TEACHING NOTE 97-09:
CREDIT DERIVATIVES

Version date: August 22, 2008 C:\CLASSES\TEACHING NOTES\TN97-09.WPD

The two primary types of risks faced by firms engaged in financial transactions are market risk and credit risk. The former is the risk that movements in interest rates, exchange rates, stock prices or commodity prices will have an effect on the firm's value. The latter is the risk that counterparties to transactions it is engaged in will fail to make obligated payments. Credit risk is sometimes called *default risk*.

The management of market risk is achieved by entering into offsetting or hedging transactions. Credit risk is much more difficult to manage. Bankers and other lenders have dealt with credit risk for years, but the methodology used in the past is not very sophisticated and not well-suited for use in today's world of highly leveraged derivative transactions, often involving a multiplicity of parties and being determined by a potentially large number of market variables. As activity in the over-the-counter derivatives market began to accelerate, credit risk was increasingly recognized as important and requiring more attention than in the past. Typical methods of controlling credit risk include limiting the amount of business a party does with another party, requiring minimum counterparty credit ratings, such as triple-A by both Moody's and Standard & Poor's, periodically marking contracts to market, requiring collateral, and for some dealer firms, the establishment of separately capitalized derivatives subsidiaries. While these methods undoubtedly reduce credit risk, they are not adequate to truly *manage* credit risk. The management of credit risk, as in the management of market risk, is an ongoing process that requires quantification of the risk, assessment of the desired level of risk and proactive adjustment of a firm's position so that its desired level of credit risk assumed equals its actual level of credit risk assumed. This does not always mean reducing or eliminating credit risk. In some cases the assumption of credit risk is highly desirable, for it brings with it the potential for higher returns.

In recent years a great deal of attention has been placed on credit risk and the possible gains from separating market risk from credit risk. Partly this concern has arisen because of the manner in which credit risk is handled in the computation of bank capital requirements. Although rules are subject to change at any time, credit risk has so far been fairly heavily penalized in capital requirement formulas.

In the early 1990s a new innovation in credit risk management appeared on the scene: the *credit derivative*. This is an instrument designed to segregate market risk from credit risk and to allow the separate trading of credit risk. Credit derivatives allow a more efficient allocation and pricing of credit risk. Ultimately this greatly benefits those who borrow and lend and who transact in derivatives that are subject to default, for it helps assure them that the premiums associated with the risk of default are appropriate for that level of risk.

There are four primary types of credit derivatives, each addressing in some manner though not perfectly, the problem of separating market risk from credit risk. The first and simplest type of credit derivative is the *total return swap*. This is a swap transaction in which a party agrees to pay the total return on a particular reference asset, such as a specific bond issued by a private borrower, and agrees to receive a rate such as LIBOR, or possibly the return from another credit-sensitive asset. The total return includes any interest payment and capital gains over the swap settlement period. There is typically no exchange of principal. The transaction simply allows the participants to go long or short a particular credit-sensitive asset. So a party holding a bond issued by a private borrower can promise to pays its total return, thereby stripping off the risk associated with credit downgrades or defaults during the life of the bond. If, however, there is no exchange of principal that party still holds the risk of default on the final principal repayment. Note also that while the swap is designed to strip off the credit risk of a third party, the two parties to the swap assume the credit risk of each other defaulting.

The total return swap transaction keeps the reference security on the books of the party who was holding it originally. The party buying into the returns on the reference security is seeking those returns without buying the asset. Note that the market risk is not eliminated since the payment of the other leg of the swap is influenced by movements in a broad, market rate such as LIBOR.

Credit swaps, sometimes called default swaps, are swaps in which one party makes payments only if a specified credit event occurs. A credit event is defined however the parties so desire, but

typical credit events are bankruptcy, insolvency, a credit downgrade or failure to make a required scheduled payment. These events are associated with a third party and they must be well-defined and unambiguous. Thus, a firm holding a bond or in a derivative position with a party whom it fears might default could enter into a credit swap with another party who pays it if one of the credit events occurs. The party seeking the credit protection makes a series of fixed payments or a lump sum payment up front. There are two variations of the credit swap, in one of which one party makes payments to another party in exchange for the latter's willingness to pay off if a credit event occurs to the third party or the first party receives payments to compensate it for the credit risk it assumes. In the other type of credit swap, as we described, the second party makes a swap payment only if a credit event occurs. Where the party makes a single payment if a credit event occurs, the transaction is really an option and is sometimes referred to as a *credit option*.

A variation of the credit option is an *option on a credit spread*. This is an option where the underlying is the spread on a third party security. For example, if you were holding a bond issued by a third party and the bond's spread over the comparable Treasury rate were 200 basis points, you might purchase an option that pays off if the spread reaches 300 basis points.

Another device used to separate market from credit risk is the *credit-linked security*. A financial institution might purchase one or more loans or bonds, assemble them into a portfolio and issue new securities representing claims against that portfolio. The financial institution may offer a guarantee against default or a promise that at a minimum a certain percentage of any money invested will be returned. This raises the question of what the financial institution does with the credit risk it assumes. It might hold that risk, enter into some of the above-described credit derivatives, or it might sell a new set of securities in which repayment is contingent upon repayment of the underlying portfolio of securities. In this manner it has found some investors who do not want the credit risk and others who do, selling them the separate parts. This is very similar to what is done in the mortgage industry, though in that case it is the separation of market risk from prepayment risk that stimulates the creation of these securities.

Besides the obvious advantage of enabling the assumption or riddance of credit risk as desired, credit derivatives offer several other specific though related benefits. One is the diversification of highly concentrated portfolios. For example, a bank lending in its community is highly exposed to the risk of its local economy deteriorating. This might occur from a large plant

layoff. The bank could potentially sell off some of the credit risk to other banks or investors outside the community. Banks are also limited in the amount of business they can do with a particular borrower. Yet a bank may want and need to lend additional funds to a borrower. By reducing some of its existing credit risk, it can easily do so.

Traditional assessment of credit risk has been highly judgmental, focusing on qualitative factors with perhaps a modest degree of analysis in the form of an examination of financial statements. This constituted the first wave of credit risk analysis. The second wave made use of discriminant analysis, or credit-scoring models. These procedures incorporate quantitative measures of a borrower's financial position into a statistical model that assigned a score, called a z-score, to the borrower. Based on historical statistics, a z-score beyond a certain threshold was considered indicative of a high probability of default. The third wave of analysis is based on option pricing theory. It reflects the fact that default is an option. When a party repays a debt, the option expires in-the-money; when it defaults, the option expires out-of-the-money. (See Teaching Note 96-01). Although option pricing theory is more powerful than previously used measures and is normally highly practical in the case of market risk, it is especially difficult to go from theory to application in the matter of credit risk. Nonetheless, large financial institutions are devoting considerable resources to developing option-theoretic credit models and further progress is occurring every day. A primary example of such is JPMorgan's CreditMetrics system, launched in April 1997, which makes its models and information available on its internet home page at www.riskmetrics.com.

With advances in technology, the efforts of many brilliant researchers in large financial institutions, and the accumulation of significant bodies of knowledge on credit experience and analysis, credit derivatives are likely to grow in usage in years to come.

References

This teaching note borrows heavily from the following special supplemental issue of *Risk*:
Credit Risk: A Supplement to Risk Magazine. (July, 1997). This publication contains numerous extremely useful articles.

Another excellent series of articles appears in

Derivatives Strategy: Credit Derivatives Supplement 2 (June, 1997), 33-60.

Technical works on credit derivatives include the following:

Das, S. R. "Credit Risk Derivatives." *The Journal of Derivatives* 2 (Spring, 1995), 7-23.

Flesaker, B., L. Hughston and L. Sprung. "Taking All the Credit." *Risk* 7 (September, 1994), 104-108.

Longstaff, F. A. and E. S. Schwartz. "Valuing Credit Derivatives." *The Journal of Fixed Income* 5 (1995), 6-14.

Schönbucher, P. J. *Credit Derivatives Pricing Models: Models, Pricing, and Implementation.* New York: Wiley (2003).

Some other sources are

Das, S., ed. *Credit Derivatives and Credit Linked Notes*, 2nd. ed. New York: Wiley (2000).

Hart, D. "Credit Derivatives: Managing Credit and Market Risk." *Journal of Commercial Bank Lending* 78 (1995), 38-43.

Howard, K. "An Introduction to Credit Derivatives." *Derivatives Quarterly* 2 (Winter, 1995), 28-37.

Neal, R. S. "Credit Derivatives: New Financial Instruments for Controlling Credit Risk." *Federal Reserve Bank of Kansas City Economic Review* 81 (2nd. Qtr., 1996), 15-27.