases its provisions, it defers recognition of earnings. This has tax implications, reducing current taxable income. Later, as loan losses are realized, the provisioning account is written down and the previously deferred earnings are recognized along with the loan loss. Because the recognized loss amount and the now-recognized deferred earnings net to zero, loan losses reduce taxable income. Second, to the extent that earnings performance signals actual cash flow performance, then bank managers have incentives to manage earnings levels. For example, when the level of earnings may incorrectly signal future prospects, managers can adjust earnings to prevent unwarranted stock price changes. More straightforwardly, earnings figures will be managed when earnings are used to gauge the performance of bank managers.

Here, I construe loan loss provisioning as follows. The bank manages its exposure to credit risk by insuring that it has access to cash sufficient for its operating requirements. It can accomplish this by investing in assets that can be readily sold to obtain needed cash or, as previously discussed, using a credit derivative to insure its access to cash. Consider a bank constrained from using a credit derivative that is choosing the portion of its earnings to be paid out as dividends. A large dividend payout reduces cash available for investment in default-free securities. By reducing its payout, it can increase its holdings of liquid assets. These asset holdings can be thought of as liquidity buffer stocks. Absent these sources of liquidity, the bank becomes more likely to be forced to meet its obligations through the sale of its less liquid loans.

The adverse selection premium described earlier amplifies the value of maintaining these buffer stocks. Banks unable to provide credible signals for their valuations of loans put up for sale will generally find that these loans must be sold at a discount to the bank's assessed valuations. The difference between the market price and the bank's valuation is the adverse selection premium, which compensates purchasers for the risk that the bank is selling its weakest loans. Such revenue shortfalls can impair the ability of the bank to meet its financial obligations. To avoid this outcome, the bank can sell inventories of liquid assets without a discount and use the proceeds to fund its other obligations. Then the bank faces an inventory problem. It must maintain an inventory of liquid assets sufficient to meet its future loan loss experience. However, investments made in this inventory generally yield a lower return than the bank's other uses for its funds. So, the bank incurs an opportunity loss for maintaining an inventory of loan loss reserves. The previous section showed that credit derivatives mitigate this opportunity loss in certain circumstances.

In this sense, the credit derivative strategy can be construed as dynamically provisioning against loan losses. Contrast this with the static inventory allocation represented by loan loss provisions. With credit derivatives, the bank maintains an off-balance-sheet position that delivers funds as the needs arise, rather than maintaining a funds inventory. The just-in-time arrival of funds via a credit derivative contract fulfills the need for immediate funds to meet financial obligations. Like manufacturing firms that adopt just-in-time inventory systems, banks may find this a cost-efficient solution to funding their operations.

The value of this alternative inventory method should be included in the franchise value of the institution. When claims against this franchise value are limited to the bank's owners, bank managers act for the owners in their inventory decisions. These agents add value when their allocation decisions use credit derivatives to reduce the opportunity cost of carrying inventories of lower-yielding liquid assets in place of higher-yielding loans.

Policy implications

The conclusions outlined in this article have implications for the regulatory policy afforded to credit derivative contracts. Below, I describe current regulatory policy on capital requirements. See Watterson and Bahlke (1997) for a more comprehensive treatment of the legal and regulatory issues involved in credit derivatives.

Regulatory policy toward credit derivatives

Regulatory capital is broken into tiers. Tier one capital, required to be no less than 4 percent of risk-weighted assets, is an institution's net worth.[14] Tier two capital includes these items plus other market issuances, but also includes provisions for loan losses subject to two limitations. The first limitation is that loan loss provisions included as capital cannot exceed 1.25 percent of gross risk-weighted assets. The second is that the total value of these provisions cannot exceed that of all other forms of tier two capital. With tier two capital requirements at 8 percent of risk-weighted assets, loan loss provisions are an important component of regulatory capital. Proponents of RAROC (risk-adjusted return on capital) and similar mechanisms argue that, on correctly risk-adjusted bases, tier two capital levels generally should be around 5 percent. This implies that institutions presently having excess balances of liquid assets are bearing a large cost for holding these balances. One can expect banks to seek to lower their costs by pushing for regulations that permit substitution of credit derivative contracts for loan loss provisioning.

The Bank of England published a provisional letter on credit derivatives in late 1996. British regulators classify bank assets as *trading book* or *loan book*. Capital charges for loan-book assets are larger, reflecting their lesser liquidity. The Bank of England judged the credit derivative market to be insufficiently liquid to permit the more favorable trading-book classification. To the extent that regulatory capital requirements are binding on these institutions, this view limits use of credit derivatives.[15]

In the U.S., the Federal Reserve and the Office of the Comptroller of the Currency (OCC) have taken different paths. The OCC holds that the credit derivative market is too new to take broad regulatory measures. OCC regulators are concerned that moving too quickly would adversely influence the innovation process. They are conducting case-by-case evaluations of institutions' credit derivative positions, responding as appropriate. Since these decisions involve proprietary information, the trend in these decisions is not apparent. The OCC seems aware of the potential for increasing the efficiency of risk transfers and views its case-by-case approach as supporting this emerging market segment.

The Federal Reserve has published two guidelines on credit derivatives. In addition, a Federal Reserve economist is considering the potential for these contracts to increase systemic risk (Duffee and Zhou, 1998).

The first guideline published by the Fed was a Supervisory and Regulation Letter (SR 96-17) released in August 1996. This letter primarily covers credit contracts held in the banking book, so its application pertains primarily to end users of these contracts. It directs bank examiners to base capital requirements for a credit contract on the credit exposure of the reference asset. The letter makes an analogy between the present treatment of letters of credit and the Fed's intended treatment of credit derivatives; that is, ascertain the credit exposure of the underlying credit, determine the proportion of that credit exposure present in the credit contract, then apply the capital charge for credit exposures to the product of these. This treatment does not appear to recognize risk reductions obtained through holding a diversified portfolio of credits. In addition, the letter identifies counterparty default on the credit derivative as a credit exposure and requires capital on this risk, noting that this aspect will primarily affect dealers.

The second guideline published by the Fed was a Supervision and Regulation Letter (SR 97-18) released in June 1997. This letter provides guidance for examinations of trading accounts. For trading account positions, banks can use either the standard capital charge or a capital charge based on risk levels from an approved internal model. The letter categorizes trading-book contracts as either open positions, matched positions, or offsetting positions and identifies the types of risk for each: counterparty credit risk, market risk, and credit risk from the asset underlying the derivative contract. Open positions have exposures to all three risk types. Matched positions pose only counterparty credit risk, the other two risk types being offset. Offsetting positions, for example, positions whose payouts match in some but not all states, are similar but the latter two types of risk are mitigated not eliminated.

The letter directs examiners to classify positions according to this matrix and apply standard capital charges. Capital charges for counterparty risk apply the following rule: If the underlying reference credit is an investment-grade asset, the equity capital charge is used; if the reference credit is a speculative-grade asset, the commodity capital charge is applied. This treatment does appear to permit consideration of diversification. The relatively favorable treatment of credit derivatives for trading book assets vis-à-vis assets held in the loan book gives banks an incentive to move assets from the banking book to the trading book. The strength of this incentive is mitigated by the somewhat less favorable accounting treatment for assets held in the trading book.

Economic consequences of current regulatory policy

Excepting bank trading books, regulators have placed significant restrictions on the use of credit derivatives. Credit derivatives used to insure assets held in banking books, that is, most loans, must replicate the loss experience of the loan to obtain reductions in regulatory capital requirements. This restriction implies that banks incur the full adverse selection premium as if they had sold the loan. In addition, the bank can be required to hold capital against any counterparty risk encountered should the bank's counterparty fail to perform. Thus, the credit derivative strategy will generally be dominated by a strategy of selling loans. Therefore, institutions that have previously maintained inventories of loan loss provisions will generally find these preferable to credit derivatives.

The bank can use credit derivatives to hedge credit risk in assets held in bank trading books. Thus, credit derivatives can be adopted when the bank is willing to move assets from the banking book to its trading book. This change requires the bank to mark these loans to market. Historically, banks have been reluctant to mark loans to their market values. This reluctance implies that capital relief is unlikely.

Duffee and Zhou (1998) make an argument similar to that of Grossman (1988). The lack of transparency in the pricing of OTC transfers of credit exposures can result in inefficient risk-bearing decisions. Imagine a series of contracts linked in the sense that default on any one increases the odds of other defaults. Full transparency insures that investors can accurately assess the risk and return from investing in these contracts. Less than full transparency implies that some investors may underestimate risks so that capital costs for firms creating additional contracts are too low. This situation can result in excessive contracting activity. If contracts begin to fail and loss experience reveals the extent of oversupply, the market value of outstanding contracts declines. If these failures are seen as systemic, they could lead to social costs in the form of government-sponsored bailouts.

The problem can be solved if contract transparency is increased. However, making credit risk completely transparent requires revelation of proprietary information. The Fed solves this problem by relying on its bank supervisory functions to control the extent of this risk. Absent a change in this policy, Fed policy toward credit derivatives is likely to be determined by its bank supervision concerns rather than by concerns over transparency.

Exchange-traded contracts,[16] on the other hand, can improve the transparency of credit derivatives, but the contracts must be written on observable benchmarks such as numbers of bankruptcies or bond prices. As pointed out earlier, the use of benchmarks for credit exposure involves basis risk.

Conclusion

I have shown that under certain circumstances, credit derivatives replicate the reduction in credit risk accomplished by loan loss provisions. Using a one-period insurance contract to illustrate the functions of a credit derivative, I compared the costs of credit derivative contracts and loan loss provisions. When the loan-provision amount is greater than the cost of the credit derivative, the bank can increase its loans. When the additional income from loans exceeds the risk-adjusted opportunity cost of the loan provisioning, the bank will find that credit derivatives dominate loan loss provisions.

I then priced the insurance contract using the binomial model of Cox, Ross, and Rubinstein (1979). This price represents a lower bound for the insurance contract. Credit insurers will require compensation for any adverse selection. Smith and Warner (1979) explain the existence of joint benefits from contracts structured to mitigate contracting problems. One solution to this adverse selection problem is the specification of drivers for contract cash flows determined outside the bank. Use of an externally determined driver will generally be less well correlated to the loss experience of any single institution. This creates a tradeoff between the adverse selection premium and the cost incurred when the credit derivative fails to cover the loss experience, that is, basis risk.

A contribution of this article is the identification of two problems faced by the emerging credit derivative contract market. The first is the reluctance of bank regulators to permit relief from regulatory capital requirements. The second is that contracts that successfully avoid adverse selection problems are likely to have broader appeal. These will generally be contracts whose payouts are determined by performance indexes mimicking the loss experience of many institutions. It follows that liquidity will be greatest for contracts based on external drivers, further increasing their cost effectiveness over other forms of credit derivative contracts.

I have shown how credit derivatives can be used to lower the capital costs of banks, in particular, their costs for holding regulatory capital. I have also shown that credit derivatives can replicate the cash flows provided by provisioning for loan losses. When this insurance function is accomplished at low cost, the bank can increase its lending activities. Thus, outlays made for credit derivatives can dominate the returns offered by the safe-asset holdings generally used for loss provisioning purposes.

NOTES

[1]KMV are the initials of the three founding partners of the KMV Corporation, Steve Kealhofer, John Andrew McQuown, and Oldrich Vasicek. Their method is described in McQuown (1993).

[2]Both an overview and a technical description of *CreditMetrics* are available on the Internet at www.riskmetrics.com/cm/index.html.

[3]For detailed coverage of this product, see the Internet site at www.csfp.csh.com/csfpfod/html/csfp_10.htm.

[4]This article covers the use of credit derivatives by financial institutions. Frost (1997) describes corporate use of these contracts.

[5]For a thorough description of the DPC structure, see Remolona, Bassett, and Geoum (1996).

[6]This concern is not without merit. Hartmann (1996) points out that credit derivatives offer a speedier route for increasing credit risk exposure. Banks may be tempted to use this route to gamble for resurrection when capital levels are low.

[7]Certain accounting and tax benefits can also be derived by retaining title to the underlying assets.

[8]Implicitly, the covariation between the interest rate and default probability is also presumed to be zero.

[9]This is a more restrictive policy than the accountant's use of this term. A later section further develops the idea of loan loss provisioning.

[10]This case can also be made by pointing out that the bank can now choose between the linear combinations of default-free investments earning r and risky loans earning r_L. The bank will generally value this expansion of its opportunity set.

[11]This view raises the concern that financial institutions prohibited from engaging in insurance activities may be prohibited from participating in credit derivatives.

[12]An example of the Diamond intuition is the following. A bank is constrained from accepting new loans because it is at its total allowable level of risk. Were the bank able to increase its lending, a portion of its present risk level could be eliminated though diversification. A derivative can be used to reduce its exposure to undiversifiable risks, allowing the bank to then increase lending and lessen risk through diversification.

[13]When the up state pays zero, this point can be understood through the insurance pricing equation above. Since both the provisioning outlay and the credit derivative are discounted at r, this interest rate impact is the same for both alternatives. However, the down state payoff is also weighted by a term that includes $u - r$ in the denominator. As r rises, the weight declines increasing the effect of an interest rate change on the credit derivative.

[14]Net worth is the residual of assets after subtracting the payments owed to all holders of nonequity claims; that is, depositors and owners of debt. For purposes of this discussion net worth can be construed as the value of the equity claims on a publicly owned institution.

[15]The Financial Services Authority (FSA) has taken over supervisory responsibility for UK banks. Releases by the FSA appear to conform with the earlier policy defined by the Bank of England. The releases are Board Notice 482 and Board Notice 414.

[16]For example, the Chicago Mercantile Exchange recently announced a futures contract on personal bankruptcies.

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