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# Credit Derivatives: New Financial Instruments for Controlling Credit Risk

*By Robert S. Neal*

One of the risks of making a bank loan or investing in a debt security is *credit risk*, the risk of borrower default. In response to this potential problem, new financial instruments called credit derivatives have been developed in the past few years. Credit derivatives can help banks, financial companies, and investors manage the credit risk of their investments by insuring against adverse movements in the credit quality of the borrower. If a borrower defaults, the investor will suffer losses on the investment, but the losses can be offset by gains from the credit derivative. Thus, if used properly, credit derivatives can reduce an investor's overall credit risk.

Estimates from industry sources suggest the credit derivatives market has grown from virtually nothing two years ago to about \$20 billion of transactions in 1995. This growth has been driven by the ability of credit derivatives to provide valuable new methods for managing credit risk. As with other customized derivative products, however, credit derivatives expose their

users to risks and regulatory uncertainty. Controlling these risks is likely to be an important factor in the future development of the credit derivatives market.

This article provides information on the rationale and use of credit derivatives. The first section of the article describes how to measure credit risk, whom it affects, and the traditional strategies used to manage it. The second section shows how credit derivatives can help manage credit risk. The third section examines the risks and regulatory issues associated with credit derivatives.

## CREDIT RISK

Credit risk is important to banks, bond issuers, and bond investors. If a firm defaults, neither banks nor investors will receive their promised payments. While there are a variety of methods for managing credit risk, these methods are typically insufficient to reduce credit risk to desired levels. This section defines credit risk, describes how it can be measured, and shows how it affects bond issuers, bond investors, and banks. The section also describes the techniques most commonly used to manage credit risk, such as loan underwriting standards, diversification, and asset securitization.

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### *What is credit risk?*

Credit risk is the probability that a borrower will default on a commitment to repay debt or bank loans. Default occurs when the borrower cannot fulfill key financial obligations, such as making interest payments to bondholders or repaying bank loans. In the event of default, lenders—bondholders or banks—suffer a loss because they will not receive all the payments promised to them.<sup>1</sup>

Credit risk is influenced by both business cycles and firm-specific events. Credit risk typically declines during economic expansions because strong earnings keep overall default rates low. Credit risk increases during economic contractions because earnings deteriorate, making it more difficult to repay loans or make bond payments. Firm-specific credit risk is unrelated to business cycles. This risk arises from events specific to a firm's business activities or its industry, events such as product liability lawsuits. For example, when the health hazards of asbestos became known, liability lawsuits forced Johns-Manville, a leading asbestos producer, into bankruptcy and to default on its bonds.

A broad measure of a firm's credit risk is its credit rating. This measure is useful for categorizing companies according to their credit risk. Rating firms, such as Moody's Investors Services, assign a credit rating to a company based on an analysis of the company's financial statements. Credit ratings range from Aaa for firms of the highest credit quality, to Ccc for firms likely to default.<sup>2</sup>

A more quantitative measure of credit risk is the credit risk premium. The credit risk premium is the difference between the interest rate a firm pays when it borrows and the interest rate on a default-free security, such as a U.S. Treasury bond. The premium is the extra compensation the bond market or commercial bank requires for lending

to a company that might default. As a firm's credit risk increases, bond investors and commercial banks demand a higher credit risk premium. This increase is necessary to offset the higher expected losses on the bond or loan due to the increased probability that the loan will not be repaid.

The characteristics of credit risk premiums are displayed in Chart 1. The chart shows the risk premiums for Aaa and Baa industrial bonds from 1984 to 1994. The top line is the interest rate for all Baa-rated bonds less the interest rate for 10-year Treasury bonds, while the bottom line shows the rate for Aaa bonds less the 10-year Treasury rate. There is a strong relation between the credit rating and the credit risk premium—the higher the credit rating, the lower the credit risk premium. As a result, a downgrade in a company's credit rating can significantly increase its borrowing costs. The chart also shows that the cost of borrowing for a company with a constant rating can vary over time. For example, the Baa premium increased from 1.4 percent in August 1981 to 3.0 percent in November 1981.

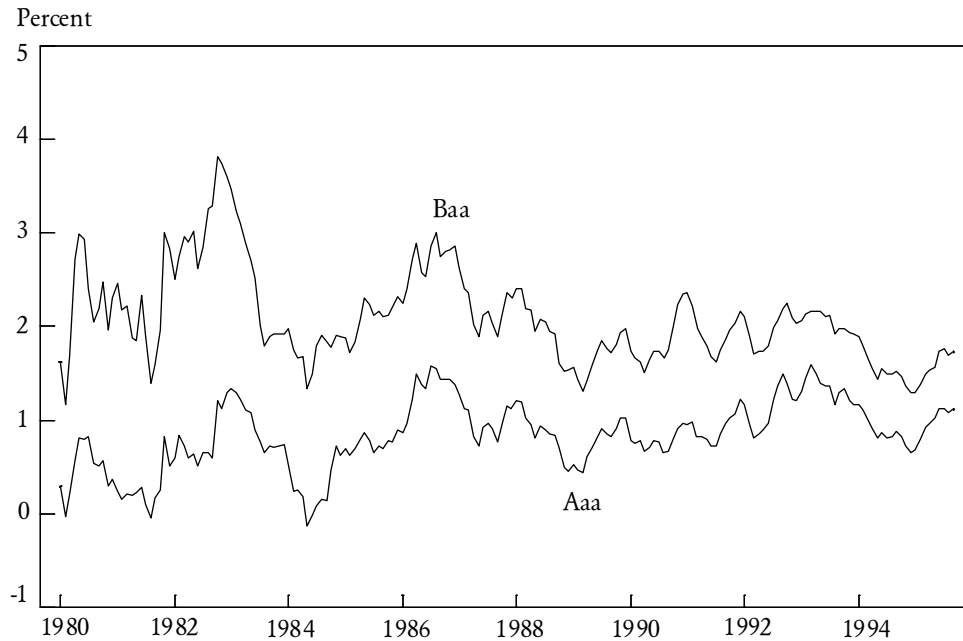
### *Who is affected by credit risk?*

Credit risk affects any party making or receiving a loan or a debt payment. Some examples include bond issuers, bond investors, and commercial banks.

*Bond issuers.* Bond issuers are affected by credit risk because their cost of borrowing depends crucially on their risk of default. A borrower who plans to issue debt in the near future faces the risk that unanticipated events will suddenly increase the costs of borrowing. For example, the recent disclosure of a \$1.1 billion trading loss at Daiwa Bank raised fears of the bank's default, which increased its cost of borrowing.<sup>3</sup> Moreover, even without a change in a company's firm-specific credit risk, a downturn in the economy could

Chart 1

## CREDIT RISK PREMIUM FOR BONDS



Note: The Baa credit risk premium is the average rate on Baa corporate bonds less the 10-year Treasury bond rate. The Aaa credit risk premium is the average rate on Aaa corporate bonds less the 10-year Treasury bond rate.

Source: Moody's Investors Service and Board of Governors.

raise the average credit risk premium and increase the cost of borrowing for all bond issuers.

*Bond investors.* Investors in individual bonds are exposed to the risk of a decline in the bond's credit rating. A downgrade in a credit rating will increase the bond's credit risk premium and reduce the value of the bond. Similarly, mutual funds that hold a portfolio of corporate bonds will be affected by fluctuations in the average credit risk premium. Increases in the premium will reduce the value of the fund's holdings and hurt the fund's total return.

*Commercial banks.* Banks are exposed to the risk that borrowers will default on their loans. The

credit risk faced by banks is relatively high for two reasons. First, banks tend to concentrate their loans geographically or in particular industries, which limits their ability to diversify credit risks across borrowers. Second, credit risk is the predominate risk in loans made to businesses. Most business loans have adjustable rates, with the interest rate periodically reset to reflect changes in the default-free rate. Since these loans incorporate changes in the default-free rate, movements in the default-free rate pose little risk to banks. The credit risk premium, however, is fixed when the loan is made. If the premium subsequently rises, lenders will suffer because the loan payments are insufficient to compensate for the higher risk.

*How is credit risk managed?*

A variety of methods are available to manage credit risk. Traditional methods have focused on loan underwriting standards and diversification. Over the last ten years, an alternative approach to managing credit risk has focused on selling assets with credit risk. Banks can sell their loans directly or they can “securitize,” or pool together their assets with credit risk and sell parts of the pool to outside investors. Either way reduces credit risk because the credit exposure is transferred to the new owner. Unfortunately, these methods are insufficient for managing the credit exposure of many financial firms.

*Underwriting standards and diversification.* The traditional approach to managing credit risk is based on the application of underwriting standards and diversification. For example, take a bank loan officer who is deciding whether to make a loan. After a careful review of the prospective borrower’s financial statements, the officer would consider such factors as earnings, profit margins, and the amount of outstanding debt and bank loans. If the prospects for the loan look good, the loan officer then considers the condition of the borrower’s industry by examining competitive pressures, product cycles, and future growth prospects. Upon a favorable review, the bank loan officer would manage the credit risk exposure by controlling the terms of the loan. The officer would set limits on the size of the loan, establish a repayment schedule, and require additional collateral for higher risk loans. A mutual fund that invests in corporate bonds goes through a similar credit analysis, although it cannot set the terms of the borrowing.

The next step in the traditional approach is to diversify the credit risks across different borrowers. The diversification principle relies on offsetting risks. For example, consider the earnings of two park vendors, one who sells ice cream and

another who sells umbrellas. On sunny days, the ice cream vendor does well, while the umbrella vendor does poorly. On rainy days, the umbrella vendor does well, while the ice cream vendor does poorly. Although the individual earnings of the two vendors can be quite volatile, the combined earnings are much less volatile due to the negative relation between their earnings.<sup>4</sup> The same principle holds for a portfolio of bank loans. The factors that cause industrial companies to default on their loans will differ from the factors that cause farmers to default on their loans. Relative to holding either type of loan separately, combining both types of loans into a portfolio allows the bank to reduce the volatility of its earnings.<sup>5</sup> The earnings from some loans will offset the losses from defaulted loans, thereby reducing the likelihood that, on net, the bank will lose money.

While diversification and underwriting standards are necessary first steps for managing credit risk, their ability to reduce credit risk is often limited by a scarcity of diversification opportunities. For example, because small commercial banks typically confine their lending to their local area, the lack of geographic diversification means the earnings from their loans will depend heavily on the condition of the local economy. Similarly, the finance divisions of automobile companies face limited diversification opportunities. While a finance division can diversify some credit risk by lending to different dealers, cyclical movements in the economy will affect all dealers, thereby limiting the opportunities for diversification.

*Securitization and loan sales.* In recent years, the development of markets for securitized assets and for loan sales has provided another method for managing credit risk. In the asset securitization approach, bonds or loans with credit risk are pooled together and sold to an outside investor. For example, the finance division of an automotive company can combine many of its loans into

a single package and sell pieces of the package to other financial institutions. From an investor's perspective, purchasing part of the package is attractive because the diversification across many loans reduces the overall credit risk. In addition, to the extent that returns from the package are not closely correlated with the investor's other holdings, diversification allows the investor to reduce the credit risk of his overall portfolio. From the automobile company's perspective, selling the loans eliminates the company's credit exposure to the loans. The substantial growth in the market for non-housing-related securitized assets is one indication of the success of this approach for managing credit risk. In 1994, \$75 billion of such securitized assets were issued, up from virtually nothing in 1984.

Banks can use the market for loan sales to manage their credit risk in a similar manner. After making a loan to a company, a bank can sell the loan to other banks or to institutional investors. One common example of a loan sale occurs when a bank provides short-term financing for a corporate takeover. After making the loan, the bank will quickly sell the loan to other investors. This strategy is attractive to banks because they earn a fee from the loan origination but the credit risk is assumed by the new investor. Occasionally, banks will lend large amounts in a single takeover, so that controlling the credit risk is extremely important. The use of loan sales by banks to manage their credit risk has increased rapidly in the last few years. In 1994, banks sold \$665 billion of loans, up from about \$200 billion in 1991.

The markets for securitized assets and loan sales provide valuable tools for managing credit risk. Unfortunately, the securitization approach is only well suited for loans that have standardized payment schedules and similar credit risk characteristics, such as home mortgages and automobile loans. Loans for commercial and industrial purposes, in contrast, have diverse credit

risks. Consequently, it is difficult for banks to securitize these loans or sell them to institutional investors. In cases such as these, a more promising way to manage the credit risk is through credit derivatives.

## MANAGING RISK WITH CREDIT DERIVATIVES

Credit derivatives are financial contracts that provide insurance against credit-related losses. These contracts give investors, debt issuers, and banks new techniques for managing credit risk that complement the loan sales and asset securitization methods. This section examines three types of popular credit derivatives—credit swaps, credit options, and credit-linked notes—and shows how they can help manage credit risk.<sup>6</sup>

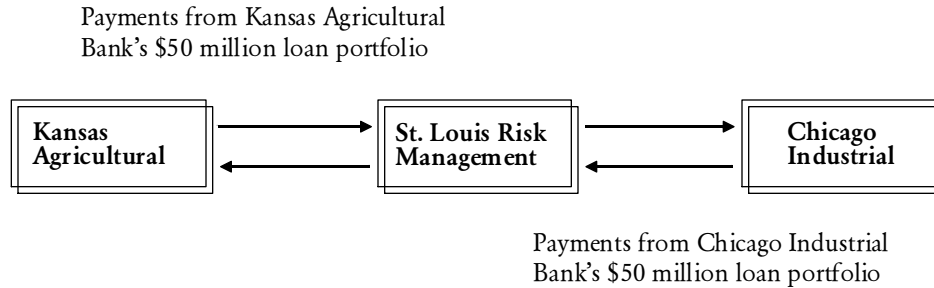
### *Credit swaps*

Credit swaps reduce credit risk through diversification. Credit swaps are appealing to commercial banks whose loan portfolios are concentrated in particular industries or geographic areas. Instead of diversifying credit risk by lending outside its local area or by selling some loans and purchasing others, a bank can swap the payments from some of its loans for payments from a different institution.

The simplest type of credit swap is called a loan portfolio swap. Take, for example, two hypothetical banks, Kansas Agricultural Bank, which lends mostly to farmers, and Chicago Industrial Bank, which lends mostly to manufacturers. The swap transaction between the two banks also involves an intermediary, St. Louis Risk Management. To execute the transaction, Kansas Agricultural Bank sends the loan payments it receives from, say, \$50 million of its agricultural loans to St. Louis Risk Management (Figure 1). Simultaneously, St. Louis Risk Management receives \$50 million of loan payments from Chicago Industrial Bank. St.

Figure 1

## LOAN PORTFOLIO SWAP



Louis Risk Management then swaps the loan payments between the two banks. Since there is little common movement in default rates between farmers and manufacturers, both banks are better off. The swap allows each bank to diversify away some of its credit risk, and St. Louis Risk Management receives a small fee for arranging the transaction.

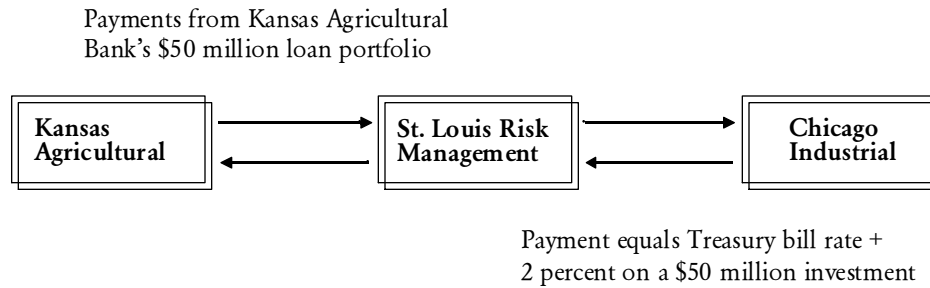
The most common credit swap is called a total return swap. In this type of transaction, Kansas Agricultural Bank sends its loan payments to St. Louis Risk Management, which, in turn, sends the payments to Minneapolis Mutual, a hypothetical insurance company (Figure 2). In exchange for the loan payments, Minneapolis Mutual sends an adjustable-rate interest payment to St. Louis Risk Management, which sends the payment to Kansas Agricultural Bank. Based on a \$50 million investment, Minneapolis Mutual might send Kansas Agricultural Bank a return of 2 percent greater than the 3-month Treasury bill rate. The effect of this swap for Kansas Agricultural

Bank is to trade the return from its loan portfolio for a guaranteed return that is 2 percent above the short-term default-free rate. Because the return is guaranteed, Kansas Agricultural Bank has eliminated the credit risk on \$50 million of its loan portfolio.<sup>7</sup>

Relative to loan sales, total return swaps offer two important advantages. First, they allow banks to diversify credit risk while maintaining confidentiality of their client's financial records. In a total return swap transaction, the borrowing firm's records remain with the originating bank. When loans are sold, the firm's records are transferred to the new owner of the loan. Second, the administrative costs of the swap transaction can be lower than for a loan sale transaction. For example, an institution such as an insurance company may be ill suited to monitor loans and to ensure that floating rate loans are properly adjusted for changes in the default-free rate. Thus, reducing administrative expenses allows diversification to be achieved at a lower cost.

Figure 2

## TOTAL RETURN SWAP

*Credit options*

Credit options are a second type of credit derivative used to hedge the risk of adverse changes in credit quality. A simple way to understand credit options is to use an analogy with car insurance. All car owners pay a fee to purchase car insurance and protect themselves from financial loss. If the car is undamaged, the car owner receives nothing from the insurance company. If the car is wrecked, the insurance company pays the owner enough to replace the car. Thus, for a fee, the insurance policy hedges the value of the car by eliminating the risk of a large financial loss.

Credit options provide a similar hedging function. These options allow investors to buy insurance to protect themselves against adverse moves in the credit quality of financial assets. For example, a bond investor might buy an insurance policy to hedge the value of a corporate bond. If the bond defaults, the payoff from the insurance policy would offset the loss from the bond. If

there is no default, the investor would continue to receive the interest payments from the bond but receive nothing from the policy.

The key features of credit options are identical to options on stocks. For example, consider a call option on IBM stock. The owner of the call option has the right to *buy* IBM shares at a previously determined price called a *strike price*. When the current price of IBM exceeds the strike price, the owner of the call option can earn a profit by purchasing shares of IBM at the strike price and then selling them at the current market price.

A second type of option is a *put* option. In general, put options are similar to insurance policies because they protect investors from declines in the value of the underlying asset. An IBM put option, for example, gives the owner of the option the right to *sell* IBM shares at a predetermined strike price. If the market price falls below the strike price, the owner of the option can earn a profit by purchasing IBM

shares at the market price and selling the shares at the strike price. A put option, therefore, provides insurance against a decline in IBM's stock price.

While these examples link the payoff of the option to the price of the underlying stock, options are also available where the payoff is linked to an interest rate. For example, fixed-rate mortgages typically provide a 30-day interest rate lock. Following approval of the loan, the prospective homeowner's mortgage rate is protected against rate increases for 30 days. This interest rate protection is actually a call option on the interest rate because the homeowner implicitly receives a payment if mortgage rates rise following the loan approval. For example, if the rate increases by 0.5 percentage point, the homeowner implicitly pays the increase, but also receives an offsetting payoff from the call option. Thus, the interest rate lock offsets any increases in mortgage rates, ensuring that the homeowner's rate will not rise.

In a similar manner, bond issuers can use credit options to hedge against a rise in the average credit risk premium. As a hypothetical example, suppose Midwest Telephone, a Baa-rated company, is planning to issue \$100 million of 1-year bonds in two months. The bonds are to be paid back in one year, and the interest rate Midwest Telephone anticipates paying is 1.5 percentage points above the 1-year Treasury bill rate. If there is an increase in the average credit risk premium for Baa companies before the debt is issued, Midwest's interest payments will also rise. To hedge against this possibility, Midwest could purchase a call option on the credit risk premium.<sup>8</sup> Just as a call option protects a homebuyer against a rise in mortgage rates, the call option on the credit risk premium protects Midwest against increases in the premium. If the premium rises above the strike rate specified in the option, Midwest's higher interest payments will be offset by gains from the option.

To illustrate this example, say Midwest Telephone buys a call option on the average Baa credit risk premium. For the \$100 million bond, the price of the option is \$500,000. The current credit risk premium is 1.5 percent and the call option will pay Midwest if the premium exceeds 1.5 percent in two months. Because the strike rate equals the current risk premium, the option protects Midwest against an increase in the premium. If a downturn in overall economic conditions causes the average premium to rise to 2.5 percent, the one-percentage-point rise in the credit risk premium will cause Midwest's interest payments to increase by \$1 million. The higher interest payments, however, will be offset by the payoff from the option (1 percent times \$100 million, or \$1 million). Since the payment from the call option offsets the increased borrowing costs, purchasing the call option allows Midwest to hedge against increases in the premium.<sup>9</sup>

Alternatively, suppose that the credit risk premium falls to 0.5 percent. In this case, the call option has no payoff, but Midwest saves \$1 million (1 percent of \$100 million) because it can borrow at the lower rate. Thus, purchasing the call option allows Midwest to insure against increases in the credit risk premium while maintaining the benefits of lower borrowing costs if the premium declines. In either case, Midwest would still pay the \$500,000 for the option, just as it would pay a premium for any other insurance policy.

Credit options can also be used by bond investors to hedge against a decline in the price of a bond. Such a decline might be caused by a downgrade in a company's debt. To hedge this risk, the investor can purchase an option that has a large payoff if the credit quality of the bond declines. A decline in quality will trigger a loss on the bondholdings, but this will be offset by the gains from the option. This insurance protects



the investor from adverse movements in a firm's credit quality.<sup>10</sup>

To illustrate, suppose an investor owns \$10 million of a company's bonds. To insure against an adverse movement in the company's credit quality, the investor might buy a put option on the bonds with a \$9 million strike price for \$40,000. This option would give the investor the right to sell his bond holdings for \$9 million anytime during the next year. Purchasing the option ensures that the investor will get at least \$9 million for the bonds. If the market value of the bonds falls to \$7 million in one year, the payoff of the option will be \$2 million. Alternatively, if the value of the bonds rises to \$12 million in a year, the value of the put option will fall to zero. Thus, the put option protects the investor against price declines while still allowing the investor to benefit from price increases.

One particularly common form of credit option is called, somewhat inappropriately, a credit default swap. This swap is actually a put option on a portfolio of bonds or loans. The owner of the default swap receives a payoff if more than a prespecified number of the bonds default. For example, suppose an investor's portfolio includes 20 Baa bonds, each of which promises to pay \$1,000 in one year. The investor might purchase a credit default swap for \$20 that promises to make a payment if three or more of the 20 bonds default. For each bond that defaults, the investor receives the difference between the \$1,000 promised payment and the yearend price of the defaulted bond.<sup>11</sup>

The appeal of a credit default swap is that it limits the investor's credit risk. It is designed for investors who are willing to absorb small credit losses but want protection against large losses. In exchange for a relatively small fee, the investor is exposed to the risk that one or two bonds may default but is protected against additional losses.

While investors clearly have an incentive to purchase credit options, it is natural to ask who would agree to sell such options. Industry sources suggest that insurance companies are among the principal sellers. Insurance companies specialize in assessing health and property risks and in charging an appropriate fee for insurance. Insuring financial risks is a logical extension of their business. They earn a fee for selling the credit options and can diversify their risks by selling credit options in different industries and in different areas.

### *Credit-linked notes*

A credit-linked note is another type of credit derivative that can be used by debt issuers to hedge against credit risk. A credit-linked note is a combination of a regular bond and a credit option. Just as with a regular bond, the credit-linked note promises to make periodic interest payments and a large lump sum payment when the bond matures. The credit option on the note, however, typically allows the issuer to reduce the note's payments if a key financial variable specified by the note deteriorates.

For example, a credit card company may use debt to fund a portfolio of credit card loans. To reduce the credit risk, the company's debt issue could take the form of a 1-year credit-linked note. This note promises to pay investors \$1,000 and an 8 percent coupon if a national index of credit delinquency rates is below 5 percent. If the index exceeds 5 percent, however, the coupon falls to 4 percent. The credit card company thus has a credit option—the company has the right to lower the interest payments if the overall credit quality of cardholders deteriorates.

A credit card company would issue a credit-linked note because it provides a convenient mechanism to reduce the company's credit exposure. If cardholder defaults are low, then the

company can pay the 8 percent coupon. If the default rates are high, the company's earnings are reduced, but it only has to pay a 4 percent coupon. By structuring the note in this way, the credit card company is purchasing credit insurance from the investors.

Investors would consider buying such a credit-linked note because they earn a higher rate of return than the credit card company's regular bonds. When the company issues the notes, the price of the notes will be lower than the price of the company's regular bonds. The lower price compensates investors for the risk that their interest payments could decline. For a given interest payment, the reduced price that investors pay gives them a higher return.

#### CREDIT DERIVATIVES: RISKS AND REGULATORY ISSUES

While credit derivatives provide a valuable tool for managing credit risk, they can also expose the user to new financial risks and regulatory costs. Like other over-the-counter derivative securities, credit derivatives are privately negotiated financial contracts. These contracts expose the user to operational risk, counterparty risk, liquidity risk, and legal risk. In addition, there is uncertainty regarding the regulatory status of credit derivatives and the appropriate capital charges for bank loans hedged with credit derivatives. For the most part, these risks are either controllable or relatively small and therefore unlikely to restrict the development of the credit derivatives market.

##### *What are the risks of credit derivatives?*

Perhaps the largest risk of using credit derivatives is operational risk. Operational risk is the risk that traders could imprudently use any derivative instrument for speculation instead of hedging. For example, losses from unwarranted derivatives-related trading caused the dissolution

of Barings PLC, a British investment bank, and contributed to the default of Orange County, California. While operational risk can be large, it can also be controlled easily. Rigorous internal control procedures, for example, can prevent traders from establishing inappropriate positions.

A second source of risk is counterparty risk. This is the risk that the counterparty to a transaction will default. For example, in the total return swap described earlier, Minneapolis Mutual could default after initiating the swap with Kansas Agricultural. Because of this possibility, credit derivatives cannot completely eliminate credit risk.

While counterparty risk is a source of concern, the magnitude of this risk is relatively small. For a firm to suffer a loss from a counterparty default, all the following must occur: the counterparty must default, the counterparty must owe money on the credit derivative transaction, and the loss must be greater than can be absorbed by the intermediary to the transaction. The likelihood that the intermediary cannot absorb the loss, however, is very low. The intermediaries are either top-rated commercial banks or the Aaa-rated subsidiaries of investment banks. Both types of organizations are well capitalized and carefully hedge the risk of their transactions (Figlewski).

A third source of risk is liquidity risk. Liquidity risk is the uncertainty about being able to sell or offset a previously established position. 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 expiration. In contrast, liquidity risk is an important consideration for issuers of credit derivatives and for users of

credit derivatives who anticipate offsetting their position before the contract matures. Liquidity risk is currently high because there is no active secondary market for participants to hedge their credit exposure or to offset a previously established position. To the extent that the market becomes more active, this risk will decline.

A fourth 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. The Orange County bankruptcy provides an example of legal risk. For several years, the County successfully invested in risky, fixed-income derivative securities. A sudden and large change in interest rates, however, caused a steep decline in the value of its securities, leaving the County unable to meet margin calls. In the wake of the bankruptcy, the County sued the investment bank that sold them the securities. The County claimed it was illegal for it to hold such securities and therefore the derivative securities were unenforceable contracts. The issue is currently being resolved in the courts. If the courts agree with the County, the likelihood will increase that losing parties on other derivative transactions will adopt legal defenses to avoid honoring their derivative contracts. Such a development would strongly restrict growth in the credit derivatives market.

#### *Regulatory issues*

Another uncertainty confronting users of credit derivatives is their regulatory status. Should credit derivatives be treated as securities, commodities, swaps, or insurance products? This distinction is important because these contracts are regulated by different agencies and under different terms. Swaps, for example, are regulated by the Commodities Futures Trading Commission. 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.

Another regulatory issue is capital requirements for credit derivatives. Banks may find that hedging credit risk actually increases their capital requirements. Suppose a bank uses a credit derivative to construct a long-term hedge for the credit risk of a large borrower. The credit derivative reduces the risk of the bank, but under current risk-based capital standards there is no recognition of the lower risk. Not only is there no reduction in the bank's capital requirement for the loan, but the bank must set aside additional capital to insure against counterparty default. As credit derivatives become more available, regulators will need to assess the circumstances under which credit derivatives can reduce a bank's capital requirements. If regulators allow prudently structured credit hedges to reduce capital charges, banks will have a strong incentive to adopt such hedges, which would reduce their credit risk and allow them to make more loans.

#### CONCLUSION

Credit risk is an important consideration for banks, bond issuers, and bond investors. The conventional methods of managing credit risk, such as diversification, bank loan sales, and asset securitization, offer only a partial solution to controlling credit risk exposure. In recent years, the growing market for credit derivatives has provided powerful new tools for managing credit risk that are less costly and more effective than traditional methods. Lenders such as commercial banks and investors such as mutual funds can use credit derivatives to hedge against adverse moves in the credit quality of their investments.

Despite its recent growth, the market for credit derivatives is still in its infancy. Many observers believe that the growth in credit derivatives will parallel the enormously successful interest rate swap market. For this to occur, however, credit

derivative issuers and users must resolve uncertainties associated with regulatory status, legal status, and the adequacy of internal control procedures.

## ENDNOTES

<sup>1</sup> An alternative definition of credit risk relies, not on absolute default rates, but on the variability of actual default rates relative to expected default rates. Suppose a lender expects a 20 percent default rate on a portfolio of high-risk loans and sets the interest rate accordingly. If the subsequent default rate is close to 20 percent, it can be argued that the credit risk of the portfolio is actually low. The lender has earned a high rate of return on the loans and the uncertainty surrounding the rate is low. To keep the presentation simple, the article uses the definition in the text. Use of the alternative definition does not change any of the results in the article.

<sup>2</sup> From highest to lowest quality, Moody's ratings are Aaa, Aa, A, Baa, Ba, B, and Ccc. Categories Baa and above are termed investment-grade bonds, while categories Ba and lower are termed non-investment-grade, or junk, bonds.

<sup>3</sup> Two weeks after the disclosure of the trading loss, Standard and Poor's downgraded Daiwa's bonds. The bond market reaction to the disclosure was even swifter. The price of Daiwa's bonds fell immediately, suggesting that investors required a higher credit risk premium to compensate for the additional default risk.

<sup>4</sup> Diversification can also reduce volatility even if the earnings of the firms are positively related. All that is required for diversification to yield benefits is that the earnings of the two firms not be perfectly positively correlated.

<sup>5</sup> Strictly speaking, the gains from diversification are primarily obtained from reducing firm-specific credit risk. Diversification will yield fewer benefits in reducing credit risk associated with business cycles because these fluctuations affect all firms.

<sup>6</sup> Whittaker and Kumar provide a more detailed discussion on the uses of credit derivatives.

<sup>7</sup> Strictly speaking, the credit risk has not been eliminated because of the possibility that the counterparty, Minneapolis Mutual, may default. Since the counterparties typically have high credit ratings, however, credit risk is significantly reduced.

<sup>8</sup> Longstaff and Schwartz provide a mathematical model for pricing such options.

<sup>9</sup> In this example, the strike price of the option was set to 1.5 percent, the same as the level of the Baa credit risk premium when the option was purchased. In practice, an issuer could purchase an option with a higher strike price. The advantage of a higher strike price is that the price of the option is lower. The disadvantage is that it offers less protection against an increase in the average credit risk premium.

<sup>10</sup> For a discussion of the methods used to price such options, see the articles by Das and by Jarow, Lando, and Turnbull.

<sup>11</sup> The credit default swap is called a swap because of its payment structure. Instead of directly paying the intermediary \$20 for the option, the bondholder swaps a payment to the intermediary in exchange for the default protection. The payment is expressed as a fraction of the value of the total promised payments of the bond portfolio. In this case, the payments would be \$20/\$20,000, or 0.1 percent. The bondholder would swap 0.1 percent of the promised payments to the intermediary in exchange for the default protection.

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