PRICEWATERHOUSECOOPERS

The PricewaterhouseCoopers Credit Derivatives Primer

Financial Advisory Services

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Credit Derivatives
An Introduction to the Mechanics

Credit risk is arguably the most significant form of risk capital market participants face. It is often unmanaged, or at best poorly managed, and not well understood. It tends to be situation-specific, and it does not fit easily in the paradigm of modern portfolio theory. And yet, it is an important consideration in most business and financial transactions. Managing credit risk exposure more effectively is crucial to improving capital market liquidity and efficiency.

Credit derivatives have emerged in the 1990s as a useful risk management tool.

Credit derivatives have emerged in the 1990s as a useful risk management tool. They enable market participants to separate credit risk from the other types of risk and to manage their credit risk exposure by selectively transferring unwanted credit risk to others. This uncoupling of credit risk from other types of risk creates new opportunities for both hedging and investing. Introduced in 1991, the volume of outstanding credit derivatives now exceeds $100 billion notional amount by some estimates. Their use continues to expand, and the participants in this market now include banks, industrial corporations, hedge funds, insurance companies, mutual funds, and pension funds.

Credit derivatives have the potential to alter fundamentally the way credit risk is originated, priced, and managed; they permit investors to diversify their credit risk exposure; and they enable the credit markets to reallocate credit risk exposures to those market participants who are best equipped to handle them. But as credit derivative use has grown, so has concern about whether users really understand the risks involved and whether these instruments are fairly priced. This primer explains how credit derivatives work and how companies and investors can use them to manage their exposure to credit risk more effectively and to enhance their investment returns through better diversification.

What are Credit Derivatives?

A *derivative contract*, or *derivative* for short, is a bilateral contract whose value *derives from* the value of some underlying security, such as a stock or a bond. Suppose the underlying security is a bond. A bond's value depends on a variety of factors, including its coupon, maturity, sinking fund schedule (if there is one), optional redemption features (if the issuer or investors have the right to force early redemption), and credit risk. *Credit risk* refers to the risk that a security will lose value because of a reduction in the issuer's capacity to make payments of interest and principal. Default risk refers to the likelihood that the issuer will actually fail to make timely payments of principal and interest. *Default risk* is a form of credit risk in which the reduction in the capacity to pay is so serious that a scheduled payment is delayed or missed altogether. The payment may ultimately be made, but default risk is still a concern because the delay in receiving payments is costly.

There are four basic types of derivatives: forwards, futures, options, and swaps. To date, credit derivatives have been structured as forwards, options, or swaps, but not yet as futures. Credit forwards are a very recent development, so most of the primer deals with credit options and swaps.

A Definition

A *credit derivative* is a privately negotiated contract the value of which is derived from the credit risk of a bond, a bank loan, or some other credit instrument. Market participants can use credit derivatives to separate default risk from other forms of risk, such as currency risk or interest rate risk. The value of a credit derivative is linked to the change in credit quality of some underlying fixed-income security, usually a bond, a note, or a bank loan. As credit quality changes, so does the value of a fixed-income security. A deterioration (improvement) in credit quality raises (lowers) the yield investors require and reduces (increases) the price of the bond, other factors remaining the same. A credit derivative can be used to hedge this risk. For example, a bank can use credit derivatives to reduce its exposure to the risk of a loan customer's defaulting. It can transfer this risk to other parties, for a fee, while keeping the loans to this customer on its books. The extent of the protection the hedge affords depends on the nature of the derivative selected.

Credit derivatives are generally short-term in nature, usually having a time to expiration of between one and three years initially.

Credit derivatives are generally short-term in nature, usually having a time to expiration of between one and three years initially. As the credit derivatives market develops, longer-dated instruments may become more readily available. Similar developments have taken place in the interest rate swap and currency swap markets.

Three Basic Structures

There are three basic ways to structure a credit derivative:

1 Link a stream of payments to the total return on a specified asset. A total return swap is an example of such a structure. The total return receiver also gets the credit risk exposure from the underlying asset because this risk exposure is embodied in the total return payment stream.

2 Base the payoff on a specified *credit event*, such as a bond default or a bond rating downgrade. A credit swap is an example of such a structure. The payer serves as an insurer and bears the credit risk associated with the specified credit event.

3 Tie the payoff to the credit spread on a specified bank loan or bond. Credit spread options are an example of such a structure. The writer of a credit spread put option acts like an insurer and bears the risk that the credit quality of the underlying asset might deteriorate and cause the specified credit spread to widen.

In addition to hedging some of their credit risk exposure, market participants can also use credit derivatives to increase their credit risk exposure to a particular borrower, for example, one with which they are very comfortable. They can also use credit derivatives either (1) to take advantage of differences between their expected future default rates (for example, based on historical data) and the default rates implied by bond prices in a particular market sector or (2) to profit from opportunities to arbitrage the differences in implied future default probabilities in two credit markets (e.g., the bond market and the syndicated loan market). As credit derivatives evolve, these arbitrage opportunities are likely to disappear gradually. But until they do, the search for arbitrage profits will stimulate the growth of the credit derivatives market.

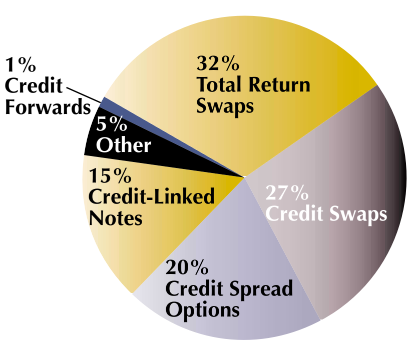
The Market for Credit Derivatives

Credit derivatives are new, although options that pay in the event of default have existed for more than 25 years, dating back to the introduction of bond insurance in 1971. Letters of credit and surety bonds, which pay in the event of default, have been around even longer. Credit derivatives are different. They are usually structured to pay off in the event credit quality changes even if default does not occur.

The first over-the-counter credit derivatives were introduced in the New York market in 1991. The credit derivatives market evolved initially out of financial institutions' needs to manage their credit concentrations. Banks purchased the early credit swaps, called default puts, to hedge their poorly diversified credit risk exposures. They were the forerunners of what are now called credit swaps. However, dealers often found it difficult to find counterparties who were willing to sell these derivative instruments because potential counterparties at first had no experience with them. In the second phase of the market's development, dealers applied existing derivatives techniques, in particular the swap technology, to emerging market debt, corporate bonds, and syndicated bank loans. Dealers created total return swaps; however, they usually held the underlying assets on their balance sheets to hedge their own risk exposures. In the third phase of the market's evolution, dealers have begun to position credit derivatives trades. They cross hedge and manage their credit risk exposures on a portfolio basis in much the same way they manage an interest rate derivatives book of business. Signifying the coming of age of the credit derivatives market, the International Swaps and Derivatives Association (ISDA) has developed standard documentation for credit swaps.

The New York market is still the leading credit derivatives market but the London market is also growing quickly. By 1994, the annual worldwide volume of credit derivative transactions had exceeded $2 billion notional amount. By 1996, the credit derivatives market had grown to more than $39 billion notional amount outstanding. To put this number in perspective, the credit derivatives market in 1996 was about the same size as the interest rate swap market in 1983.

Exhibit 1
Market Breakdown by Product Type, 1996



Source: CIBC Wood Gundy

Exhibit 1 provides a breakdown of the credit derivatives market in 1996 by product type, and Exhibit 2 furnishes a breakdown based on the underlying assets. Total return swaps account for about one-third of the market, credit swaps account for about one-quarter, and credit spread options represent about one-fifth. Emerging market debt represents the underlying assets for more than half the outstanding credit swaps, and corporate bonds and loans account for the balance. The breakdown in Exhibit 2 is not surprising when one recognizes that the earliest credit swaps were written in the form of default put options on Brady bonds. Dealers created them in response to investors seeking protection against the risk of default before they would agree to buy such bonds.

The market for credit derivatives continues to grow. It roughly tripled in 1997 to more than $100 billion notional amount. The product mix is shifting toward higher percentages of credit swaps and credit spread options, and the mix of underlying assets is shifting toward a higher percentage of corporate debt (and a correspondingly smaller percentage of emerging market debt). The market will continue to grow as new uses for credit derivatives are discovered and new forms of credit derivatives are developed.

Total Return Swaps

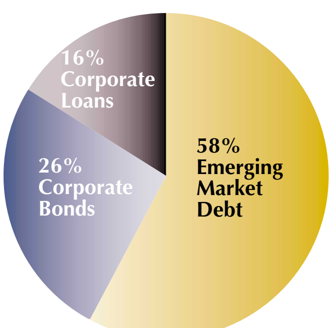
The total return swap is the most widely used form of credit derivative. Suppose an investor wants to purchase a 5-year BBB-rated bond issued by XYZ Corporation but does not want to bear the out-of-pocket cost (and possibly inconvenience) of arranging financing, actually buying the bond, and taking delivery. Suppose also that a bank owns the same bond and would like to extend a loan to XYZ Corporation but its loans to XYZ and investments in XYZ debt instruments have fully exhausted its capacity to lend to XYZ. A total return swap will allow the investor to receive the total economic return on this bond without actually buying it. It will allow the bank to reduce its risk exposure to XYZ Corporation as if it had sold the bond without actually selling it. If the two entities enter into a total return swap structured around this bond's total return stream, the investor will be synthetically "long" the 5-year bond, and the bank will be synthetically "short" the same bond.

A *total return swap* involves swapping an obligation to pay interest based on a specified fixed or floating interest rate in return for an obligation representing the total return on a specified reference asset or index. Exhibit 3 illustrates a total return swap. Such a swap transfers the total return (including interim cash flows and capital appreciation or depreciation) of a reference asset or index from one party to another. The total return payer makes payments equal to the interim cash flows (interest payments on a bond) plus any capital appreciation on the reference asset. Usually the total return receiver pays a floating interest rate, generally one of the LIBOR (London Interbank Offered Rate) rates, plus any capital depreciation on the reference asset.

The total return payer realizes the same series of returns it would if it had sold the reference asset short; the total return receiver realizes the same stream of returns it would if it owned the reference asset. But the total return receiver avoids having to take custody of the bond. Since it is also obligated to make a series of specified payments, the investment in the bond is leveraged. For example, suppose the total return recipient pays 3-month LIBOR. It effectively finances its investments in the reference bond by borrowing at 3-month LIBOR.

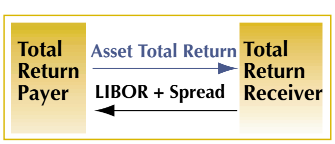
Total return swaps are usually scheduled to mature in between one and three years. As the market develops, it will accommodate longer maturities.

Exhibit 2
Market Breakdown by Type of Underlying Asset, 1996



Source: CIBC Wood Gundy

Exhibit 3
A Total Return Swap



Total Return Swaps and Asset Swaps

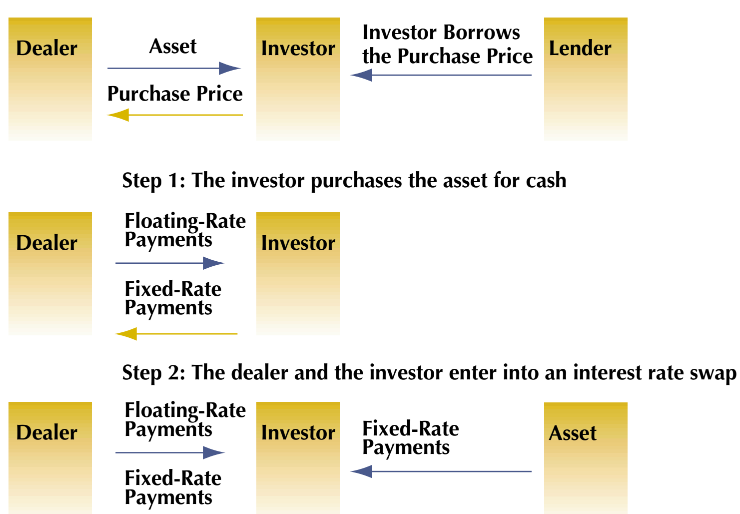
A total return swap is similar in some respects to an *asset swap*. An asset swap is a combination of two transactions: the purchase of an asset, such as a bond or a bank loan, for cash coupled with an interest rate swap. An *interest rate swap* involves the exchange of interest payment obligations, for example, the exchange of payments at LIBOR for payments at a fixed rate. The term of the interest rate swap matches the remaining maturity of the asset. The purchaser of the asset must fund the purchase, and both the purchase and funding transactions appear on the purchaser's balance sheet.

Exhibit 4 illustrates an asset swap. The asset is a fixed-interest-rate bond. The investor borrows the purchase price and buys the asset (step 1). The dealer and the investor then enter into a fixed-for-floating interest rate swap (step 2). The investor agrees to pay fixed and receive floating based on some specified index, such as one of the LIBOR. Combining the two transactions, the investor has effectively purchased a floating-rate bond.

As illustrated in Exhibit 4, asset swaps are designed to change the cash flow attributes of a particular asset. Sometimes a currency swap is used to change the currency in which the payments are denominated (as well as the interest rate). An asset swap like the one illustrated in Exhibit 4 would be useful if the investor wanted to take on credit exposure to the issuer of the bond but wanted floating-rate income whereas the bond issuer had only fixed-rate debt outstanding. Asset swaps are the basic building blocks from which credit derivatives have evolved.

A total return swap differs from an asset swap in five basic respects. (1) The total return swap does not require an initial cash outlay. (2) Since no asset is purchased, there is no borrowing either. (3) A total return swap is usually off-

Exhibit 4
An Asset Swap



Result: The investor has purchased a fixed-rate asset and converted it to a floating-rate asset.

balance-sheet whereas borrowing funds and purchasing an asset are on-balance-sheet transactions. (4) The total return swap can expire before the asset matures. (5) If the issuer of the bond defaults, the total return swap terminates; for the asset swap in Exhibit 4, the interest rate swap would remain in place. The investor faces continuing counterparty risk on the interest rate swap (because the counterparty might default on its swap payment obligation).

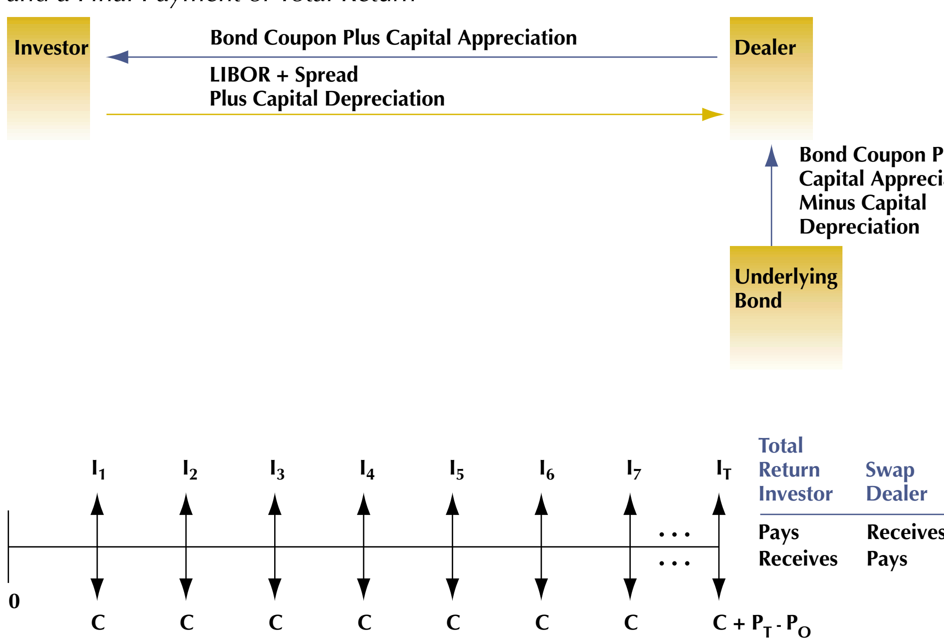
It should be pointed out that the accounting treatment of derivatives in general, and credit derivatives in particular, is changing. New rules adopted in 1997 by the Financial Accounting Standards Board will change the method of accounting for derivatives transactions by requiring the parties to a credit derivatives transaction to record the fair market value of the transaction on the face of their balance sheets.

Regular Interest Payments with a Final Payment of Total Return

Exhibit 5 illustrates how a total return swap works. At origination, the two parties agree on the *reference asset* and its initial value (P_O). The reference asset is normally an actively traded corporate bond or sovereign bond or a widely syndicated bank loan, or a portfolio formed from one of these classes of debt obligations. The two parties also agree on a notional amount, the term of the swap, and the reference rate. The total return receiver agrees to

Exhibit 5

A Total Return Swap with Regular Interest Payments and a Final Payment of Total Return



Notes:

I_1 = Periodic interest at the stated rate on the interest-only leg of the swap.
C = Periodic interest on the underlying bond on the total-return leg of the swap.
P_0 = Initial value of the underlying bond.
P_T = Terminal value of the underlying bond.

make a series of interest payments at the reference rate, which is a specified fixed rate or a rate determined according to a specified formula. In Exhibit 5, interest is paid at regular intervals in the amounts I_1, I_2, I_3, and so on. The first payment (I_1) is determined when the parties enter into the swap. If the interest rate is a floating rate, such as 6-month LIBOR, the future payments will depend on future interest rates.

The total return receiver receives payments at the rate C. In Exhibit 5 the interest rate on the underlying bond is fixed, and C is the amount of periodic interest on the bond. The total return receiver receives C at the end of each interest period. At maturity, the two parties revalue the reference asset (P_T in Exhibit 5). If the reference bond has increased in value, $P_T > P_O$, and the total return receiver receives $P_T - P_O$. If it has decreased in value, the total return receiver pays $P_O - P_T$. The total return receiver receives $C + P_T - P_O$, interest plus capital gain or loss, at the end of the final period. The dealer in Exhibit 5 owns the bond, and finances its purchase, but the investor/total return receiver bears all the credit risk of this bond, just as it would if it had purchased the bond. The position of the total return receiver in Exhibit 5 is similar to the position of the investor in the asset swap in Exhibit 4: Both are exposed to the credit risk of the underlying bond.

Determining the final price of the reference bond can be difficult if the bond is not actively traded or regularly quoted.

Determining the final price of the reference bond can be difficult if the bond is not actively traded or regularly quoted. One approach is to poll a set of designated securities dealers to determine the reference bond's fair market value. In some cases, the counter-parties are given the opportunity to participate in the poll. Another approach is to find another debt security of the issuer that is traded or quoted by a securities dealer, or at least valued on a regular basis by an independent valuation service. It is then used to determine an appropriate discount rate for valuing the reference bond. A third approach is to base the amount of the final payment ($P_T - P_O$) on the difference in the credit spread of the reference bond between the inception and the termination of the swap.[1]

There is a second problem. Suppose the reference bond goes into default. Each party's obligation to make payments ceases as of the end of the period in which the default occurs. The total return recipient would receive a final payment based on the fair market value of the defaulted reference bond at the end of the period. This end-of-period value reflects the present value of the recoveries investors expect to receive when the issuer's financial distress is eventually resolved.[2]

The total return swap structure illustrated in Exhibit 5 could also be used to create synthetic investments in mortgage-backed securities, emerging market

[1] As described later in this primer, the credit spread for a bond can be used to determine the price of the bond. The two values of the credit spread, one at the inception and the other at the termination of the swap, can be used to determine the prices P_O and P_T, respectively.

[2] Bonds that are in default trade *flat*. That is, the bonds change hands without the buyer's compensating the seller directly for accrued and unpaid interest. The end-of-period value, of course, includes the expected present value of interest obligations that are accrued and unpaid, but that will be paid, perhaps only partially, in the future after the issuer's financial distress has been resolved.

sovereign debt, and other classes of debt instruments. The swap structure could also use a treasury index, such as the 5-year constant maturity treasury index (CMT) or one of the other CMT indexes, in place of a floating-rate index like LIBOR. Caps or floors could also be included. In each case, the stream of total return payments would be calculated based on the specified underlying bond, and the stream of interest payments the total return receiver must pay would be calculated based on the specified interest rate or index, in both cases as specified in the swap agreement.

As with swaps generally, the terms of the two payment streams would be crafted so that at inception the swap would be a zero-net-present-value transaction; the present values of the two streams would offset so that neither party would owe the other anything on the swap date. As with all swaps, the payment obligations are netted at the end of each interest period, and one party makes a net payment to the other. If either party to the swap defaults, the swap is marked to market and unwound based on the provisions of the swap contract.

An Example. Exhibit 6 provides an example of a total return swap. The underlying asset is $10 million principal amount of a 9% BBB-rated corporate bond that pays interest semiannually. The bond is scheduled to mature in 5 years. The swap dealer has agreed to pay the total return on this bond for the coming 6 months in return for payments based on (1) an interest rate of 6-month LIBOR plus a spread of 25 basis points (0.25%) and (2) a notional principal amount equal to the face value of the underlying asset, $10 million.[3] At the swap date, the bond is worth par, and 6-month LIBOR is 5.75%. Thus, the investor will effectively finance a 6-month purchase of the

Exhibit 6

An Example of a Total Return Swap

Assumptions

Asset:	$10 million principal amount of a 9% BBB-rated 5-year corporate bond
Floating Rate:	6-month LIBOR plus 25 basis points (6-month LIBOR is 5.75% on the date of the swap)
Term of the Swap:	6 months (one interest period)
Value of the Bond:	Swap Date: 100% of face value Termination Date: 95% of face value

Calculation of the Swap Payment

Interest on the Bond:	$10,000,000 × 0.09/2 = $450,000
Interest at LIBOR:	$10,000,000 × (0.0575 + 0.0025)/2 = $300,000
Capital Gain (Loss):	Initial Value: $10,000,000 × 1.00 = $10,000,000 Terminal Value: $10,000,000 × 0.95 = $9,500,000 Capital Loss: $10,000,000 – $9,500,000 = $500,000

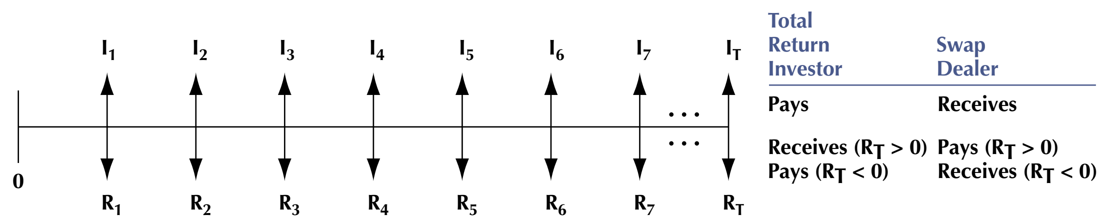
Total Return Investor's Receipts (Payments):

Receives Interest on the Bond:	$450,000
Pays Floating-Rate Interest	(300,000)
Pays Capital Loss	(500,000)
Makes a Net Payment to the Swap Dealer	($350,000)

[3] A basis point is 1/100th of 1%.

Exhibit 7

A Total Return Swap with Regular Payments of Total Return



Notes:

I_T = Periodic interest at the stated rate on the interest-only leg of the swap.

R_T= Periodic amount of total return on the total-return leg of the swap.

9% bond at an interest cost of 6% per annum.

At the termination date, suppose the bond has fallen in price to 95. There is a capital loss equal to 5% of the bond's face value, or $500,000 in total. The investor owes this sum to the swap dealer. The interest payment obligations are $300,000 for the investor and $450,000 for the swap dealer. The investor must make a net payment to the swap dealer in the amount of $350,000 (= $300,000 - 450,000 + 500,000). Note that if instead the bond had appreciated in value by 5 points, to 105 from 100, the swap dealer would owe the amount of the capital appreciation, $500,000, to the investor. In that case, the swap dealer would have to make a net payment to the investor in the amount of $650,000 (= $450,000 interest on the bond + 500,000 capital appreciation - $300,000 interest at LIBOR + 0.25%).

Regular Payments of Total Return

Total return swaps usually have the structure illustrated in Exhibit 5. However, an alternative structure is possible. The total return payer could pay the total return for the period at the end of each interest period. Total return, R_1, R_2, R_3, and so on, equals interest plus capital gain or loss during the interest period. Exhibit 7 illustrates this structure. It requires valuing the reference bond as of the end of each period whereas the first approach requires valuing the bond only at inception and upon the termination of the swap. If R_T is negative for any period, then the total return investor pays I_T - R_T to the counterparty.

If the reference bond goes into default, the swap terminates. The value of the reference bond is determined as described earlier in this section.

Relative Performance Total Return Swaps

The total return swaps described thus far represent the synthetic purchase (from the total return receiver's perspective) and sale (from the total return payer's perspective) of a single asset. Two total returns swaps can be combined, as illustrated in Exhibit 8, to create a *relative performance total return swap*. Such a swap is tantamount to an exchange of assets. The party on one side of the swap pays the total return on one asset and receives the total return on the other. The counterparty is in the opposite position. The first party is effectively shorting one bond and using the proceeds to invest in another. The strategy will be successful if the long position outperforms the bond that was shorted.

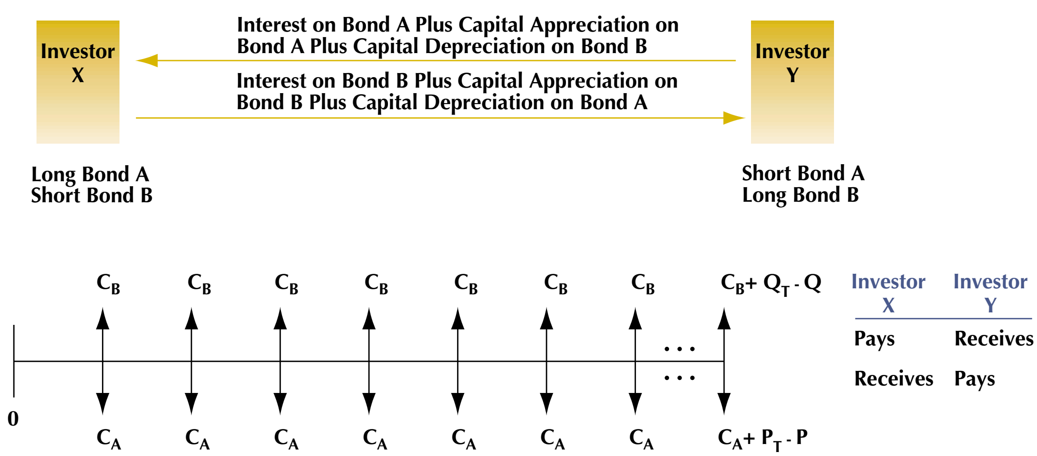
In Exhibit 8, C_A is the periodic interest on Bond A, C_B is the periodic interest on Bond B, P_O and P_T are the initial and terminal prices of Bond A, and Q_O and Q_T are the initial and terminal prices of Bond B. Investor X (Investor Y) is effectively long (short) Bond A and short (long) Bond B. For example, suppose Bond A appreciates and Bond B depreciates during the term of the swap. Investor X receives (Investor Y pays) C_A in interest each period on Bond A, $P_T - P_O$ at termination for the capital appreciation on Bond A, and $Q_O - Q_T$ at termination for the capital depreciation on Bond B, and Investor X pays (Investor Y receives) C_B in interest each period on Bond B. Each period one investor makes a payment to the other for the difference in the amounts owed.

Using Total Return Swaps to Hedge Credit Risk Exposure

Total return swaps are attractive to banks, insurance companies, and other entities that would like to hold an asset to maturity (for relationship, regulatory, or other reasons), but are concerned about their credit risk exposure. A lender can hedge its credit risk exposure by entering into a total return swap in which it agrees to *pay total return*. The payment stream depends on the credit standing of the borrower. If the borrower's credit standing deteriorates, the final payment, $P_T - P_O$ in Exhibit 5, decreases. Such a transaction enables

Exhibit 8

A Relative Performance Total Return Swap



Notes:
C_A = Periodic interest on underlying bond A.
C_B = Periodic interest on underlying bond B.
P_O = Initial value of underlying bond A.
P_T = Terminal value of underlying bond A.
Q_O = Initial value of underlying bond A.
Q_T = Terminal value of underlying bond B.

the lender to hedge the credit risk while leaving the loan on its books because the decrease in PT offsets the decrease in the value of the loan. In return, the lender would receive a market rate of interest, for example, 6-month LIBOR plus a spread. The swap counterparty will receive the total return payment stream as illustrated in Exhibit 5 or Exhibit 7, depending on the particular structure of the swap, thus bearing the credit risk of the loan. Total return swaps are flexible, for example, allowing a lender to buy credit risk protection for, say, the last three years in the life of a five-year bond.

Using Total Return Swaps to Take on Credit Risk Exposure

Alternatively, an investor can take on credit risk exposure to a company by entering into a total return swap. The investor would agree to pay LIBOR (plus a spread) in return for the total return on the risky debt. The investor would receive the total return stream as specified in Exhibit 5 or Exhibit 7, depending upon the swap structure. The receipt of total return payments mirrors the payments the investor would receive if it owned the bond. The investor has effectively leveraged its investment by "borrowing" the purchase price at LIBOR.

A total return swap can be structured so as to magnify the investor's risk exposure.

A total return swap can be structured so as to magnify the investor's risk exposure. Credit derivatives have been created that enable investors to take on more credit risk than an equal position in an underlying instrument whose maturity matches the term of the swap. For example, a three-year total return swap based on a 10-year reference bond has the same credit risk price sensitivity as a ten-year note and substantially greater credit risk price sensitivity than a three-year note. A greater maturity for the underlying reference bond increases the total return receiver's credit risk exposure.

Total return swaps offer a number of potential advantages over a bond purchase. Under current accounting practice, a swap can often be structured so that it is off-balance-sheet. The financial institution that serves as the counterparty effectively acts as a custodian, which saves the lender the administrative and legal burdens of bond ownership. If the counterparty has lower funding costs or can derive tax or accounting benefits not available to the investor, part of these benefits may be passed through to the investor in the form of a lower swap rate.

Pricing Total Return Swaps

Lenders and equity investors must be compensated for bearing risk. This statement applies to all forms of risk, including credit risk. Credit derivatives offer a means of isolating credit risk and transferring it to others. Whether this is advantageous depends on the price the transferee charges. If this price is lower than the premium in rate of return that lenders or equity investors would require to bear it, then using credit derivatives can be mutually beneficial.

A total return swap is usually structured as a zero-net-present-value transaction. As illustrated in Exhibit 5, one party receives the total return on the underlying asset and pays LIBOR plus a credit spread; the counterparty's cash payments and cash receipts are the reverse of the first party's. Aside from the risk that either party might fail to meet its obligations under the swap, one side of the transaction is a mirror image of the other. So, consider the swap from the dealer's perspective.

The dealer in Exhibit 5 can hedge its risk exposure by buying the underlying bond and borrowing the funds to do so under a LIBOR-based bank loan facility. The dealer could increase the credit spread it charges the investor so as to cover its cost of funding, receive compensation for the risk that the investor might default on its payment obligations to the dealer, and earn a profit on the transaction. The dealer often arranges for its side of the swap to be handled by a triple-A-rated bankruptcy-remote subsidiary or trust, so that the investor has no credit risk exposure to the dealer.

Total return swaps are usually priced on the basis of what it costs the dealer to hedge its position.

Total return swaps are usually priced on the basis of what it costs the dealer to hedge its position. Dealers refer to this method of pricing as pricing on a "cash-and-carry" basis. The dealer prices the total return swap based mainly on its cost of hedging its total risk exposure. However, a perfect hedge is seldom attainable. For example, if the underlying asset is a bank loan and the dealer is the total return recipient, hedging may be difficult. The dealer usually cannot sell the bank loan short. In such cases, the dealer will select the most cost-effective hedge available and charge the investor for any basis risk the dealer is forced to bear. Nevertheless, the basic pricing approach is the same: Total return swaps are generally priced on a cash-and-carry basis.

Typical Parties to Total Return Swaps

Typical total return payers include bank and insurance company lenders and bond investors who want to reduce their credit risk exposure to a particular borrower without removing the debt obligation from their balance sheets. For example, they may want to keep a loan on their books because the borrower is a good client who, for reasons of confidentiality, would object if the financial institution sold any portion of the loan. Loan documentation and financial records would have to be transferred in a loan sale but normally are not transferred under a swap.

Typical total return receivers include hedge funds, insurance companies, pension funds, and other investors who want to invest in debt obligations on a leveraged basis, to diversify their portfolios or to achieve higher yields by increasing their credit risk exposure. Hedge funds buy total return swaps to exploit differences they perceive between the pricing of credit risk in the bond, bank loan, and equity markets. Often, total return receivers want to avoid the administrative expense and inconvenience of clearing and financing the purchase of the underlying asset. For example, an investor may want to invest in bank loans without the expense and administrative burden of actually extending the loan itself or participating in the syndication of the loan. Also, when an investor, such as a bank, is capital constrained, entering into a total return swap may provide a more efficient means of making a leveraged bond investment than acquiring the bond and financing it in a conventional manner.

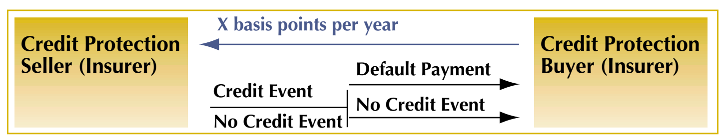
Total return swaps can sometimes be structured to achieve higher after-tax returns than a comparable leveraged cash purchase. The total return swap structures are flexible enough to allow investors to design them to capitalize on an expected change in interest rates, an expected change in the shape of the yield curve, or an expected change in a particular credit spread.

Credit Swaps

The classic credit derivative is the credit swap. A *credit swap* (or *credit default swap*) functions like a letter of credit or a surety bond. It enables an investor to insure against an event of default or some other specified credit event. It consists of a single upfront payment, or possibly a series of payments, in exchange for the counterparty's obligation to make a payment that is contingent upon the occurrence of a specified credit event. It represents a form of credit insurance, which pays off when the credit event occurs. On the fixed-payment leg of the swap, the buyer of credit event protection (the insured) agrees to make one or more payments, which represent insurance premiums. On the contingent-payment leg of the swap, the seller of credit event protection (the insurer) agrees to make the specified contingent payment. Exhibit 9 illustrates a credit swap.

The credit event could be a payment default on an agreed-upon public or private debt issue (the *reference asset*), a filing for bankruptcy, a debt rescheduling, or some other specified event to which the two parties agree. The standard ISDA documentation for credit swaps defines a set of credit events. As a general rule, the credit event must be an objectively measurable event involving real financial distress; technical defaults are usually excluded. The reference credit is usually a corporation, a government, or some other debt issuer or borrower to which the credit protection buyer has some credit exposure.

Exhibit 9
A Credit Swap



A credit swap can be viewed as a put option whose payoff is tied to a particular credit event.

A credit swap can be viewed as a put option whose payoff is tied to a particular credit event. Indeed, the earliest credit swaps were referred to as *default puts* for that reason. If a credit event occurs during the term of the swap, the seller/insurer pays the buyer/insured an amount to cover the loss, which is usually par (in the case of a bond) minus the final price of the reference asset, and then the swap terminates. In effect, the buyer/insured puts the reference asset to the seller/insurer at par. The final price is usually determined through a dealer poll.

Credit swaps usually settle in cash but physical settlement is not uncommon. In that case, the credit protection provider pays the full notional amount (i.e., the par value of the bond) and takes delivery of the bond.

As a third payment alternative, the credit protection provider can be required to pay a specified sum in cash if the specified credit event occurs. This amount could be either a fixed sum or a sum determined according to a formula. The fixed sum or the formula, as the case may be, would be decided at the start of the swap.

Basic Credit Swap Structure

Exhibit 10 illustrates the basic structure of a credit swap. The two parties agree on a notional amount, the term of the swap, the reference asset, the list of credit events, and the payment features. The buyer/insured agrees to make a payment, or a series of fixed payments, and the seller/insurer agrees to make a specified contingent payment if the credit event occurs. If no credit event has occurred by the time the swap matures, then the insurer's contingent obligation expires. Actually, the buyer of credit protection usually has 14 days after the "expiration date" of the credit swap to determine whether a credit event has occurred, and if so, to document it.

Credit swaps are often customized to meet the specific needs of the buyer/insured. The reference asset can be a loan, a bond, or a portfolio of loans or bonds. It can be denominated in U.S. dollars or in a foreign currency. The periodic fixed payments depend mainly on the credit quality of the reference asset. The credit spreads prevailing in the market also affect the pricing.

Credit Swaps and Asset Swaps

It was pointed out earlier in the primer that asset swaps are the basic structure from which credit derivatives have evolved. Credit swaps also evolved from asset swaps. Recall that a typical asset swap involves the purchase of an asset, such as a bond, coupled with an interest rate swap. The investor is thus exposed to the risk that the bond might default as well as the other risks of owning the bond, except for any interest rate risk that is transferred to the counterparty to the interest rate swap. Similarly, the seller/insurer under a credit swap is exposed to the risk that the underlying bond might default. In contrast, the credit swap segregates this risk and transfers it to the seller/insurer without any of the other risks that go along with bond ownership. Also, a credit swap, like the one illustrated in Exhibit 10, does not involve the purchase of the asset (and thus no funding of the purchase would be required either). The only cash outlay is the initial (option) premium; the only payment

Exhibit 10
The Basic Structure of a Credit Swap

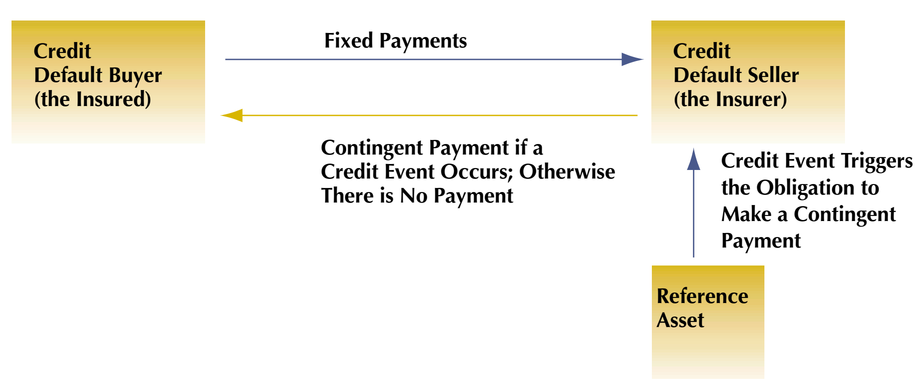
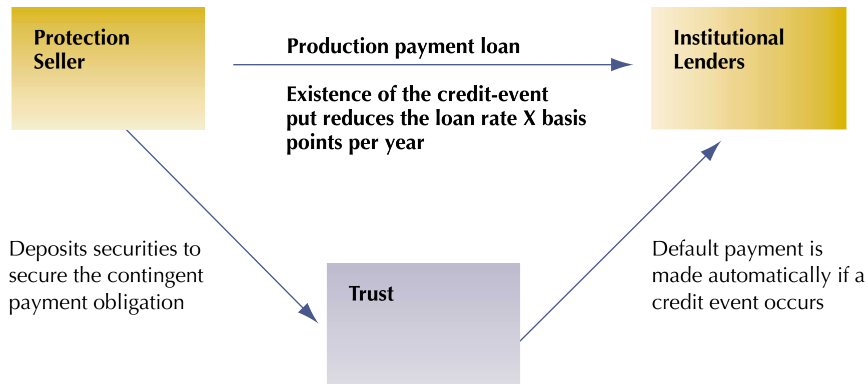


Exhibit 11
Structure of the Oil and Gas Project Credit-Event Put



the protection buyer receives is contingent upon the occurrence of the specified credit event; and if a default occurs, the credit swap terminates.

Credit-Event-Put Trust Structure

A *credit-event* put (or *event-risk put*) is a variant of the credit swap in which the payoff amount is segregated in a trust. A credit-event put could specify either a fixed or a variable payoff. The credit event may not involve an actual default. For example, it might entail a reduction in debt rating, and the amount of the variable payoff would depend on the extent of the reduction in debt rating. Alternatively, it might simply involve payment of the full principal amount by the seller/insurer in exchange for physical delivery of the reference bonds, that is, a true put. To guarantee the insurer's ability to meet its contingent payment obligation, the payoff can be segregated in a trust. The following example describes a credit-event-put structure employed in connection with a production payment financing. It was employed in the United States, but such a structure or one similar to it could also be used to hedge emerging market default risk.

An Example. A BBB-rated oil and gas company purchased a portfolio of producing oil and gas properties. It financed the purchase by borrowing on a non-recourse basis from a group of institutional investors.[4] The oil and gas company deposited funds into a trust. The terms of the trust provide that if the oil and gas company defaults on any of its outstanding debt, all the funds in the trust will be distributed pro rata among the institutional lenders. Exhibit 11 illustrates the structure of the oil and gas project credit-event put.

Uses of Credit Swaps

Credit swap buyers include lenders and fixed-income investors who have exhausted their credit limits to a particular borrower but who want to lend

[4] A non-recourse debt obligation restricts the lenders' ability to seek repayment if there is a default. In the example, the lenders could have the portfolio of producing oil and gas properties liquidated, but because their loans were non-recourse, they could not seek repayment directly from the oil and gas company.

additional funds or buy additional debt of that borrower. They can hedge their credit risk exposure by purchasing a credit swap linked to the new loan. Similarly, a bank can free up additional lending capacity to a particular borrower by arranging a credit swap to hedge part of its credit risk exposure on its existing bank lines to that borrower. A bank could instead sell loans or sell participations in loans but credit derivatives generally involve lower transaction costs. Also, a bank can retain the loan while reducing its credit risk exposure, which it may prefer over selling the loan from a borrower relationship standpoint.

There are several other types of buyers of credit swaps. A manufacturing company can use a credit swap to hedge its exposure to a large trade creditor. Project sponsors or lenders who are comfortable with the economic risks of a large foreign project but are concerned about their exposure to the sovereign credit risk of the country in which the project is located can buy a credit swap linked to the sovereign issuer's outstanding debt. For example, a credit event could be defined as a reduction in the credit rating of the country's debt. If the country's credit rating falls, causing the value of the sponsor's and lenders' investments in the project to fall, the contingent payoff on the credit swap would at least partly compensate for this loss in value.

A lender can use a credit swap to diversify its credit risk exposure...

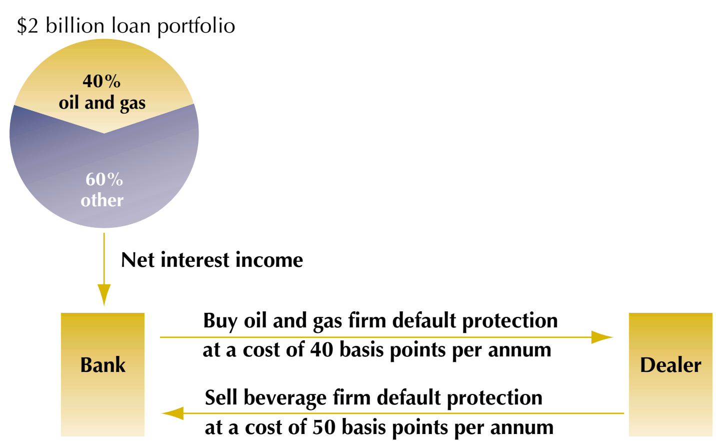
Using Credit Swaps to Diversify Credit Risk Exposure

A lender can use a credit swap to diversify its credit risk exposure, for example, to relieve an undue concentration of risk. Exhibit 12 illustrates how a credit swap achieves this diversification.

Suppose that a bank that is located in an oil-producing region has 40% of its total loan portfolio committed to the oil and gas industry. Such a clear con-

Exhibit 12

Using a Credit Swap to Diversify Credit Risk Exposure



Oil and Gas Credit Swap

Bank buys protection
$200 million notional amount
Reference assets: loans to specified oil and gas firms

Beverage Credit Swap

Bank sells protection
$160 million notional amount
Reference assets: loans to specified beverage firms

centration of risk is worrisome; a downturn in the oil and gas industry could cause the bank to fail. But suppose also that the bank has no credit exposure to the beverage industry and that the correlation between oil and gas firm defaults and beverage firm defaults is very low. This correlation is important because the lower the correlation between default rates in the two industries, the greater the potential for diversification benefits. To appreciate this point, note that if there was a perfect correlation between oil and gas firm defaults and beverage firm defaults, then the two industries would be indistinguishable from the standpoint of credit risk. In that case, substituting some beverage firm credit risk for some oil and gas firm credit risk would not reduce the lender's overall credit risk exposure; diversification would not be beneficial.

The lender in Exhibit 12 has a $2 billion loan portfolio, 40%, or $800 million, of which it has lent to oil and gas firms. To reduce its concentration of risk in the oil and gas industry, the bank could buy a credit swap tied to one or more of the loans to oil and gas firms contained in its loan portfolio. For the sake of illustration, suppose that it can buy 2-year protection on $200 million notional amount of oil and gas loans at a cost of 40 basis points per annum, or $800,000 (= 200 million x 0.004) per year. This $800,000 per year premium reduces its net interest income. Suppose further that it can offset this cost by selling 2-year protection on $160 million notional amount of beverage firm loans at a cost of 50 basis points per annum, or the same $800,000 per year.

...income-neutral credit diversification will improve a bank's risk-return profile so long as the default rates of the underlying credits are less than perfectly correlated.

Buying the oil and gas credit swap virtually eliminates the bank's credit risk exposure on $200 million of oil and gas loans. However, this transaction reduces net interest income as well as credit risk. Unless it has a sophisticated risk analysis system, the bank cannot be certain that the swap has improved its risk-return profile because both risk and return have declined. However, selling the beverage credit swap exactly offsets the decline in net interest income. If the credit risk exposure from the $160 million notional amount of the beverage credit swap is less than the credit risk exposure eliminated through the $200 million notional amount of the oil and gas credit swap, the bank's overall risk exposure will be lower but its net income will not be affected. Its risk-return profile will therefore improve as a result of the swaps.

This example illustrates what might be termed *income-neutral credit diversification*. As a general rule, income-neutral credit diversification will improve a bank's risk-return profile so long as the default rates of the underlying credits are less than perfectly correlated. Income-neutral credit diversification works best when the two credits are of similar quality (e.g., the same bond rating) and the credit spreads are close to one another because in that case the two notional amounts will be nearly equal (whereas significantly different notional amounts could distort the distribution of credit risk in the loan portfolio).

Using Credit Swaps to Enhance Return on Capital

A bank can use a credit swap to improve its return on capital. This opportunity is mainly due to the favorable regulatory treatment of interbank obligations under the risk-based capital rules. Under these rules, a bank has to maintain capital (essentially equity and certain other equity-like items) at least equal to 8% of its risk-weighted assets. Assets are risk-weighted according to a schedule of risk weights established cooperatively by the banking regulators in the Organization for Economic Cooperation and Development (OECD) countries. Loans to corporate borrowers carry a 100% risk weighting whereas a loan to another OECD bank carries only a 20% risk weighting. In effect, a loan to another OECD bank requires capital equal to just 1.6% (= 0.2 x 8%) of the amount of the loan. Credit derivatives can be used to exploit this difference in risk weightings, as illustrated in the following example.

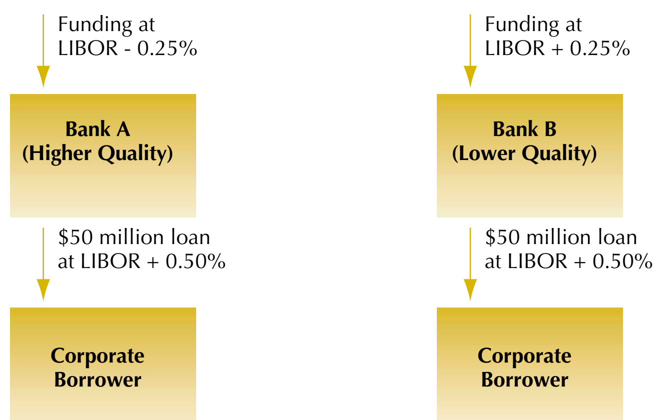
An Example. Exhibit 13 shows the capital requirements and returns on capital for two banks. Bank A is a higher-quality institution, which is able to fund its loans at LIBOR minus 25 basis points. Bank B is a lower-quality institution, which must pay LIBOR plus 25 basis points to fund its loans. The 50-basis-point differential reflects their difference in credit quality.

Credit derivatives can be used to exploit a difference in risk weightings...

Suppose that each bank lends $50 million to a corporation whose credit standing requires a spread of 50 basis points over LIBOR. Each bank must allocate $4 million (= $50 x 0.08) of capital to support its loan. Assume that LIBOR is 5.50%. Each bank earns 6% (= 5.50 + 0.50) on its $50 million loan, which produces $3 million (= $50 x 0.06) of interest income each year. Each bank puts up $4 million of capital and borrows the remaining $46 million to fund its loan. Bank A borrows $46 million at an annual cost of 5.25% (= 5.50 - 0.25), or $2.415 million. It realizes net interest income of $0.585 million (= $3.000 - 2.415) and a return on capital of 14.625% (= 0.585 ÷ 4.0). Bank B must pay more for its funds because it is of lower credit quality. Its interest expense is $2.645 million (= $46 x 0.0575); its net interest income is $0.355 million (= $3.000 - 2.645); and its return on capital is 8.875% (= 0.355 (4.0).

Exhibit 13

Bank Return on Capital Without Credit Derivatives



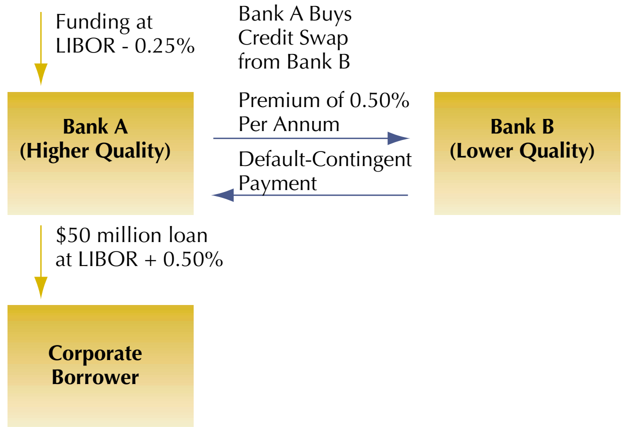
Risk Weighting	**100%**	**Risk Weighting**	**100%**
Capital	**$4 million**	**Capital**	**$4 million**
Net Revenue:		**Net Revenue:**	
Loan	**$3.000 million**	**Loan**	**$3.000 million**
Funding	**2.415**	**Funding**	**2.645**
Net Revenue	**$0.585 million**	**Net Revenue**	**$0.355 million**

Return on Capital = $\frac{0.585}{4.0}$ = **14.625%**

Return on Capital = $\frac{0.355}{4.0}$ = **8.875%**

Exhibit 14

Bank Return on Capital With Credit Derivatives



Risk Weighting	**20%**
Capital	**$800,000**
Net Revenue:	
Loan	**$3.000 million**
Funding	**2.583**
Credit Swap Premium	**0.250**
Net Revenue	**$0.167 million**

Return on Capital = $\frac{0.167}{0.8}$ **= 20.875%**

Risk Weighting	**100%**
Capital	**$4 million**
Net Revenue:	
Credit Swap Premium	**$0.250 million**
Treasury Interest	**0.210**
Net Revenue	**$0.460 million**

Return on Capital = $\frac{0.460}{4.0}$ **=11.500%**

Using a Credit Swap. Exhibit 14 shows how the two banks can use a credit swap to *enhance the returns of both banks*. Bank A buys a credit swap from Bank B, which is tied to Bank A's loan to the corporate borrower. Bank A agrees to pay Bank B 50 basis points per annum, the same credit spread that it receives from the corporate borrower. Bank B agrees to pay Bank A, in the event the corporate borrower defaults, an amount equal to the difference between the face amount of the loan and the loan's fair market value immediately following the default. Bank A has used the credit swap to transfer the credit risk on the corporate loan to Bank B. As a result, Bank A is now exposed to the default risk of Bank B. Unless Bank B defaults under the credit swap, Bank A is protected against a default by the corporate borrower.

The new risk weighting on the corporate loan is 20%. Bank A needs to put up only $800,000 of capital. It borrows $49.2 million (= $50.0 x 0.8) at a 5.25% interest rate. Interest income is still $3.0 million. Interest expense is $2.583 million (= $49.2 x .0525), and the credit swap premium costs $0.25 million (= $50 x 0.005). Bank A's net revenue is $0.167 million, and its return on capital has increased to 20.875%.

Bank B receives $0.250 million of income from the credit swap. Its swap obligation has a 100% weighting, so it must put up $4.0 million of capital. It can invest this $4.0 million. Suppose it buys Treasury notes yielding 5.25%. This investment produces $0.210 million (= $4 x 0.0525) of income. Bank B's net revenue is $0.460 million, and its return on capital has increased to 11.50%. Note that if the two corporate borrowers in Exhibit 13 are the same as the borrower in Exhibit 14, or at least of the same credit quality, then Bank B has a higher return on capital without any increase in its credit risk exposure.

Other Benefits. Exhibits 13 and 14 illustrate another benefit of credit swaps. Bank B, the lower-quality bank, earns a spread of only 25 basis points (= 0.50% - 0.25%) on its loan to the corporate borrower because its cost of funding is LIBOR + 0.25%. To earn the same spread as the higher-quality Bank A, it would have to seek out higher-margin loans, which would expose Bank B to greater credit risk. Instead, Bank B can earn a premium of 50 basis points, which can be looked at as a form of credit spread, on the credit swap. Credit swaps offer lower-quality banks an attractive alternative to higher-risk lending as a means to improve their profitability.

With credit swaps, banks can upgrade the credit quality of their loan portfolios and improve diversification while increasing their return on capital.

There is one other way that credit swaps can help banks. Suppose that a hedge fund sold the credit swap to Bank A in Exhibit 14. A hedge fund might feel comfortable taking on credit risk exposure to the corporate borrower but not want to lend directly. A credit swap in these circumstances can be mutually beneficial. The amount of capital Bank A has to allocate to support the loan could still be as low as the $800,000 indicated in Exhibit 14, depending on the credit quality of the hedge fund, because the bank faces much lower default risk exposure; Bank A's default risk exposure depends on the risk of *simultaneous* defaults by both the corporate borrower (the credit event) and the hedge fund (i.e., its failure to meet its contingent-payment obligation under the swap). The credit swap with the hedge fund enables the bank to transfer a substantial portion of the credit risk of the loan outside the banking system.

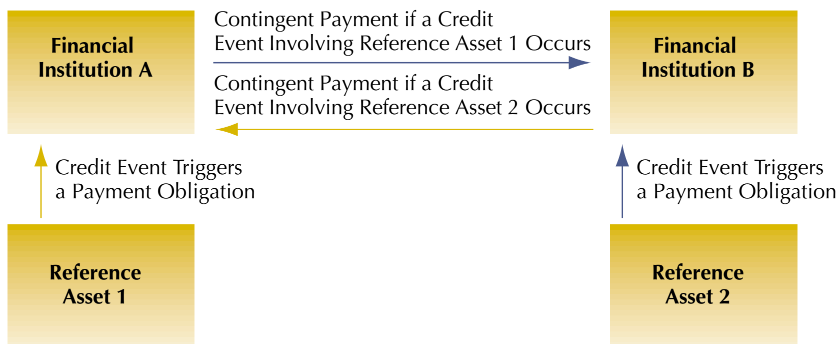
With credit swaps it is possible for banks to upgrade the credit quality of their loan portfolios and improve diversification while at the same time increasing their returns on capital.

Exchange-of-Default Protection Between Two Lenders

Credit swaps can be used to exchange one form of credit risk exposure for another. For example, a regional bank with a very high local loan concentration could enter into a credit swap with exchange-of-default protection in order to diversify its credit risk exposure. The counterparty might be another regional bank located in a different part of the country that faces the same problem or it might be some other financial institution that could better diversify its loan portfolio by swapping default risk exposures. Exhibit 15 illustrates a swap structure that can achieve such mutually beneficial diversification.

The two lenders swap default risk exposures. If a credit event occurs involving one of the reference assets, the seller/insurer with respect to that reference asset must make the specified contingent payment to the other party. Note that each party acts as a buyer/insured on one leg of the swap and a seller/insurer on the other leg. Both parties can benefit not only from a diversification standpoint but also because each may want to reduce its credit risk exposure to the region within which it operates without having to incur the transaction costs involved in selling loans and purchasing replacement loans. Banks may also be reluctant to sell loans they have made to their best customers, which may be responsible for their excessive credit concentration.

Exhibit 15
A Credit Swap with Exchange-of-Default Protection



Credit swap sellers include hedge funds and other market participants who are willing to write default risk insurance. They also include banks and other lenders with relatively high funding costs that would like to upgrade the credit quality of their loan portfolios. Credit swaps are a good vehicle for accomplishing this objective because they do not require funding the way a loan does.

Basket Default Swaps

A credit swap can have the credit event based on a single reference asset, or instead the credit event can be tied to a portfolio of assets. For example, the swap could specify a portfolio of reference bonds, and the seller/insurer would have to make a contingent payment if any of these bonds experiences a credit event. Such a swap is called a *basket default swap*. Usually, the swap terminates as soon as the first credit event occurs (when the contingent payment is made). In this structure, the credit swap takes the form of a portfolio of put options, which are contingent upon one another because once one of them pays off, the others automatically expire.

Pricing Credit Swaps

Pricing a credit swap requires two critical types of information: (1) the probability that the credit event will occur and (2) the amount of the payment if the credit event occurs. If the credit event is the default by a debt issuer and if the payment is the difference between the face amount of the debt and the amount of the lenders' recovery in default, then we need to know: (1) the probability of default and (2) the amount of the lenders' recovery (percentage of face amount) under default.

There are three basic techniques for pricing credit swaps:

(1) Use the historical probabilities of default and historical default recoveries to estimate the future payoffs under a credit swap. Both Moody's Investors Service and Standard & Poor's have published extensive data concerning the probability of default for publicly issued bonds based on the debt's credit rating and how long the bonds were outstanding at the time of default. Each rating agency has also published fractional recovery rates

according to the seniority of the debt, that is, the fraction of face amount recovered by holders of senior secured debt, senior unsecured debt, senior subordinated debt, and so on. These data can be used to infer future default probabilities and recovery rates. However, such inferences have the obvious limitation that future default experience may differ significantly from historical experience. In addition, all bonds within a particular rating category are not identical, and recovery rates within each level of seniority can vary widely from one bankruptcy to another.

(2) Build a mathematical model of the default process. This basic approach is the one most widely used by credit swap market participants. It is embodied in a variety of proprietary valuation models, some developed by dealers for their own use and others developed by commercial services that furnish estimates of default probabilities for their subscribers. These models generally start by mathematically representing the stochastic process that explains how the value of the issuer's assets is determined. They use this asset value process to assess the likelihood that the future value of the issuer's assets might fall below the issuer's debt service requirement so as to trigger a default. Many of these models are based on a famous model of the default process developed many years ago by the Nobel laureate Robert Merton.[5] This approach also has some important limitations because developing mathematical models that produce "workable" solutions requires simplifying assumptions, which can impair the model's accuracy.

Once the credit spread term structure has been estimated, the credit spreads can be used... to price a credit swap on any underlying debt instrument no matter how complicated its cash-flow pattern.

(3) Estimate the credit spread term structure, as illustrated in Exhibit 16. For each maturity, the *credit spread term structure* shows the size of the *credit spread* — the amount of the premium in yield required to compensate investors for bearing default risk — that a fixed income investor would demand when deciding how much to pay for a zero-coupon bond with that maturity and with the same credit quality (i.e., bond rating) as the debt instrument underlying the credit swap. In Exhibit 16, a new 5-year par-value bond would require a yield spread of 100 basis points (1% in yield) above the 5-year par-value treasury yield (point A) to compensate for default risk. If 5-year treasuries yield 9%, the investor would require a 10% yield to buy the underlying bond. The 100 basis points of additional yield would compensate the bondholder for bearing the bond's default risk over the 5-year life of the bond. The credit spread term structure shows the credit spreads for zero-coupon bonds that are implicit in the credit spreads for par-value bonds shown on the yield spread curve. A 1-year zero-coupon bond would require a 50-basis-point credit spread (point B); a 2-year zero-coupon bond would require a 75-basis-point credit spread (point C); a 3-year zero-coupon bond would require a 95-basis-point credit spread (point D); and so on.

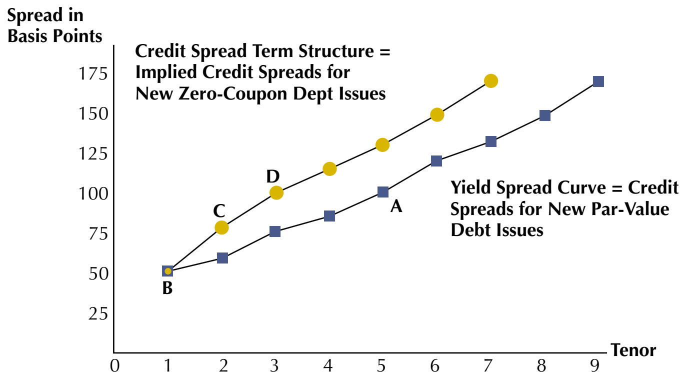
The credit spreads in Exhibit 16 provide a good approximation in many cases as to how much a credit swap should cost. For example, a 5-year credit swap that would fully protect the buyer against the risk of default on a 5-year par-

[5] Merton's paper that contains his model is included in the additional readings at the end of the primer.

value bond with the same credit rating as the bonds underlying Exhibit 16 should cost about 100 basis points per year (point A). A credit swap on a similarly rated 2-year zero-coupon bond should cost 75 basis points per year (point C). However, the cost estimated in this manner is usually only an approximation because sufficient information to obtain the current yield spread curve for a particular issuer is seldom available and issuers may have multiple classes of debt with differing senior-ity and thus different expected recovery rates and different credit spreads.

Exhibit 16

A Credit Spread Term Structure



The best one can normally do is achieve a reasonable approximation to the yield spread curve and credit spread term structure for the debt instrument underlying a credit swap by estimating these curves for the whole class of bonds with a particular debt rating. Once the credit spread term structure has been estimated, the credit spreads can be used in the manner illustrated later in the primer to price a credit swap on any underlying debt instrument no matter how complicated its cash flow pattern.

How Credit Spreads Work

This section of the primer digresses slightly to cover the subject of credit spreads because one of the illustrations in the next section uses the credit-spread approach to pricing credit swaps. The yield on a bond can be expressed as the sum of the yield on a comparable default-free bond and a credit spread S. As just noted, the *credit spread* is the amount of the premium in yield required to compensate investors for bearing default risk. In the U.S. bond market, credit spreads are measured relative to the yields on U.S. Treasury bonds, which are considered default-free. Yield may be the yield to maturity, yield to call, yield to worst, or some other yield measure. For a nonredeemable bond, yield to maturity is the customary yield measure.[6]

Suppose a company issues 10-year nonredeemable bonds. Let YTM denote the yield to maturity of the current 10-year on-the-run treasury note.[7] The company bonds' yield to maturity is YTM + S for some credit spread S. It compensates the bondholders for the risk that the issuer might default on its debt service payment obligations sometime prior to maturity. The greater this risk, the greater the credit spread S.

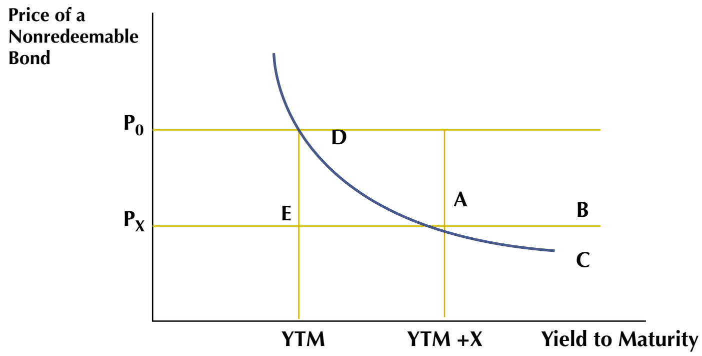
The price of a company's bonds (or some other reference bonds) is P_S when the credit spread is S, and P_X is the price of the bond when the credit spread is X. If the credit spread S is greater than the credit spread X, then P_S is less

[6] Yield to worst is the minimum of the yield to maturity and the yields to call for all possible call dates. Bond investors calculate it when assessing how adversely a bond's call feature might affect the value of their bonds.

[7] The on-the-run treasury securities are recently issued, actively traded treasury obligations that bond market participants use as pricing benchmarks.

Exhibit 17

The Price-Yield Relationship for a Nonredeemable Bond



than P_X because the price of a bond and its yield are inversely related. The price of the 10-year treasury note is P_O; its credit spread is zero because treas-ury securities have no risk of default. (It is the base yield with respect to which the yield on corpo-rate bonds is expressed.) Exhibit 17 illustrates the price-yield relationship for a nonredeemable bond.

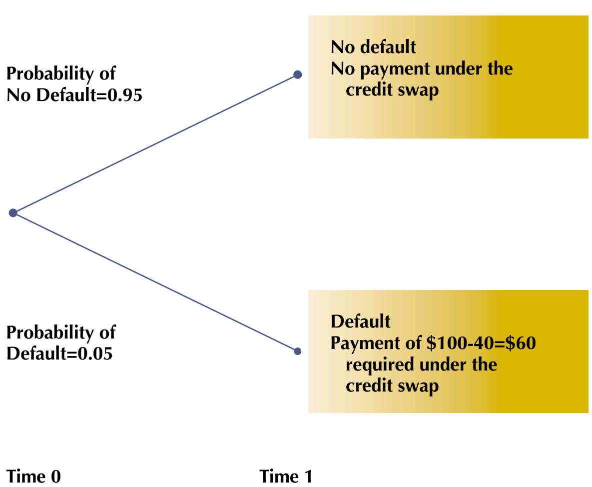
Examples of Pricing Credit Swaps

Two simple examples will illustrate credit swap pricing. The first example concerns a one-year bond. Suppose that either an analysis of historical default rates (method 1) or a mathematical default model (method 2) indi-cates a 5% chance of default. The estimated recovery rate (based on rating agency historical data) is 40% of the face amount. The risk-free one-year interest rate is 10%.

Exhibit 18 shows the two possible outcomes. There is no payment under the credit swap unless the issuer of the underlying bond defaults. The probability this will happen is 0.05. Since the bondholders would recover 40% of face value in the event of default, there is a shortfall of $60 (= 100 - 40) in that case. The credit swap would pay $60 at time 1 with probability 0.05. The expected payoff under the swap is $3.00 (= 0.05 x 60 + 0). The present value — the cost of the swap — is $2.73 (= 3/1.10) of the face value of the underlying bond.

Exhibit 18

Payment Diagram



Value of the Credit Swap $= \dfrac{0.95 \times 0 + 0.05 \times \$60}{1.10} = \$2.73$

This example is oversimplified for several rea-sons. Most importantly, dealers would not use the actual probability of default to price the cred-it swap. Instead, they would adjust it to reflect the risk aversion of investors. How this is done is beyond the scope of this primer.[8]

The second example involves pricing a credit swap using the credit spread term structure (method 3). A 5-year note issue pays interest annually at the coupon rate of 10% and repays principal in a lump sum (at maturity). The face amount of the bond is $100. The credit spreads are taken from the credit spread term structure in Exhibit 16. The cost of the credit swap is calcu-lated in Exhibit 19. It is the difference between (1) the present value of the underlying debt instrument's payment stream cal-culated at the default-risk-free zero-coupon Treasury yields and (2) the pre-

[8] The Jarrow and Turnbull book *Derivative Securities* listed in the additional readings at the end of this primer explains how these adjusted probabilities are calculated.

Exhibit 19

Pricing a Credit Swap Using the Credit Spread Term Structure

Year	Scheduled Payment	Zero-Coupon Treasury Yield	Present Value of Payment	Credit Spread(1)	Adjusted Yield(2)	Present Value of Payment
1	$10	5.00%	$ 9.5238	0.50%	5.50%	$ 9.4787
2	10	5.50	8.9845	0.75	6.25	8.8581
3	10	6.00	8.3962	0.95	6.95	8.1744
4	10	7.00	7.6290	1.15	8.15	7.3096
5	110	8.00	74.8642	1.35	9.35	70.3556
Total			$109.3977			$104.1764

Cost of the Credit Swap = $109.3977 - 104.1764 = $5.2213

(1) From the credit spread term structure in Exhibit 16.
(2) Sum of the respective zero-coupon Treasury yields and credit spreads.

sent value of the payment stream calculated by adding the appropriate credit spread adjustment for default risk to each zero-coupon Treasury yield. The difference between these two present values is the cost of the swap, $5.2213 per $100 face amount of debt.

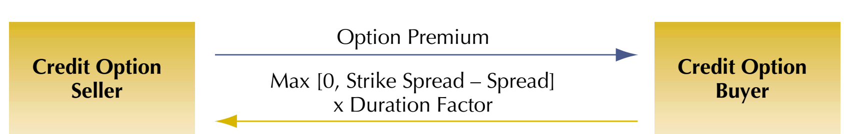
Credit Spread Options

An *option* conveys to the buyer a right without an obligation. A *put option* involves the right to sell, and a call option the right to buy. A *credit spread option* is an option on a particular borrower's credit spread. The *credit spread* is the difference between the yield on the borrower's debt (in the loan or bond market) and the yield on Treasury debt of the same maturity. Since Treasury debt is free of any default risk, the credit spread provides a measure of the premium in yield investors require to compensate for the risk of default. The buyer of the option pays an option premium, usually a lump sum up front but in some cases a series of payments, in return for the seller's agreeing to make a lump-sum payment in the event the specified borrower's credit spread crosses a stated threshold. Exhibit 20 illustrates a credit spread call option.

Credit spread options enable investors to separate credit risk from market risk and other types of risk in the following situations. Suppose an investor wishes to protect against the risk that a particular bond's credit rating will be downgraded, in which case the credit spread would widen and the bond's price would fall. Buying a credit spread put would provide the desired protection. Suppose instead the investor believes that a particular bond's credit rating will be upgraded, in which case the credit spread would decrease. With a credit

Exhibit 20

A Credit Spread Call Option



spread call it can capitalize on that development without actually buying the bond.

How Credit Spread Options Work

Credit spread options are normally tied to bonds as the underlying security. A credit spread put option, or *credit spread put* for short, is a put option whose payoff increases as the yield spread on a specified bond rises above a specified spread X. X is called the *strike spread*. A credit spread call option, or *credit spread call* for short, is a call option whose payoff increases as the yield spread falls further below X. Holding constant the yield on default-risk-free debt, the reduction in yield spread causes the yield of the risky debt obligation to fall, and the value of the risky debt to rise. Credit spread options usually have times to expiration of between six months and two years. They can be settled in cash or through delivery of the underlying bond.

Floating-rate notes are generally a good proxy for measuring credit risk exposure because the floating interest rate neutralizes the interest rate risk. A floating-rate note *will not* change in value as market interest rates change provided its coupon rate adjusts frequently enough but will change in value due to changes in the credit spread the market requires. Thus, when the underlying asset is a floating-rate note, an option on the note's credit spread is generally equivalent to an option on the value of the floating-rate note. This observation is important because credit spreads are usually measured relative to LIBOR in the London bond market and the underlying asset for credit spread options in that market is usually a floating-rate note.

Credit Spread Puts

The payoff on a credit spread put can be expressed as:

Spread		**Payoff**
Increases	$(S > X)$	$(P_X - P_S)$ x Amount
Decreases or Stays the Same	$(S \leq X)$	0

S is the actual credit spread, and X is the strike spread specified in the put agreement. P_X and P_S are as previously defined with each price being expressed as a fraction of the bond's principal amount. *Amount* is the (notional) principal amount specified in the put agreement.

There is an alternative payoff structure. The payoff can instead by expressed as:

Spread		**Payoff**
Increases	$(S > X)$	$(S - X)$ x Duration x Amount x P_X
Decreases or Stays the Same	$(S \leq X)$	0

Duration is the modified duration of the reference bond. The difference S - X represents the change in yield resulting from the change in credit quality. Duration is the sensitivity in percentage terms of the bond's price to a change in yield, called the bond's *modified duration. (S - X) x Duration x Amount x* P_X approximates the change in value of a specified principal amount of bonds equal to *Amount* when the credit spread changes by S - X. The actual change in value is the first payoff (P_X - P_S) x Amount. The second payoff relationship approximates the first; either one can be used in designing the option. The accuracy of the approximation depends, at least in part, on how *Duration* is measured. For example, bond duration is often measured over an interval, to obtain what is termed *effective duration*, because of the nonlinearity of the price-yield relationship (see Exhibit 17). The approximation works best in the case of small changes in spread.

Exhibit 21

How a Credit Spread Put Option Works

I. Basic Assumptions

Principal Amount of Debt	$100 million
Interest Payable	Semiannually
Option Expiration	6 months
Benchmark Treasury Yield	7.00%
Strike Spread	125 bp
Reference Bond Maturity	10 years
Reference Bond Coupon	8%
Reference Bond Duration (1)	6.54 years

II. Value of the Credit Spread Put Option (Price Formula)

Market	At Strike Spread (X)		At Market Spread (S)		Payoff on the Credit
Spread(S)	Yield (2)	Amount × P_X(3)	Yield (4)	Amount × P_S(3)	Spread Put (5)
75 bp	8.25%	$983.76	7.75%	$1,016.59	-
100	8.25	983.76	8.00	1,000.00	-
125	8.25	983.76	8.25	983.76	-
150	8.25	983.76	8.50	967.85	$15.91
175	8.25	983.76	8.75	952.28	31.48
200	8.25	983.76	9.00	937.03	46.73

III. Value of the Credit Spread Put Option (Duration Formula)

Market Spread(S)	Strike Spread (X)	Greater of S-X and O	Modified Duration	Amount × (P_X(3)	Payoff on the Credit Spread Put (6)
75 bp	125 bp	0	6.54 years	$983.76	-
100	125	0	6.54	983.76	-
125	125	0	6.54	983.76	-
150	125	0.25%	6.54	983.76	$16.08
175	125	0.50	6.54	983.76	32.17
200	125	0.75	6.54	983.76	48.25

Notes:

(1) Modified duration of a 9.5-year 8% bond yielding 8.25% (the 7.00% treasury yield plus the 125 bp strike spread). For simplicity, the modified duration is held fixed in this exhibit.

(2) The benchmark treasury yield (7.00%) plus the strike spread (1.25%).

(3) The price of a 9.5-year bond that pays interest semiannually at a coupon rate of 8%.

(4) The benchmark treasury yield (7.00%) plus the market spread.

(5) The greater of (i) (P_X - P_S) × Amount and (ii) zero.

(6) The greater of (i) S - X and (ii) zero, multiplied by Duration × Amount × P_X.

The total market value of a credit spread put equals the sum of its intrinsic value and its time value.

An Example. Exhibit 21 illustrates how the payoff function on a credit spread put option works. Both payoff formulas are illustrated. The basic assumptions used in both calculations are provided in Section I. The strike spread is 125 basis points (bp). The reference bond is currently trading at a spread of 100 bp and a yield of 8.00%, so the credit spread put option is out of the money. If the spread widens to greater than 125 bp by the time the 6-month option expires, the option will be in the money.

Section II shows the payoffs based on the price formula (PX - PS) x Amount. If the credit spread is 125 bp or less at expiration, the option is worthless. If the credit spread is greater than 125 bp at expiration, the option pays off a positive amount. The greater the deterioration in the credit standing of the reference bond, the bigger the market spread, and the greater the put option payoff. For example, suppose the debt rating of the issuer of the reference bond has dropped, causing the credit spread on its 9.5-year bonds to increase to 200 bp. The bond is worth $937.03 per $1,000 face amount at a credit spread of 200 bp but the put option holder has the right to sell the bond to the put option writer at a spread of 125 bp, or a price of $983.76. The credit spread put option will pay off $46.73 (= $983.76 - 937.03) per $1,000 face amount.

The bond's value will have fallen from $1,000 to $937.03, a loss of $62.97 per $1,000 face amount. The initial increase in the credit spread, from 100 bp (at the time the option was purchased) to 125 bp (the strike spread), was borne by the investor because the credit spread put was initially out of the money. The choice of strike spread determines the degree of default risk protection the investor gets. A strike spread of 100 bp would have provided full protection, but at a much higher option cost.

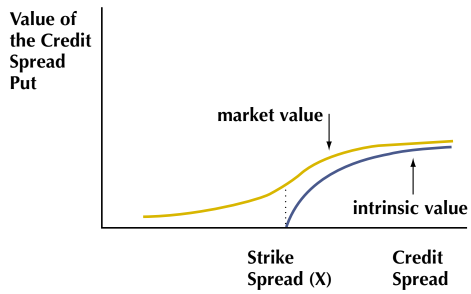
Section III of Exhibit 21 illustrates the alternative payoff structure. Assume that the credit spread put agreement specifies that the reference bond's price and duration should be calculated at the strike spread as of the end of the 6-month option period. At that time the bond's remaining life will be 9.5 years. An 8% bond is worth P_X = $983.76 per $1,000 face amount when the required yield is equal to the treasury yield plus the strike spread, 8.25% (=7.00 + 1.25). The bond's modified duration is 6.54 years.[9] The payoffs are calculated in the following manner. Suppose the market spread is S = 175 bp. Then S - X = 0.50%. P_X = 0.98376. The payoff is (S - X) x Duration x Amount x P_X = .0050 x 6.54 x $1,000 x 0.98376 = $32.17.

The duration formula in Section III only approximates the payoff structure in Section II because it holds the duration of the reference bond fixed. In practice, a bond's duration changes with its price. Thus, the payoffs calculated in Section II reflect more accurately the true change in value of the reference bond.

The Value of a Credit Spread Put. The payoff relationships represent the intrinsic value of a credit spread put. But an option also has a time value. The total market value of a credit spread put equals the sum of its intrinsic value

Exhibit 22

The Value of a Credit Spread Put on a Nonredeemable Bond



and its time value.

Exhibit 22 illustrates how the value of a credit spread put written on a nonredeemable bond varies with the credit spread of the reference bond. If the credit spread is below X, the option is out of the money, and the payoff is zero. As the spread rises above X — as the bond's default risk increases and its credit quality deteriorates — the option is further in the money. The price of the bond P_S falls further below P_X, and the payoff on the put option increases.

The size of the payoff also depends on the benchmark bond's yield to maturity. The price-yield relationship has the convex shape illustrated in Exhibit 17. For given S and X, the difference P_X - P_S becomes smaller as the benchmark bond's YTM increases. This happens because the price-yield curve in Exhibit 17 becomes flatter as it moves to the right. Thus, to avoid confusion, we must specify not only a single benchmark bond, but also when its yield to maturity should be calculated. The YTM is usually calculated as of the date the option is exercised. Similarly, if the payoff function is based on the benchmark bond's duration, the put agreement must specify how the duration is determined.

The market value of the credit spread put is represented by the gold solid line in Exhibit 22. The vertical distance between the market value and intrinsic value curves for any particular credit spread S represents the option's time value. Time value approaches zero as the credit spread becomes very large or very small. Time value also approaches zero as the option approaches expiration. These two types of behavior are typical of all options.

[9] The Fabozzi textbook included in the list of additional readings at the end of the primer contains a formula on page 61 for calculating the modified duration of a fixed-rate note:

$$\text{Modified duration (in years)} = \left\{ \frac{C}{y^2} \left[1 - \frac{1}{(1+y)^n} \right] + \frac{n(1000-C/y}{(1+y)^{n+1}} \right\} / 2P$$

where C is the bond coupon (in dollars) per semiannual period, y is the bond's yield per semiannual period, n is the number of semiannual periods in the remaining life of the bond, and P is the bond's price.

In Exhibit 21, C=$1000 x .08/2 = 40 y = .0825/2 = .04125 n=19 P=$983.76
and

$$\text{Modified duration (in years)} = \left\{ \frac{40}{(.04125)^2} \left[1 - \frac{-1}{(1.04125)^{19}} \right] + \frac{19(1000-40/.04125}{(1.04125)^{20}} \right\} /1964.52 = 6.54$$
years

Exhibit 23

How a Credit Spread Put Hedges Credit Risk Exposure

I. Basic Assumptions

Principal Amount of Debt	$25 million
Interest Payable	Annually
Option Expiration	2 years (exercised just prior to expiration)
Strike Spread	350 bp
Benchmark Treasury Yield	7.00% (on date of issue and on option expiration date)

			Credit Spread	
	Coupon	Maturity at Date Bond Is Issued	At Date Bond Is Issued	On Option Exercise Date
Reference Bond	10.25%	8 years	325 bp	425 bp

II. Hedge Ratio (1)

$$\text{Hedge Ratio} = \frac{\text{Difference in bond price}}{\text{Difference in credit spread put price}}$$

$$= \frac{P_{325} - P_{425}}{V_{425} - V_{325}} = \frac{1{,}000 - 958.00}{31.27 - 4.00} = 1.540154$$

Notional Amount of Credit Spread Put = $25,000,000 × 1.540154 = $38,503,850.

III.Effect of the Hedge

Value of Bonds at 325 bp Spread (2)	$25,000,000	
Value of Bonds at 425 bp Spread (3)	23,950,000	
Loss of Value on Bonds Being Hedged		$1,050,000
Value of Credit Spread Put at 425 bp (4)	1,204,015	
Value of Credit Spread Put at 325 bp (5)	154,015	
Net Gain on Hedge		1,050,000
Overall Net Gain (or Loss)		$ -

Notes:

(1) P_{325} = current price of the bond being hedged per $1,000 principal amount at a credit spread of 325 bp.
P_{425} = price of the bond being hedged per $1,000 principal amount after two years at a credit spread of 425 bp.
V_{425} = value just prior to expiration of the credit spread put per $1,000 principal amount when the reference bond's credit spread is 425 bp.
V_{325} = value of the credit spread put per $1,000 principal amount when the reference bondís credit spread is 325 bp. The value is the current market price of the option, $4 per $1,000 notional amount (40 basis points, or 0.4% of the notional amount).

(2) Value of $25 million of 8-year bonds bearing a 10.25% annual coupon when the required yield is 10.25%.

(3) Value of $25 million of 6-year bonds bearing a 10.25% annual coupon when the required yield is 11.25%.

(4) The 6-year reference bond is worth $958.00 per $1,000 principal amount when the required yield is 11.25% (=7% + 4.25%). At a strike spread of 3.50%, the reference bond is worth $989.27 per $1,000 principal amount. The payoff on the put is thus $31.27 per $1,000 principal amount. The notional amount of the credit spread put is $38,503,850. The value of the credit spread put is $1,204,015 (=$38,503,850 × [31.27 ÷ 1,000]).

(5) The credit spread put costs $4 per $1,000 notional amount. The total cost is $154,015 (= $38,503,850 × [4.00 ÷ 1,000]).

Using Credit Spread Puts to Hedge Credit Risk Exposure. Exhibit 23 illustrates how a credit spread put hedges credit risk exposure. Suppose the investor owns 8-year corporate bonds and is concerned that the bonds' credit spread might widen by 100 bp over the next two years. The bonds' credit spread is currently 325 bp. The investor is willing to bear the first 25 bp of credit risk if it holds the option to its expiration date. To purchase credit risk protection, the investor buys a credit spread put with a strike spread of 350 bp (= current credit spread of 325 bp + 25 bp of retained risk). It specifies an 8-year treasury note issue as the benchmark for measuring the issuer's credit spread. The investor and the writer of the credit spread put agree that the 8-year corporate bonds will serve as the reference bonds and that the credit spread will be determined on the option expiration date through a dealer poll.

Panel II of Exhibit 23 provides the calculation of the hedge ratio. The market price of the credit spread put option is 40 bp, or $4 per $1,000 principal amount. If the bond's credit spread increases to 425 bp, the value of the bond falls to $958.00 per $1,000 principal amount. At a strike spread of 350 bp, the credit spread put's value just prior to expiration is $31.27 per $1,000 principal amount.[10] The hedge ratio is 1.540154. The investor should buy $1,540.15 of credit spread puts for each $1,000 bond it wishes to hedge. The investor wishes to hedge $25 million principal amount. It should therefore purchase a credit spread put specifying a notional principal amount of $38,503,850.

Consider what happens if the investor purchases the credit spread put and the bonds' credit spread increases by 100 bp. Panel III of Exhibit 23 quantifies the benefit of the hedge. The bonds decrease in value by $1,050,000 (for $25 million principal amount). The credit spread put yields a payoff of $1,204,015. The cost of the put is $154,015. The gain on the hedge is $1,050,000 (= $1,204,015 - 154,015), which just offsets the loss of value on the bonds. It should be pointed out, however, that this apparently perfect hedge depends on how much the credit spread actually changes. If it changes by an amount different from 100 bp, there will not be a perfect offset. (Truly perfect hedges are rare indeed!)

If the issuer does not have traded debt but does have a (private) debt rating, the rating can be used to determine a payoff function for the option.[11] Calculating the payoff requires a credit spread, as in the preceding example. The credit spread can be determined based on the rating at the time the option is exercised. The terms of the option could specify a credit spread for each possible rating. For example, these credit spreads might be based on the credit spreads actually prevailing in the debt market at the time the option agreement is entered into. Exhibit 24 provides an example. If the rating is BB at the time of exercise, the actual credit spread used to calculate the option's payoff is 425 bp.

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[10] See footnote (4) of Exhibit 23.

[11] Lenders sometimes require the borrower to obtain a rating in connection with a private placement.

Let's continue the example in Exhibit 23. Suppose the company's debt was privately placed with a group of life insurance companies. It is not publicly traded but the lenders insisted upon having it rated. The rating is BBB. According to Exhibit 24, the credit spread is 325 bp. Suppose its lenders are concerned that product market competition might force the company to cut prices and result in the company's debt rating falling to BB in two years. So they arrange a two-year credit spread put. The strike spread is 350 bp. According to Exhibit 24, the credit spread would be 425 bp when the debt rating is BB. The 325 bp and 425 bp credit spreads are the same as in Exhibit 23. Thus, the hedge ratio and overall net gain (or loss) calculations are also the same as in Exhibit 23.

Exhibit 24
Sensitivity of the Credit Spread to the Debt Rating

Debt Rating (1)	Credit Spread	Debt Rating (1)	Credit Spread
AAA	50 bp	B+	505 bp
AA+	85	B	550
AA	120	B-	600
AA-	155	CCC+	650
A+	190	CCC	700
A	225	CCC-	750
A-	255	CC+	825
BBB+	290	CC	875
BBB	325	CC-	925
BBB-	355	C+	1000
BB+	390	C	1075
BB	425	C-	1150
BB-	465	Below C-	1300

Note:
(1) Composite of the ratings assigned by Duff & Phelps, Fitch, Moody's, and Standard & Poor's. If there is a split rating, the composite debt rating is determined by averaging the assigned ratings and rounding down. For example, suppose only three of the four rating agencies assign ratings, and these are BBB, BBB-, and BBB-. The debt rating for purposes of the credit spread test is BBB-, and the credit spread is 355 bp.

Credit Spread Calls

The payoff on a credit spread call can be expressed as:

Spread		Payoff
Decreases	S < X)	$(P_S - P_X)$ x Amount
Increases or Stays the Same	$(S \geq X)$	0

Exhibit 25
How a Credit Spread Call Option Works

I. Basic Assumptions

Principal Amount of Debt	$100 million
Interest Payable	Semiannually
Option Expiration	6 months
Benchmark Treasury Yield	7.00%
Strike Spread	75 bp
Reference Bond Maturity	10 years
Reference Bond Coupon	8%
Reference Bond Duration (1)	6.60 years

II. Value of the Credit Spread Call Option (Price Formula)

Market Spread(S)	At Strike Spread (X)		At Market Spread (S)		Payoff on the Credit Spread Call (5)
	Yield (2)	Amount × P_X(3)	Yield (4)	Amount × P_S(3)	
0 bp	7.75%	$1,016.59	7.00%	$1,068.55	$51.96
25	7.75	1,016.59	7.25	1,050.86	34.27
50	7.75	1,016.59	7.50	1,033.54	16.95
75	7.75	1,016.59	7.75	1,016.59	-
100	7.75	1,016.59	8.00	1,000.00	-
125	7.75	1,016.59	8.25	983.76	-
150	7.75	1,016.59	8.50	967.85	-

III. Value of the Credit Spread Call Option (Duration Formula)

Market Spread(S)	Strike Spread (X)	Greater of X-S and O	Modified Duration	Amount × P_X	Payoff on the Credit Spread Call (6)
0 bp	75 bp	0.75%	6.60 years	$1,016.59	$50.32
25	75	0.50	6.60	1,016.59	33.55
50	75	0.25	6.60	1,016.59	16.77
75	75	0	6.60	1,016.59	-
100	75	0	6.60	1,016.59	-
125	75	0	6.60	1,016.59	-
150	75	0	6.60	1,016.59	-

Notes:

(1) Modified duration of a 9.5-year 8% bond yielding 7.75% (the 7.00% treasury yield plus the 75 bp strike spread). For simplicity, the modified duration is held fixed in this exhibit.
(2) The benchmark treasury yield (7.00%) plus the strike spread (0.75%).
(3) The price of a 9.5-year bond that pays interest semiannually at a coupon rate of 8%.
(4) The benchmark treasury yield (7.00%) plus the market spread.
(5) The greater of (i) (P_S - P_X) × Amount and (ii) zero.
(6) The greater of (i) X - S and (ii) zero, multiplied by Duration × Amount × P_X.

The payoff represents the option's intrinsic value. The payoff function could also be expressed with (X - S) x Duration x Amount x P_X in place of (P_S - P_X) x Amount to obtain an expression analogous to the one for a put option:

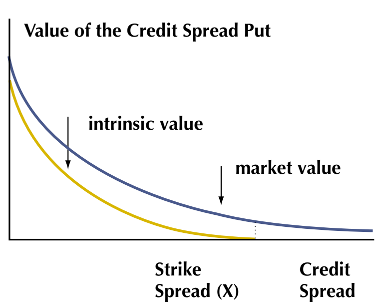
Spread		Payoff
Decreases	(S < X)	(X - S) x Duration x Amount x P_X
Increases or Stays the Same	(S ≥ X)	0

Exhibit 25 illustrates how the payoff function on a credit spread call option works. As with the credit spread put option, both payoff formulas are illustrated. The basic assumptions used in both calculations are provided in Section I. The strike spread is 75 bp. The reference bond is currently trading at a spread of 100 bp and a yield of 8.00%, so the credit spread call option is out of the money. If the spread narrows to less than 75 bp by the time the 6-month option expires, the option will be in the money.

Section II shows the payoffs based on the price formula (P_S - P_X) x Amount. If the credit spread is 75 bp or greater at expiration, the option is worthless. If the credit spread is less than 75 bp at expiration, the option pays off a positive amount. The greater the improvement in the credit standing of the reference bond, the smaller the market spread, and the greater the call option payoff. For example, suppose the debt rating of the issuer of the reference bond has improved, causing the credit spread on its 9.5-year bonds to decrease to 25 bp. The bond is worth $1,050.86 at a credit spread of 25 bp, but the call option holder has the right to buy the bond from the call option writer at a spread of 75 bp, or a price of P_X = $1,016.59. The credit spread call option will pay off $34.27 (= $1,050.86 - 1,016.59) per $1,000 face amount.

Section III of Exhibit 25 illustrates the alternative payoff structure. Assume that the credit spread call agreement specifies that the reference bond's price and duration should be calculated at the strike spread as of the end of the 6-month option period. The value of the reference bond at the strike spread X = 75 bp is P_X = $1,016.59. The option payoffs are calculated by applying the alternative formula. As with the credit spread put option in Exhibit 21, the alternative payoff structure only approximates the payoff structure in Section II because it holds the duration of the reference bond fixed.

Exhibit 26
The Value of a Credit Spread Call on a Nonredeemable Bond

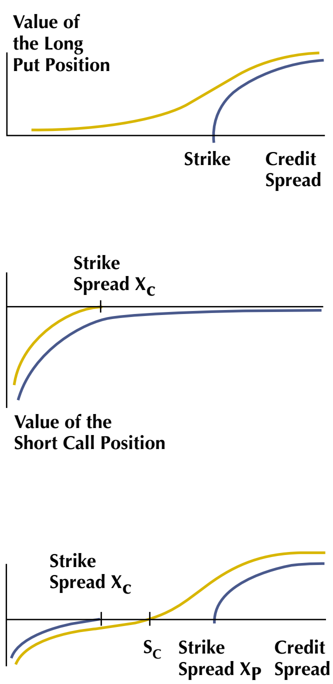


Value of a Credit Spread Call. Exhibit 26 illustrates how the value of a credit spread call written on a nonredeemable bond varies with the credit spread of the reference bond. If the credit spread is above X, the option is out of the money, and the payoff is zero. As S falls below X — as the bond's default risk decreases and credit quality improves — the option becomes further in the money. The price of the bond P_S rises further above P_X, and the payoff increases. The intrinsic value curve in Exhibit 26 has a convex shape because of the convexity of the nonredeemable bond. In Exhibit 17, the price of the bond increases at a progressively faster rate as the credit spread decreases. Hence, the payoff (P_S - P_X) x Amount increases at a progressively faster rate as the credit spread decreases.

Credit Spread Collars

A *credit spread collar* combines a credit spread put and a credit spread call. As previously explained, investors can purchase credit spread puts to reduce, or even eliminate, their credit risk exposure. To reduce the cost of this insurance, the investor can sell a credit spread call. By picking the terms of the credit spread call appropriately, the sale price of the call can equal the purchase price of the put. The combination of the put and call in that case is called a *zero-cost collar* because the investor has no net cash outlay.

Exhibit 27
The Value of a Credit Spread Collar on a Nonredeemable Bond



How a Credit Spread Collar Works. Exhibit 27 illustrates how the value of a credit spread collar written on a nonredeemable bond varies with the credit spread of the reference bond. A credit spread collar consists of a long position in a credit spread put coupled with a short position in a credit spread call. The payoff on this package can be expressed as:

Spread		Payoff
Increases	($S > X_P$)	(P_1 - P_S) x Amount
Middle range		0
Decreases	($S < X_C$)	(P_S - P_2) x Amount

P_1 is the price of the reference bond that corresponds to the credit spread X_P, and P_2 is the price of the reference bond that corresponds to the credit spread X_C. P_S again represents the price of the reference bond when the credit spread is S.

The payoff function can be expressed instead in terms of bond duration, just like the credit spread put and call that compose them. Expressed in this manner, the payoff function is:

Spread		Payoff
Increases	($S > X_P$)	($S - X_P$) x Duration x Amount x P_1
Middle range		0
Decreases	($S < X_C$)	(X_C - S) x Duration x Amount x P_2

The upper panel of Exhibit 27 shows how the value of the put varies with the credit spread when the strike spread is X_P. The middle panel shows how the value of a short position in the call varies with the credit spread when the strike spread is X_C. The lower panel expresses the value of the credit spread collar as the sum of the value of the long position in the credit spread put and the value of the short position in the credit spread call. The thin solid line indicates the intrinsic value of the collar for each credit spread. The thicker solid line represents the market value of the collar. Note that if $X_C = X_P = X$, the middle panel in Exhibit 27 would be the mirror image of Exhibit 26. For any given credit spread S, the value of the short position is the negative of the value of the long position.

At the credit spread S_C the value of the credit spread collar is zero. The value of the credit spread put equals the value of the credit spread call. If the credit spread of the underlying bond is S_C at the time the put is purchased and the call is sold, the credit spread collar is a zero-cost collar.

Using Credit Spread Collars to Hedge Credit Risk Exposure. The investor in the credit spread put example in Exhibit 23 could simultaneously sell a credit spread call so as to create a credit spread collar. The put hedges the investor's downside risk exposure, as illustrated in Exhibit 23. Selling the call enables the investor to defray part (or perhaps even all) of the cost of the put. However, the investor must sacrifice the benefit of any improvement in credit quality that reduces the bond's credit spread below the strike spread specified in the credit spread call.

Suppose the investor enters into a zero-cost collar. The terms of the credit spread put and the other conditions are the same as in Exhibit 23. The net cost of the two options is zero. Assume that the call, like the put, is initially out of the money. If the bonds' credit spread widens by 100 bp, the call option expires out of the money. The exercise value of the put option is still \$31.27 per \$1,000 principal amount. The hedge ratio is

$$\textit{Hedge Ratio} = \frac{1{,}000.00\text{-}958.00}{31.27\text{-}0} = 1.343140$$

The notional amount of the credit spread put is

\$25,000,000 x 1.343140 = \$33,578,500.

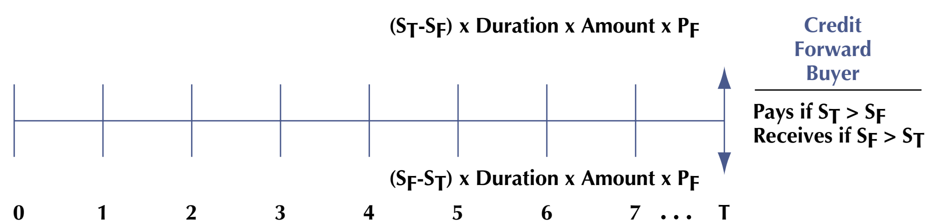
A 100 bp increase in the bonds' credit spread is associated with a payoff of \$31.27 per \$1,000 principal amount, or \$1,050,000 in the aggregate. Once again, the gain on the hedge just offsets the bonds' loss of value.

Credit Forwards

A *forward agreement* is a contract that obligates the seller to deliver, and the buyer to purchase, a specified asset on a particular date at a price specified at the time they enter into the forward agreement. A forward agreement for a bond commits the buyer to purchase a specified reference bond at a stated price on a specified future date. A *credit forward* (or *credit spread forward*) is a forward agreement that specifies a credit spread and a benchmark bond, rather than a particular price, for the reference bond. Credit forwards were developed in the mid-1990s.

Exhibit 28 illustrates the pattern of payments for a credit forward. At maturity, the credit forward buyer would make a payment to the credit forward seller equal to $(S_T - S_F) \times Duration \times Amount \times P_F$ if the actual credit spread for the reference bond when the credit forward matures, S_T, exceeds the credit spread S_F specified in the credit forward. On the other hand, the credit forward seller would make a payment to the credit forward buyer equal to $(S_F - S_T) \times Duration \times Amount \times P_F$ if the credit spread in the contract, S_F, exceeds the actual credit spread S_T. *Duration* and *Amount* are as defined earlier. P_F is the price of the bond, expressed as a fraction of the bond's face amount, when the credit spread is S_F. The payoff structure for the forward agreement means that the buyer of the credit forward bears the default risk on the reference bond.

Exhibit 28
Pattern of Payments for a Credit Forward



If a credit event occurs, the credit forward transaction is marked to market and terminated. The credit forward buyer pays the seller according to the formula just given.

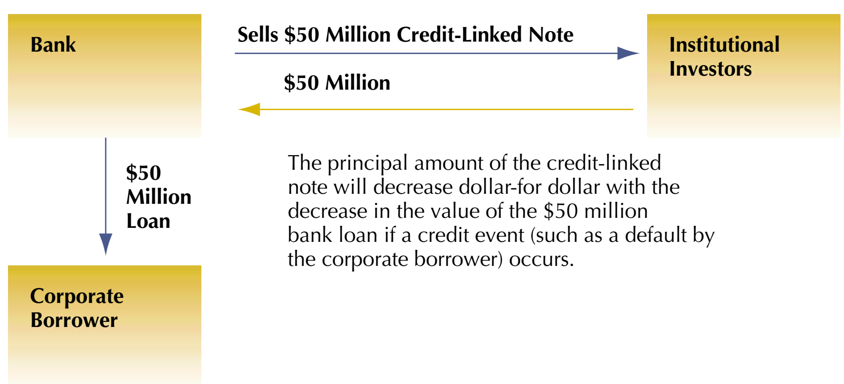
Credit-Linked Notes

A *structured note* is a package consisting of a conventional fixed-rate or floating-rate note and a derivative instrument embedded in it. A *credit-linked note* is a form of structured note in which the derivative instrument is a credit derivative. Generally, any credit derivative can be structured either as a stand-alone, off-balance-sheet instrument, such as a swap or a forward, or it can be attached to a conventional note as part of an on-balance-sheet instrument, to form a structured note.

Credit-linked notes are often issued by either a very strong credit, such as a high-grade bank or a government agency, or a special-purpose bankruptcy-remote trust that is a counterparty to a credit default swap, total return swap, or credit forward contract. The credit-linked note thus represents a synthetic bond, which some investors find preferable to purchasing a stand-alone derivative instrument. The performance of a credit-linked note can be tied to a single reference asset or to a basket of reference assets.

The credit-linked note typically adjusts the principal repayment to pay off on the derivative instrument embedded within the note. For example, suppose an investor purchased a 6-month structured note that would repay at maturity $1,000 minus the payoff on the credit spread put in Exhibit 21 (Section II). The investor has sold the put option to the issuer of the note (and in return gets a higher coupon). If the reference bond's credit spread is 200 bp on the maturity date, the holder of the structured note would receive $953.27 (= $1,000 - 46.73) per $1,000 face amount. This single payment is equivalent to receiving $1,000 and simultaneously paying off $46.73 on the option.

Exhibit 29
A Credit-Linked Note



Credit-linked notes offer a way for institutional investors to participate in the corporate bank loan market. Exhibit 29 illustrates how a credit-linked note transfers the default risk on a corporate loan to institutional investors. The bank extends a $50 million corporate loan and issues to insurance companies, money managers, or other institutional investors an equal principal amount of a credit-linked note whose repayment is tied to the value of the loan. If a credit event occurs, the bank's repayment obligation on the note decreases by just enough to offset its loss on the loan. If the credit-linked note pays interest on the same basis as the corporate loan, less a margin to compensate the bank for its cost of originating and servicing the loan, the institutional investors have essentially all the benefit and credit risk of the bank loan without having to take ownership of the loan. Credit-linked notes allow non-traditional bank lenders to participate in the corporate bank loan market indirectly while still investing in securities.

Credit-linked notes were very popular in the early 1990s when the credit derivatives market first began to develop. Their use has diminished as the swap and option products have grown in importance.

Why it is Difficult to Price Credit Derivatives

Pricing credit derivatives is more difficult than pricing other types of derivative instruments. Credit derivatives are different from the others because their "underlying asset" is not priced separately in the capital market. For example, equity derivatives, such as stock options, have common stock as the underlying asset, and common stock is a traded security with a market-determined price, so long as the issuer is a public company. In contrast, credit factors, such as the risk of default, determine the payoff profile of a credit derivative. Credit is not a traded security. Instead, it is an important risk element that affects the value of virtually all debt and equity securities, but to varying degrees. The pricing of credit risk is implicit in the pricing of these securities. But extracting the price of the credit risk involved from the price of the security can be a daunting task. Nevertheless, it must be extracted from securities prices because there is no "credit page" disseminated by any financial data vendor to which a dealer or investor can turn to check on the "price" of the "underlying asset."

Pricing credit risk is also difficult because prior to default, it is impossible to distinguish unambiguously firms that will default from those that will not. Discriminant analysis and other statistical techniques are available to try to distinguish firms that are most likely to default from other firms. But credit risk is still a matter of likelihoods; the likelihood that a firm's credit standing will deteriorate, the likelihood that the firm will miss a scheduled interest or principal payment, the likelihood that it will file for bankruptcy protection, and so on.

Assessing these likelihoods is challenging. Default is actually a relatively rare event. The typical firm has a probability of only about 2% that it will default in any given year. However, the likelihood of default varies considerably between firms. In any particular year, the odds that a triple-A-rated firm will default are only about 2 in 10,000. The odds for a single-A-rated firm are higher, about 10 in 10,000. Towards the bottom end of the credit scale, a triple-C-rated firm has a likelihood of defaulting in any one year of about 4 in 100, and is therefore 200 times as likely to default as a triple-A-rated firm. Complicating these probability assessments is the fact that for any given debt rating, the probability of default can double, or even triple, between the high point and the low point in the credit cycle.

As noted earlier in the primer, there is a second factor in addition to the probability of default that fundamentally affects the pricing of credit derivatives. The loss the lender will suffer if a credit event occurs is usually significant. The amount of any loss is determined not only by the characteristics of the firm but also by the particular provisions of the loan contract. The seniority of the debt obligation in bankruptcy is critical in this regard. For example, holders of senior secured bonds generally recover about one-half of the bonds' face amount whereas holders of subordinated unsecured bonds recover only about one-third of the face amount. And these recovery percentages can vary substantially across borrowers and over the business cycle.

Because of the great variability of default probabilities and recovery rates, historical experience cannot provide precise measures of either factor. Dealers and investors must instead try to extract the market's assessments of these probabilities and recovery rates from the prices at which default risky securities are currently trading. Unfortunately, the valuation techniques currently in use all require simplifying assumptions to make them workable. These assumptions can affect the accuracy of the valuations and can lead to a range of estimates for the value, rather than a single value, of a credit derivative.

Using Credit Derivatives to Hedge Emerging Market Risk

As illustrated in Exhibit 2, emerging market debt makes up more than half the assets underlying credit swaps. Credit derivatives can be useful in arranging debt financing for a project that will be located in an emerging market. Project location can make it difficult to finance such a project. Many potential lenders and equity investors will be uncomfortable lending to or investing in a project just because of its location. These investors can enter into credit derivative transactions to hedge specific credit risk, such as the sovereign risk of default or the risk of currency nonconvertibility.

Definition of Emerging Market Risk

Emerging market risk is the risk that an investment in a project located in an emerging market might lose value because of political or economic events specific to the country in which the project is located. The term *emerging* (or *developing*) *market* refers to economies that are rapidly developing but are not yet fully industrialized. Political risk is a large component of emerging market risk. Political events can affect a country's credit standing. Some of these events, such as the risk of expropriation, can be insured against separately. Other risks, which are political in nature but not specific to the project, may not be separately insurable other than through credit derivatives.

Changes in the economy can also affect a country's credit standing. This can in turn affect the value of loans to the government and loans to, or equity investment in, entities located in the country. These political and economic risks, as they affect the value of the government's outstanding debt obligations, are usually referred to as *sovereign risk*. Sovereign risk can affect emerging market risk directly when the host government provides a guarantee or some other form of credit support for a project's debt obligations. Investors' perceptions of sovereign risk can also affect their perception of the emerging market risk present in a particular emerging economy.

Deterioration in the country's credit standing can impair the credit standing of a stand-alone project, causing the project's debt obligations to lose value. Debt obligations can also lose value because of a devaluation, which can trigger an economic crisis. An economic crisis in one emerging country can cause declining prices for the debt of other emerging countries. Such a situation occurred immediately following the sharp Mexican peso devaluation in 1995.

Political Risk and Other Types of Risk

Political risk, and hence emerging market risk, is often perceived as significant when a project is located in a developing economy. In addition, certain events can transform the project's currency risk and economic risk into political risk. For example, suppose a project sponsor is granted a concession to build, own, and operate an electric generating plant. The plant will be located in a particular emerging market. The project sponsor plans to borrow funds for the plant on a non-recourse project basis. It will form a project power company, which will borrow funds denominated in U.S. dollars. It is authorized to charge the government-owned local electric utility an electricity tariff that is payable in the local currency but that is indexed to changes in the local currency/U.S. dollar exchange rate. This tariff adjustment mechanism is specified in a formula contained in a take-or-pay electric power purchase agreement between the project power company and the utility. If the local currency devalues, electricity charges will rise. If the utility absorbs the increases, its financial condition could deteriorate. If it passes them through to its customers, there could be political repercussions. The possible actions of the local government are a concern. If the local currency depreciates sharply in value, it might refuse to allow the electricity tariff to rise by the full amount. Currency risk has thus become an added element of political risk to project lenders and equity investors.

Designing a mechanism for transferring emerging market risk requires, among other things, a proxy for such risk that is quantifiable.

Next consider economic risk. Suppose the take-or-pay power purchase agreement covers the generating facility's entire electricity output. Suppose further that the demand for electricity fails to grow as initially anticipated by both parties to the contract, perhaps because the government-owned utility failed to expand its distribution system rapidly enough. There is some risk that the government might fail to honor its take-or-pay obligation by refusing to take all the power it contracted to purchase, or to pay for the shortfall, as the take-or-pay provision requires.

Suppose a prospective lender or equity investor is comfortable with the economics of the project just described but is uncomfortable with the emerging market risk. For example, if debt issued by the government suffers a reduction in credit standing, the utility's purchase obligation weakens in credit quality, and the project debt becomes riskier. Government-issued debt could diminish in credit quality for any of several reasons. Investors (or banks) might perceive greater risk due to a change in the political situation within the country; one of the major rating agencies might have reduced the government's debt rating; the government might have defaulted on a debt-payment obligation; or the government might have taken some policy action that has impaired its ability to pay.

Finding a Proxy for Emerging Market Risk

Designing a mechanism for transferring emerging market risk requires, among other things, a proxy for such risk that is quantifiable. The proxy enables market participants to specify the payoff function and determine an appropriate payment to make to the party who bears that risk. One possible proxy is the credit spread on government-issued debt, if the government has debt outstanding that is publicly traded. The option could specify that the credit spread equals the difference between the yield to maturity on a designated bond issued by the country in which the project is located and the yield to maturity on a designated benchmark bond denominated in the same currency. Another possible proxy is the value of bank loans to the government, if the government has such debt and it is traded. The option would specify the risk premium over LIBOR that is implicit in the price at which the debt is trading. A third proxy is the debt rating, if the government's debt is rated by one of the major rating agencies.

If the government does not have traded debt or a rating, some other proxy for its credit standing must be found. An economic index or some combination of such indexes might be used. Changes in the foreign trade current account balance, the level of foreign currency reserves, gross domestic product, or the rate of inflation are candidates. However, no single economic index is likely to capture the change in credit standing as well as the value of a particular debt instrument or loan, or a debt rating, when such a proxy is available.

Using Total Return Swaps to Hedge Emerging Market Risk

Lenders or equity investors can use total return swaps to hedge (part of) their emerging market risk. To simplify the discussion, in both cases I will speak of lenders but the analysis also applies to equity investors. Suppose the government has fixed-rate bonds outstanding that are denominated in the same currency as the project loan. They are traded among financial institutions and thus are eligible to serve as reference bonds. The fixed interest rate avoids mixing interest rate risk and emerging market risk because the amount of the periodic cash payment will not change as interest rates fluctuate. Similarly, having the same currency prevents confusing currency risk and emerging market risk.

Lenders or equity investors can use total return swaps to hedge (part of) their emerging market risk.

Changes in the value of the reference bonds will reflect political and economic events taking place in that country. The project lender who agrees to pay total return based on the value of the reference bonds will benefit if the country's political and economic situation deteriorates because the value of the reference bonds will decrease. In particular, the reduction in the value of the payment obligations (P_T in Exhibit 5 or the R_T in Exhibit 7) will at least partially offset the decline in the value of the project loan.

Suppose instead that the government's debt is not traded but is rated. The swap might specify a formula that increases (decreases) the amount of the total return payment in the event the government's debt rating improves (falls). If the debt rating falls, the reduction in the total return payment under the swap would at least partially offset the decline in the value of the project loan. If there is neither traded debt nor a rating, then the formula could tie the change in total return payment to change(s) in the specified index(es), as described earlier.

Using Credit Swaps or Credit-Event Puts to Hedge Emerging Market Risk

Either a credit swap or the credit-event-put trust structure discussed earlier in the primer could be used to hedge an institutional lender's exposure to emerging market risk. The swap or put agreement would specify one or more credit events. A credit event could be defined as (1) a default by the government on a significant debt obligation, (2) a downgrade of its debt rating, (3) a decline in excess of some specified amount in the price of a designated government debt issue, (4) the government's imposition of foreign exchange controls, or (5) some particular economic or political event. The agreement would also specify the amount of the default payment and the amount of the option premium. The credit-event-put trust structure can be used to secure the default payment. The agreement would require that funds be placed in a trust where they would be available to compensate the lender if a credit event occurs. If it does, the funds in the trust would be disbursed to the lender automatically; if it doesn't by the time the credit-event-put agreement expires, the funds would be returned to the party that set up the trust.

Using Credit Spread Puts to Hedge Emerging Market Risk

A credit spread put enables a lender to hedge its exposure to adverse developments in the country where a project is located. Like a credit swap, but unlike a total return swap, the credit spread put enables the investor to retain the benefit resulting from an improvement in the government's credit standing.

...the credit spread put enables the investor to retain the benefit resulting from an improvement in the government's credit standing.

A project lender purchases a credit spread put from a financial institution, a project sponsor, or some other party. If the country where the project is located has traded debt outstanding, the credit spread put can specify a traded government debt issue, a notional principal amount, a strike spread, and an option expiration date. The initial redemption date for the specified debt issue should occur no sooner than the option expiration date. If the actual credit spread on the exercise date is above the strike spread, the option writer pays the project lender. The payment, the option payoff, would consist of the difference in bond value calculated in the manner described earlier in this primer.

Using Credit Forwards to Hedge Emerging Market Risk

A protection buyer can sell a credit forward written on a reference bond issued by, or a syndicated loan to, the country where the project is located. The buyer of the credit forward bears the emerging market risk. However, it would also realize the benefit resulting from an improvement in the country's credit standing. In this regard, a credit forward provides credit risk protection similar to that of a total return swap. However, the forward agreement has a simpler structure. Consequently, forward agreements may eventually enjoy wider use than swaps for managing emerging market risk.

Legal and Regulatory Issues

Innovative financial products often raise new legal and regulatory issues. Credit derivatives are no exception. This section of the primer touches on some of the more important of these issues. However, it does not attempt to provide a thorough discussion because that would entail a host of technical issues that are beyond the scope of the primer. As these products and the uses for them evolve, additional legal and regulatory issues will undoubtedly arise, so no discussion of such issues would be complete for very long anyway.

Legal Issues

Documentation. Derivatives, particularly credit derivatives, require effective legal documentation to spell out the rights and obligations of each counterparty to the transaction. ISDA recently developed standard documentation for credit swaps. The availability of standard documentation will help spur the further development of the credit swap market because it will reduce the cost of transacting in credit swaps. Previously, the counterparties had to prepare their own documentation.

Documenting credit swaps has been especially challenging. The contingent payment depends on the occurrence of a "credit event." What constitutes a credit event has to be defined with sufficient precision that both parties will be able to agree when a credit event has occurred, and if it has, the date it occurred. Unlike other derivative instruments, credit derivatives are not based on an underlying asset that is publicly quoted or an index that is widely available. It is based on "credit," and in the case of credit swaps, on the occurrence of a specified credit event. However, there is no "credit page" furnished by an information vendor that provides the price of "credit" or that would indicate when a credit event has occurred. Defining a credit event is a bit tricky, and it can depend on the nature of the reference credit's business. For example, a "payment default" might include a range of possible events, from missing a scheduled interest payment to failing to pay a vendor of office supplies on time. But failures to pay on time should not constitute a payment default when there is a valid reason for not paying, as for example, when a supplier of raw materials has delivered items that the purchaser believes in good faith do not meet contract specifications. Moreover, there may be other events that are potentially far more ominous than a payment default, as for example, a defense contractor's failure to deliver a weapons system according to contract specifications that triggers cancellation of the contract (or perhaps severe financial penalties instead). Some credit events are relatively easy to document, such as a company's filing a bankruptcy petition. But others are not. A debt rescheduling can be a long, drawn-out affair. Often, a privately negotiated debt restructuring is undertaken to avoid a payment default or a bankruptcy filing. And some loans have been delinquent for a year or longer without lenders declaring a default. Therefore, the definitions must be precise in credit derivative documentation.

A related problem concerns the inconsistencies in the terms of bond and loan documents. The terms and conditions of bond agreements are not uniform; there can be significant variations in how events of default are defined, for example. In general, the stronger a company's credit standing, the harder it can push for weaker covenant restrictions and a less inclusive set of events of default. Moreover, bank loan documentation tends to be even less standardized than bond documentation.

When using a credit derivative to hedge credit risk exposure under a particular loan (or bond), a hedger is really depending on the terms of one legal document —the credit derivative agreement—to protect itself against a breach of the terms of the other—the loan agreement (or bond contract). Unless the two sets of terms are properly matched, the degree of protection may be imperfect. The hedger in this case is exposed to what might be thought of as "documentary basis risk." Even when using ISDA's standard documentation, a hedger must check to make sure that any documentary basis risk is insignificant.

A third problem concerns the use of nonstandard documentation. Prior to the development of ISDA's standard documentation for credit swaps, dealers developed their own in-house confirmations for use with the ISDA master agreement. While it has always been contemplated that dealers would adapt the standard documentation to suit their particular requirements, each set of dealer documentation raises new definitional issues and must be checked separately to avoid documentary basis risk.

Potentially more serious is the use of non-derivative contracts to document derivatives transactions.

Potentially more serious is the use of non-derivative contracts to document derivatives transactions. Derivatives have received some negative press in recent years, which has made some companies and investors wary of using derivative instruments. Others have used them but documented them in agreements that avoid using derivative terminology or traditional derivative contract provisions. Financially, the products exhibit the characteristics of derivatives, so the difference is one of form rather than substance. For example, a credit swap may be documented as a "guarantee." However, while it may be convenient for regulatory or other reasons to refer to a credit swap as a guarantee, there may be significant legal differences between the two. Any such differences will depend upon the provisions of state, federal, or foreign law that govern the contract. Thus, the switch in terminology may cause the legal consequences of the "guarantee" to switch also, possibly in ways the counterparties did not intend. Using nonstandard documentation can itself be a risky proposition.

Confidentiality. A credit derivative is referenced against the credit quality of a particular borrower. Banks or other lenders will gather confidential information about borrowers in the ordinary course of their lending relationship with them. Such information is often critical in their assessment of the borrower's credit quality. The existence of such information raises an important issue: Should a lender that has a lending relationship with the issuer of the reference asset and that has material information that could have a bearing on the value of a credit derivative pass on that information to the counterparty, for example, in a credit swap transaction?

In many jurisdictions, a bank owes a duty to its customers, which is enshrined in law. In other jurisdictions, there may not be any such duty. In yet other jurisdictions, there may be obligations of confidentiality under contract law. In any case, a bank or other lender that has a lending relationship with the issuer of the reference asset will have to consider very carefully what information about the issuer it can pass on to the derivative counterparty. This problem may be especially tricky where the information must be provided in order to trigger a credit event, such as the occurrence of a payment default.

None of these confidentiality issues is unique to credit derivatives. The expanding secondary market for bank loans must deal with the same issues.

Netting. The ISDA master agreement provides for close-out netting of the counterparties' obligations to one another with respect to all the derivative transactions covered by the agreement when early termination of the master agreement occurs. ISDA has obtained legal opinions in several jurisdictions indicating that the close-out netting provisions are enforceable in those jurisdictions in the event of a counterparty's bankruptcy. In contrast, netting may not be available for non-derivative credit risk management products.

Netting occurs when there are two or more transactions between two parties. Each party's gains and losses with respect to the other party are offset against one another (i.e., netted) to determine a single consolidated amount that one party owes to the other.

Because credit derivatives are new, the advantage of being able to net credit derivative transactions against other derivative transactions may nevertheless not be available in many jurisdictions even under the master agreement. In some jurisdictions, close-out netting in the event bankruptcy occurs is governed by statute, and netting is only available for certain specified types of transactions. To have the netting provisions apply, it is necessary to show that the credit derivative transaction falls within one of the specified categories. Also, in jurisdictions where the netting legislation predates credit derivatives, credit derivatives will fall outside its ambit unless the legislation can be interpreted broadly enough to include credit derivatives. Therefore, before entering into a credit derivative transaction, it would behoove a counterparty to confirm that the netting provisions are enforceable. Otherwise, the credit risk protection might ultimately prove to be illusory.

Regulatory Issues

The Board of Governors of the Federal Reserve System (the Fed) and the Office of the Comptroller of the Currency (OCC) have issued guidelines for the regulatory treatment of credit derivatives. The Fed guidelines generally require banks to treat credit derivatives as direct-credit substitutes and to allocate capital to support those obligations even when the instruments are off-balance-sheet.

When a bank sells credit protection, for example, by writing a credit swap or acting as the total return receiver in a total return swap, the full notional amount is used in the risk-based capital calculation. It is allocated to the risk category appropriate for the reference asset, rather than the credit derivative counterparty, because the reference asset determines the degree of credit risk.

When the bank seller of credit protection enters into a back-to-back credit derivative transaction to hedge its credit risk exposure, the Fed guidelines allow the first derivative transaction to be allocated to the risk category appropriate for the counterparty under the second (hedging) transaction, provided that the bank examiners are comfortable that the hedging transaction will be an effective offset. For example, suppose the risk category of the reference asset under the first derivative transaction would require a 100% risk weighting but the counterparty under the second derivative transaction is an OECD bank. The obligation of an OECD bank carries a 20% risk weighting. Assuming the effectiveness of the hedge can be demonstrated, the first derivative transaction would be assigned a 20% risk weighting. This situation is illustrated in Exhibit 14.

The Fed guidelines also discuss capital allocation when the hedge is imperfect, that is, when the payoffs under the two credit derivative transactions are less than perfectly correlated. The OCC guidelines are similar to the Fed's. Both are likely to be revised as the instruments evolve and as the regulators' understanding of their risk characteristics improves. Eventually, both the Fed and the OCC are likely to adopt a (consolidated) trading-book treatment of credit derivatives, which would subject them to the new market risk capital rules.

The risk-based capital rules governing credit derivatives reflect three general principles. (1) The capital requirement is based mainly on the credit risk of the reference asset, rather than the credit standing of the swap counterparties. (2) A credit protection seller can reduce the amount of capital it must maintain by hedging some of its risk exposure, but the amount of the reduction will depend on the effectiveness of the hedge. (3) Because derivatives usually offer multiple ways of structuring any particular transaction, banks that use credit derivatives should look for opportunities to restructure the transaction and reduce the capital requirement.

Accounting Issues

On June 15, 1998, after much debate, the Financial Accounting Standards Board (FASB) issued FASB Statement No. 133 ("FAS 133"), its new financial accounting standard for derivatives and hedging activities entitled "Accounting for Derivative Instruments and Hedging Activities." FAS 133 establishes a new model for accounting for derivatives and hedging activities, which standardizes the accounting for derivative instruments and supercedes or amends previously existing standards. It is effective for fiscal years beginning after June 15, 1999.

General Principles

The accounting framework of FAS 133 is based on four fundamental principles:

- Derivative instruments represent assets or liabilities.

- These assets or liabilities should be recognized at fair value, rather than historical cost, on the balance sheet.

- Derivative gains or losses are neither assets nor liabilities and, therefore, they should not be reported as deferred items on the balance sheet.

- Hedge accounting should apply only in those cases where the change in the fair value of the hedging instrument will be highly effective in offsetting the change in the fair value or cash flows of the hedged item.

FAS 133 will govern how entities account for derivative instruments under generally accepted accounting principles. It will apply to all derivative instruments, including total return swaps, credit swaps, credit spread options, and other credit derivatives discussed in this primer. It will apply to credit derivative instruments embedded in structured notes and other complex financial instruments as well as to stand-alone credit derivatives.

FAS 133 will require entities to recognize all their derivatives positions on the balance sheet as assets or liabilities and to measure them at fair value (which may differ significantly from historical cost). The offsetting accounting entry will be recorded either as part of net income in the current period or in other comprehensive income. Other comprehensive income is a new concept that is established by FASB Statement No. 130 ("FAS 130"), "Reporting Comprehensive Income," later in this section. FAS 130 provides for a new financial statement, the Statement of Earnings and Comprehensive Income, which supplements the income statement. Exhibit 30 illustrates the basic structure proposed for this accounting statement.

How an entity accounts for changes in a derivative's fair value — gains and losses — will depend on its reason for holding the derivative and whether it is designated as, and qualifies as, a hedging instrument. All hedging relationships must be designated, documented, and regularly reassessed in order to comply with FAS 133. FAS 133 establishes strict criteria which must be met in order for a derivative to qualify as a hedging instrument. It also specifies three primary types of transactions for which hedge accounting can be applied, fair-value hedges, cash-flow hedges, and foreign-currency hedges. Hedge accounting provides for a matching of gains and losses on the hedging instrument with changes in the fair value or cash flows of the hedged item.

Gains or losses on derivatives that are not designated as hedges or that do not qualify as a hedging instrument under FAS 133 must be reported in current period earnings.

Fair-Value Hedge. *A fair-value hedge* is a hedge of the fair value of an asset, liability, or firm commitment. A fair-value hedge is designed to offset the entity's exposure to changes in the fair value of a particular asset, liability, or firm commitment that is attributable to a specific risk. FAS 133 limits the types of risks that can be hedged to (1) price risk of the entire hedged item, (2) interest-rate risk, (3) credit risk, and (4) foreign-currency risk. In a fair-value hedge, the hedging instrument (i.e., the derivative) is marked to fair value each period with the gain or loss recognized currently in net income. Changes in the fair value of the hedged item (attributable to the risk being hedged) are also recorded currently in net income. In a perfect hedge, the changes in the fair values of the derivative and the hedged item (attributable to the risk being hedged) will completely offset each other in net income. Two examples of a fair-value hedge are (1) a credit swap purchased to hedge the credit risk of an existing fixed-rate bond and (2) a credit spread put option to hedge a firm commitment to purchase a bond at a fixed dollar price.

Exhibit 30
Statement of Earnings and Comprehensive Income

Net revenue	$1,000	
Cost of goods sold	500	
Selling, general, and administrative expense	200	
Depreciation	100	
Interest	100	
Pretax income	100	
Income tax expense	40	
Net income		$60
Other comprehensive income (loss) net of tax:		
Cash-flow hedges:		
Net derivative gains (losses)	50	
Reclassification adjustments	(25)	
Net gains (losses) on cash-flow hedges		25
Comprehensive income (loss)		$85

Sources: FAS 130 and FAS 133.

Cash-Flow Hedge. A cash-flow hedge is a hedge of future cash flows or of a forecasted transaction. A cash-flow hedge is designed to offset the entity's exposure to variability of the future cash flows of a recognized asset or liability or of a forecasted transaction that is attributable to a specific risk. In a cash-flow hedge, the hedging instrument is marked to fair value each period, with the gain or loss, subject to limitations, reported as a component of other comprehensive income within the equity section of the entity's balance sheet, as illustrated in Exhibit 30. Such gains or losses remain in accumulated other comprehensive income until the forecasted transaction or cash flow affects earnings. At that point, some or all of the deferred gains or losses are recognized in net income. Two examples of a cash-flow hedge are (1) a credit spread put option to hedge the credit spread on a bond investment that an entity anticipates making at a future date and (2) a forward starting credit swap purchased to hedge the credit spread on a bond that an entity anticipates issuing at a future date.

Foreign-Currency Hedge. FAS 133 treats foreign-currency hedges separately because certain types of foreign-currency hedges are incompatible with some of the basic tenets of the FAS 133 hedging model. These exceptions fall into two broad categories: hedging a net investment in a foreign operation and hedging a forecasted foreign-currency-denominated intercompany transaction. Other than these two exceptions, hedging foreign-currency exposures must meet the criteria for either a fair-value hedge or a cash-flow hedge in order to quality for hedge accounting under FAS 133.

Requirements for Hedge Accounting Treatment

FAS 133 specifies criteria that must be met in order for a transaction to qualify for hedge accounting. In the case of both fair-value and cash-flow hedges, the following conditions must be satisfied: (1) the hedging transaction must be consistent with a clearly stated risk management policy, (2) the hedging instrument and hedged item must be identified prior to application of hedge accounting, (3) the hedged item must be specifically identified, including specification of its major characteristics in the case of a forecasted transaction, (4) the hedged item must have a reliably measurable fair value, (5) the hedging relationship must be formally documented before the transaction is actually undertaken and the entity must specify beforehand how the effectiveness of the hedge will be assessed and regularly reassessed, and (6) both at inception and on an ongoing basis, the hedging relationship must be expected to be ***highly effective*** in offsetting the specified risk exposure(s). That is, in the case of a fair-value hedge, changes in the fair value of the derivative must be expected to offset substantially all of the changes in the fair value or cash flows of the hedged item that are attributable to the risk being hedged. Similarly, in the case of a cash-flow hedge, the cumulative net cash flows of the derivative must be expected to offset substantially all of the changes in the future cash flows of the hedged item that are attributable to the risk being hedged. FAS 133 also contains additional qualifying criteria for written options and other specific types of transactions.

FAS 133 does not define "highly effective." Each entity will have to justify its standard for highly effective hedges in order for hedging relationships to qualify for hedge accounting in its financial statements. A reasonable quantitative test would require that the cumulative changes in the fair value of the hedging instrument be expected to come within the range extending from 80 percent to 125 percent of the inverse cumulative changes in the fair value (or cash flows) of the hedged item in order for the hedging relationship to be considered highly effective in offsetting the change in the fair value (or cash flows) of the hedged item.[12]

Accounting for Credit Derivatives

When using a credit derivative to hedge an asset's credit risk exposure, a market participant would need to evaluate the impact on its financial statements of the hedged item and the hedging derivative. The type of exposure and the intended use of the derivative determine the accounting treatment under FAS 133. Exhibit 31 summarizes the main criteria for hedge accounting treatment of credit derivatives.

Fair-Value Hedge Accounting. If a hedged transaction meets the criteria for fair-value hedge accounting, the gain or loss each period on the hedged item attributable to the risk being hedged would flow through the income statement. Accordingly, the change in the fair value of the hedged item attributable to the risk being hedged would be offset in current period earnings to the extent of the change in the fair value of the credit derivative, and any hedge inefficiency would also be recognized immediately in the income statement.

[12] PricewaterhouseCoopers LLP, "Data Line 1998-36: Overview of FAS 133, Accounting for Derivative Instruments and Hedging Activities," June 26, 1998.

Exhibit 31
Credit Risk Hedge Accounting

1. Credit risk is explicitly recognized as a risk exposure under FAS 133.

2. A strategy to hedge the credit risk of an asset should be permissible for hedge accounting purposes if the derivative meets all the criteria spelled out in FAS 133. Thus, for example, a credit derivative can qualify as a hedging instrument.

3. Financial products that pay/receive solely based upon the occurrence of a payment default by the underlying debtor (i.e., a default due to lack of payment on the underlying) do not qualify as a derivative and consequently do not qualify for hedge accounting treatment.

4. Credit risk on an entity's assets is potentially hedgeable: credit risk on its liabilities generally is not.

5. To qualify for hedge accounting treatment, a fair-value or cash-flow hedge must, at a minimum, satisfy all the following criteria:
(1) The hedging transaction must be consistent with a clearly stated risk management policy.
(2) The hedging instrument and hedged item must be identified prior to application of hedge accounting.
(3) The hedged item must be specifically identified, including specification of its major characteristics in the case of a forecasted transaction.
(4) The hedged item must have a reliably measurable fair value.
(5) The hedging relationship must be formally documented before the transaction is actually undertaken and the entity must specify beforehand how the effectiveness of the hedge will be assessed and regularly reassessed.
(6) It must be expected that the hedging relationship will be *highly effective*, both at inception and on an ongoing basis, in offsetting the specified risk exposure(s).

6. A highly effective hedging relationship is one for which the cumulative changes in the fair value of the hedging instrument are expected to be within the range extending from 80 percent to 125 percent of the inverse cumulative changes in the fair value (in the case of a fair-value hedge) or cash flows (in the case of a cash-flow hedge) of the hedged item.

An Example. Consider three situations. In all three assume (1) the credit derivative qualifies as a fair-value hedge and (2) changes in the fair value of the hedged item are attributable solely to changes in credit risk. First, suppose the hedged item loses $10 while the change in fair value of the credit derivative is also $10. In that case, the $10 gain on the credit derivative and the $10 loss on the hedged item would both be reported in net income, with the net effect on current period earnings being zero.

Second, suppose the hedged item loses only $7. The gain on the credit derivative would offset the $7 loss on the hedged item; the remaining $3 of gain on the credit derivative would be included in net income, and the net effect on current period earnings is a $3 gain.

Third, suppose the hedged item loses $12. The gain on the credit derivative would offset $10 of the loss on the hedged item. The remaining $2 of loss in the fair value of the hedged item would also be included in current period earnings.

Cash-Flow Hedge Accounting. If a hedged transaction meets the criteria for cash-flow hedge accounting, the gain or loss each period on the derivative would generally be recognized in other comprehensive income to the extent it offsets estimated changes in the future cash flows of the anticipated transaction (i.e., the hedged item). The gain or loss deferred under FAS 133 would be recognized in net income in a manner similar to income recognition for the hedged item, for example, as a yield adjustment when the underlying asset is a bond that will be purchased in the future (in a forecasted transaction).

Application to Credit Derivatives

FAS 133 specifically provides that a hedging instrument (e.g., a credit derivative) and hedged item (e.g., a designated asset or liability) can qualify for fair-value hedge accounting if, among other conditions, the risk being hedged is the risk of changes in fair value resulting from changes in the third party obligor's creditworthiness. It also specifically provides that the designated asset or liability and hedging instrument can qualify for cash-flow hedge accounting if, among other requirements, the risk being hedged is the risk of changes in future cash flows attributable to changes in the third party obligor's creditworthiness. Thus, provided the requirements specified in FAS 133 are all satisfied, a credit derivative might qualify either for fair-value hedge accounting or for cash-flow hedge accounting, depending upon the underlying exposure.

Credit swaps make a cash payment when — but only when — a credit event occurs. A total return swap like the one in Exhibit 5 calls for a final cash payment from one party to the other depending upon whether the market price of the reference asset has risen or fallen. Credit spread options and credit spread forwards also lead to a future cash payment whose value depends on the change in the credit quality of the reference asset. These credit derivatives would typically be employed in situations where they function as a fair-value hedge. A credit derivative that provides for a payoff that is triggered by a payment default by the underlying debtor (for example, as with many credit swaps) would not qualify as a derivative instrument under the new accounting standard. Therefore, such derivatives cannot qualify for hedge accounting treatment unless they are restructured to comply with all the criteria specified in FAS 133.[13] For example, if an entity were to define the credit event with respect to a credit rating downgrade and also if any payment would be determined pursuant to an underlying index (as opposed to an insurable event), the transaction should qualify for hedge accounting treatment provided that all the other criteria are satisfied.

[13] When the contractual payment occurs as the result of the underlying debtor's payment default, the instrument is treated for financial reporting purposes as an insurance contract (in particular, a financial guarantee contract). Accordingly, the payment default is considered an insurable event, to which the accounting standards for insurance contracts apply.

Under FAS 133, credit derivatives will qualify for hedge accounting only to the extent that the effectiveness of the hedging relationship can be demonstrated. However, a number of practical questions arise in evaluating the effectiveness of a credit derivative because of the difficulties in valuing them and in measuring default correlations. Under cash-flow hedge accounting treatment, only the gain or loss associated with the effective portion of the hedge — the portion that offsets gain or loss on the hedged position each period — can be deferred in other comprehensive income during the period. The remainder must be reported in current period earnings. Moreover, FAS 133 requires that the effectiveness of the hedge be confirmed each time financial statements are issued, and in any case, at least every three months.

If cash-flow hedge accounting is employed and early termination of the credit derivative transaction occurs, for example because of a credit event, the gain or loss accumulated in other comprehensive income would be recognized in net income at the same time that the anticipated transaction affects earnings.

FAS 133 provides a standard accounting model for all derivatives and hedging activities. Accordingly, derivative market participants should have greater certainty about how transaction structures affect their financial statements. As described in this primer, credit derivatives serve many purposes. In all instances, the products achieve a business objective, which is to transfer credit risk. An entity must also consider whether the desired accounting treatment can be achieved. For example, a total return swap on an asset affects the economic profile of the asset. Nevertheless, it might not qualify for hedge accounting. Other credit derivative products, which enable a user to have the risks and rewards of a credit relationship without a direct customer relationship, might produce a more desirable accounting treatment.

In most cases, the basic credit derivative instruments should be able to meet the criteria for hedge accounting provided (1) they are directly linked to a credit exposure other than a payment default of the obligor and (2) they reduce the risk of that exposure. Analysis of credit derivative products linked to indices or reference credits can be very challenging. The difficult measurement issues should be resolved as better valuation techniques are developed, more credit data are accumulated, default correlations are more accurately measured, and the effectiveness of various credit derivatives is more accurately assessed.

Conclusion

Credit derivatives could fundamentally change the way banks and other capital market participants originate, price, and manage their credit risk exposures. A credit derivative enables a lender or bond investor to isolate and hedge its exposure to credit risk. Credit derivatives are relatively new, and the market for them is still developing. Nevertheless, credit derivatives hold considerable promise as a means for managing identifiable credit risks, such as the credit risk associated with an infrastructure project in an emerging market. As this market evolves, financial engineers will craft new forms of credit derivatives, and market participants will find new applications for them. Before using one of these instruments, a company or an investor should analyze the payoff structure and verify that the instrument will alter its credit risk exposure in the manner and to the degree desired.

There are several models available for valuing credit derivatives. Unfortunately, different models can suggest significantly different values for a particular credit derivative instrument. Bank regulators, who would generally welcome greater use of credit derivatives by banks in order to reduce portfolio concentration risk, have expressed concern about whether banks are valuing these instruments properly and using them correctly. Better credit derivative valuation models would remove a potential impediment to the market's growth.

The further development of credit derivatives might also eventually eliminate the inconsistencies that exist in the pricing of credit risk in different market sectors. Credit derivatives open up new arbitrage possibilities, just as the development of the interest rate swap market did beginning in the early 1980s. As the liquidity of credit derivative instruments increases and the valuation technology improves, market participants will be better able to spot and exploit these arbitrage opportunities. Credit pricing anomalies will gradually disappear, credit risk exposure will be reallocated more beneficially, and the credit markets will become more efficient at pricing this form of risk. These developments are likely to result in better credit risk diversification and lower credit spreads.

Additional Readings

"Accounting for Derivative and Similar Financial Instruments and for Hedging Activities," 1997 (Financial Accounting Standards Board, Norwalk, CT), proposed FAS issued August 29, 1997. This proposed financial accounting standard specifies the new method of accounting for derivatives.

"An Investor's Guide to Credit Derivatives," 1997, *Derivatives Strategy* (June), supplement pp. 1-8. This article describes the main types of credit derivatives and explains the reasons for their use.

BBA Credit Derivatives Report 1996: Based on a Survey of the London Market, 1996 (British Bankers' Association, London). This book summarizes the state of the London market for credit derivatives as of 1996 and furnishes an interesting perspective on where the market appeared to be headed.

Carty, L. and D. Lieberman, 1996, *Corporate Bond Defaults and Default Rates, 1938-1995* (Moody's Investors Service, New York). This publication contains tables that provide default probabilities calculated from historical data.

Chan, William, et al., 1997, Class Notes: *A Collection of Articles from Risk* (Canadian Imperial Bank of Commerce, New York). This collection of articles from *Risk* magazine includes five articles on credit derivatives, which describe these instruments, the market for them, and how they can be used to hedge credit risk exposure and enhance investment returns.

Fabozzi, Frank J., 1996, *Bond Markets, Analysis and Strategies*, 3rd. ed. (Prentice Hall, Upper Saddle River, NJ), chs. 3 and 14. This book is a good primer on fixed-income securities.

Finnerty, John D., 1996, "Credit Derivatives, Infrastructure Finance, and Emerging Market Risk," *Financier* (February), pp. 64-75. This article describes how credit derivatives can be used to reduce or eliminate a lender's exposure to emerging market credit risk and thereby facilitate the financing of infrastructure investments in the emerging economies.

Flesaker, B., L. Hughston, and L. Schreiber, 1996, "Credit Derivatives," in Finnerty, J.D., and M.S. Fridson, eds., *The Most Recent Developments in Fixed Income Investing* (Irwin, Burr Ridge, IL), ch. 11. This article describes the early evolution of the market for credit derivatives and several of the initial types of credit derivatives.

Ghose, Ronit, 1997, *Credit Derivatives*: *Key Issues* (British Bankers' Association, London). This collection of articles surveys the important issues concerning the use of credit derivatives, including legal and regulatory issues, how to value credit derivatives, how to use them to manage credit risk exposure, and the factors affecting the development of the market for credit derivatives.

Jarrow, Robert A., and Stuart M. Turnbull, 1995, "The Pricing and Hedging of Options on Financial Securities Subject to Credit Risk," *Journal of Finance* (March), pp. 53-85. This article contains a technical description of a very sophisticated mathematical model for pricing credit derivatives.

Jarrow, Robert A., and Stuart M. Turnbull, 1996, *Derivative Securities* (South-Western College Publishing, Cincinnati, OH), ch. 18. This book is a good textbook primer on the general subject of derivatives, how to use them, and how to value them.

Merton, Robert C., 1974, "On the Pricing of Corporate Debt: The Risk Structure of Interest Rates," *Journal of Finance* (May), pp. 449-470. This article develops a model that forms the basis for many of the models used currently to value credit swaps.

Merton, Robert C., 1977, "An Analytical Derivation of the Cost of Deposit Insurance and Loan Guarantees," *Journal of Banking and Finance* (June), pp. 3-11. This article models a loan guarantee as a put option. The value of a loan guarantee equals the value of an option to put the loan to the guarantor with the strike price equal to the loan's face amount.

Smithson, Charles W., 1995, "Credit Derivatives," *Risk* (December), pp. 38-39. This article describes the basic features of credit derivatives. Reprinted in *Class Notes: A Collection of Articles from Risk.*

Smithson, Charles W., Clifford W. Smith, Jr., and D. Sykes Wilford, 1995, *Managing Financial Risk* (Irwin, Burr Ridge, IL). This book describes the four basic types of derivatives and the interrelationships among them. It is an excellent practitioner-oriented primer on the general subject of derivatives and how to use them.

Spinner, Karen, 1997, "Building the Credit Derivatives Infrastructure," *Derivatives Strategy* (June), pp. 35-40, 42-43. This article discusses some of the impediments to the development of an active market for credit derivatives and how market participants are trying to overcome them.

Glossary

Amount
The (notional) principal amount specified in the option agreement.

Asset swap
A combination of two transactions: the purchase of an asset, such as a bond or a bank loan, for cash coupled with an interest rate swap.

Basis point
1/100th of 1%.

Basket default swap
A credit swap that takes the form of a portfolio of put options which are contingent upon one another because once one of them pays off, the others automatically expire.

Call option
An option conveying the right to buy.

Cash-flow hedge
A derivative that hedges future cash flows or a forecasted transaction. Designed to offset the entity's exposure to variability in the future cash flows of a recognized asset or liability that is attributable to a specific risk.

CMT
Constant maturity treasury index.

Comprehensive income
A more inclusive measure of an entity's income or loss than the traditional net-income measure. It includes gains or losses realized on a cash flow hedge, which must be marked to fair value each period, until the forecasted transaction being hedged actually occurs. At that point the deferred gains or losses are taken into net income.

Credit derivative
A privately negotiated contract whose value is derived from the credit risk of a bond, a bank loan, or some other credit instrument.

Credit event
A specified event, such as a bond default or a bond rating downgrade, which triggers a payoff under a credit swap.

Credit forward (or credit spread forward)
A forward agreement that specifies a credit spread and a reference bond (rather than a particular price as in a conventional forward agreement).

Credit risk
The risk that a security will lose value because of a reduction in the issuer's capacity to make payments of interest and principal.

Credit spread
The difference between the yield on the borrower's debt and the yield on Treasury debt of the same maturity; provides a measure of the premium in yield investors require to compensate for bearing the risk of default.

Credit spread call option (or credit spread call)
A call option whose payoff increases as the yield spread on a specified bond falls further below a specified credit spread.

Credit spread collar
A combination of a credit spread put and a credit spread call. Investors can purchase credit spread puts to reduce or eliminate credit risk exposure and at the same time sell a credit spread call to reduce the cost of this insurance.

Credit spread put option (or credit spread put)
A put option whose payoff increases as the yield spread on a specified bond rises further above a specified credit spread.

Credit spread term structure
For each maturity, the size of the credit spread that a fixed income investor would demand when deciding how much to pay for a zero-coupon bond with that maturity and the same credit quality as the debt instrument underlying the credit swap.

Credit swap (or credit default swap)
The classic credit derivative; functions like a letter of credit or a surety bond. Enables an investor to insure against an event of default or some other specified credit event. Consists of a single upfront payment, or a series of payments, in exchange for the counterparty's obligation to make a payment that is contingent upon the occurrence of a specified credit event.

Credit-event put (or event-risk put)
A variant of the credit swap in which the payoff amount is segregated in a trust. The put could specify either a fixed or a variable payoff.

Credit-linked note
A form of structured note in which the derivative instrument is a credit derivative.

Default put
Term used for the earliest credit swaps. A credit swap can be viewed as a put option whose payoff is tied to a particular credit event. If a credit event occurs during the term of the swap, the seller/insurer pays the buyer/insured an amount to cover the loss, which is usually par (in the case of a bond) minus the final price of the reference asset, and then the swap terminates. In effect, the buyer/insured puts the reference asset to the seller/insurer at par.

Default risk
The likelihood that the issuer will actually fail to make timely payments of principal and interest. A form of credit risk in which the reduction in the capacity to pay is so serious that a scheduled payment is delayed or missed altogether.

Derivative (or derivative contract)
A bilateral contract whose value derives from the value of some underlying security, such as a stock or a bond.

Duration
The modified duration of the reference bond; the sensitivity in percentage terms of the bond's price to a change in the bond's yield.

Effective duration
Bond duration measured over an interval.

Emerging (or developing) market
Economies that are rapidly developing but are not yet fully industrialized.

Emerging market risk
The risk that an investment in a project located in an emerging market might lose value because of political or economic events specific to the developing country in which the project is located.

Fair-value hedge
A derivative that hedges the fair value of an asset, liability, or firm commitment. Designed to offset the entity's exposure to changes in the market fair value of a particular asset, liability, or firm commitment that is attributable to a specific risk. It is marked to fair value each period and the gain or loss is recognized currently in net income (together with the (at least partially) offsetting income or loss).

FASB
Financial Accounting Standards Board

Fed
Federal Reserve System

Forward agreement
A contract that obligates the seller to deliver, and the buyer to purchase, a specified asset on a particular date at a price specified at the time they enter into the agreement.

Highly effective
A highly effective hedging relationship is one that offsets substantially all of the changes in the fair value or cash flows of the hedged item that are attributable to the risk being hedged.

Income-neutral credit diversification
Diversification of credit risk which does not alter the entity's income. It will improve the entity's risk-return profile so long as the default rates of the underlying credits are less than perfectly correlated.

Interest rate swap
The exchange of interest payment obligations, for example, the exchange of payments at LIBOR for payments at a fixed rate.

ISDA
International Swaps and Derivatives Association

LIBOR
London Interbank Offered Rate

Modified duration
The sensitivity in percentage terms of the price of a bond to a change in the bond's yield.

Netting
Bottom-line financial result when there are two or more transactions between two parties. Each party's gains and losses with respect to the other party are offset against one another (i.e., netted) to determine a single consolidated amount that one party owes to the other.

Non-recourse debt obligation
A debt obligation that restricts the lenders' ability to seek repayment from the (ultimate) borrower if there is an event of default.

OCC
Office of the Comptroller of the Currency

OECD
Organization for Economic Cooperation and Development

Option
A right to buy (call option) or sell (put option) without the obligation to buy or sell.

Option premium
The cost of the option. It is usually a lump-sum up-front payment, but in some cases it is a series of payments. In the case of a credit spread option, the buyer of the option pays the option premium in return for the seller's agreeing to make a lump-sum payment in the event the condition specified in the option occurs (e.g., the reference bond's credit spread crosses a stated threshold).

Political risk
The risk of political events adversely affecting a country's credit standing. This can in turn affect the value of loans to the government and loans to, or equity investments in, entities located in the country.

Put option
An option conveying the right to sell.

Reference asset
Asset agreed to by the parties to a credit derivative at the inception of the credit derivative transaction; normally an actively traded corporate bond, sovereign bond, widely syndicated bank loan, or a portfolio formed from one of these classes of debt obligations.

Reference rate
A specified fixed interest rate or a floating interest rate determined according to a specified formula.

Relative Performance Total Return Swap
The combination of two total return swaps, which is tantamount to an exchange of the underlying assets.

Sovereign risk
Political and economic risks, as they affect the value of the government's outstanding debt obligations.

Strike spread
The fixed credit spread specified in a credit spread option agreement (denoted X in the primer).

Structured note
A package consisting of a conventional fixed-rate or floating-rate note and a derivative instrument embedded in it.

Total return
Interest plus capital appreciation, or minus capital depreciation.

Total return swap
The most widely used form of credit derivative. It involves swapping an obligation to pay interest based on a specified fixed or floating interest rate in return for an obligation representing the total return on a specified reference asset or index.

Trading flat
How bonds trade when they are in default; the bonds change hands without the buyer compensating the seller directly for accrued and unpaid interest.

Yield to call
The internal rate of return of the cash flow stream for a bond assuming that the bond "matures" on a specified call date and that the amount repaid is the call price for that date.

Yield to maturity
The internal rate of return of the cash flow stream for a bond (consisting of the bond's price and the stream of interest and principal payments).

Yield to worst
The minimum of the yield to maturity and the yields to call for all possible call dates. Bond investors calculate it when assessing how adversely a bond's call feature might affect the value of their bonds.

Zero-cost collar
A put-call combination in which the sale price of the call (put) equals the purchase price of the put (call); the investor thus has no net cash outlay.