CHAPTER 29
CREDIT DERIVATIVES

CHAPTER SUMMARY

There are changes in the credit spread that must be controlled for by the portfolio manager when investing in non-Treasury securities. What has developed in the over-the-counter or dealer markets are derivative instruments that provide protection against credit risk. These products are referred to as credit derivatives. There are five types of credit derivatives: the area asset swaps, total return swaps, credit default swaps, credit spread options, and credit spread forwards. In this chapter such relatively new derivatives and structured credit products are explained.

TYPES OF CREDIT RISK

An investor who lends funds by purchasing a bond issue is exposed to three types of credit risk: default risk, credit spread risk, and downgrade risk.

**Default risk** is the credit risk in which the issuer will fail to satisfy the terms of the obligation with respect to the timely payment of interest and repayment of the amount borrowed.

**Credit spread risk** is the risk in which an issuer’s debt obligation will perform poorly relative to other bonds due to an increase in its credit spread. If the credit spread increases, the market price of the bond issue will decline (assuming Treasury rates have not changed).

**Downgrade risk** refers to an unanticipated downgrading of an issue or issuer that will cause the credit spread to increase resulting in a decline in the price of the issue or the issuer’s bonds. Downgrade risk is closely related to credit spread risk.

CATEGORIZATION OF CREDIT DERIVATIVES

A derivative can be categorized as a true credit derivative if it provides protection against all types of credit risk. Asset swaps and total return swaps are not categorized as true credit derivatives in that they do not provide protection against all types of credit risk.

ISDA DOCUMENTATION

In 1998, the International Swap and Derivatives Association (ISDA) developed a standard contract that could be used by parties in trades of a credit derivatives contract. The contract form is sufficiently flexible so that it can be used for more than just credit default swaps and total return swaps.

Reference Entity and Reference Obligation

The reference entity (or reference issuer) is the issuer of the debt instrument. The issuer could be
a corporation or a sovereign government. The reference obligation (or reference asset) is the particular debt issue for which credit protection is being sought.

Credit Events

Credit default products have a payout that is contingent upon a credit event occurring. The 1999 ISDA Credit Derivatives Definitions (referred to as the “1999 Definitions”) provides a list of eight credit events: bankruptcy, credit event upon merger, cross acceleration, cross default, downgrade, failure to pay, repudiation/moratorium, and restructuring.

Bankruptcy is defined as a variety of acts that are associated with bankruptcy or insolvency laws. When a default occurs, the obligation becomes due and payable prior to the scheduled due date had the reference entity not defaulted. This is referred to as an obligation acceleration. A reference entity may disaffirm or challenge the validity of its obligation. This is a credit event that is covered by repudiation/moratorium.

A restructuring occurs when the terms of the obligation are altered so as to make the new terms less attractive to the debt holder than the original terms. The terms that can be changed would typically include, but are not limited to, one or more of the following: (i) a reduction in the interest rate, (ii) a reduction in the principal, (iii) a rescheduling of the principal repayment schedule (e.g., lengthening the maturity of the obligation) or postponement of an interest payment, or (iv) a change in the level of seniority of the obligation in the reference entity’s debt structure.

The Restructuring Supplement to the 1999 ISDA Credit Derivatives Definitions issued in April 2001 modified the definition for restructuring. To qualify for a restructuring there must be four or more holders of the reference obligation and there must be consent to the restructuring of the reference obligation by a supermajority (66 2/3%).

In January 2003, the ISDA published its revised credit events definitions in the 2003 ISDA Credit Derivative Definitions. The major change was to restructuring, whereby the ISDA allows parties to a given trade to select from among the following four definitions: (i) no restructuring; (ii) “full” or “old” restructuring, which is based on the 1993 Definitions; (iii) “modified restructuring,” which is based on the Supplement Definition; and (iv) “modified modified restructuring.” The last choice is new and was included to address issues that arose in the European market.

ASSET SWAPS

When an investor possesses an asset and converts its cash flow characteristics, the investor is said to have constructed an asset swap. A common asset swap is for an investor to purchase a credit-risky bond with a fixed rate and convert it to a floating rate. If the issuer of the bond defaults on the issue, the investor must continue to make payments to the counterparty of the interest-rate swap (i.e., the swap dealer) and is therefore still exposed to the credit risk of the issuer.
An asset swap typically combines the sale of a credit-risky bond owned by a counterparty at par and with no interest accrued with an interest-rate swap. This type of asset swap structure or package is referred to as a par asset swap. The coupon on the bond in the par asset swap is paid in return for LIBOR, plus a spread if necessary. This spread is the asset swap spread and is the price of the asset swap.

TOTAL RETURN SWAPS

A total return swap in the fixed-income market is a swap in which one party makes periodic floating-rate payments to a counterparty in exchange for the total return realized on a reference obligation or a basket of reference obligations. When the reference obligation is a bond market index, the swap is referred to as a total return index swap.

The party that agrees to make the floating payments and receive the total return is referred to as the total return receiver. The party that agrees to receive the floating payments and pay the total return is referred to as the total return payer.

There are variations of the basic asset swap structure to remove unwanted noncredit structural features of the underlying credit-risky bond. The simplest example of an asset swap variation to remove an unwanted noncredit structural feature is a callable bond.

In a swaption, an investor has the right to effectively terminate the swap from the time of the first call date for the bond to the maturity date of the bond. Because the investor is paying fixed and receiving floating, the swaption must be one in which the investor receives fixed and pays floating.

Credit-independent market risk is the risk that the general level of interest rates will change over the term of the swap.

Benefits of Total Return Swaps

There are several benefits in using a total return swap as opposed to purchasing reference obligations themselves. First, the total return receiver does not have to finance the purchase of the reference assets itself. Second, the total return receiver can achieve the same economic exposure to a diversified basket of assets in one swap transaction that would otherwise take several cash market transactions to achieve.

CREDIT DEFAULT SWAPS

The credit default swap is most popular type of credit derivative. Its primary purpose is to hedge the credit exposure to a particular asset or issuer.

A credit default swap in which there is one reference obligation is called a single-name credit default swap. When the reference obligation is a basket or portfolio of obligations (e.g., 10 high-yield corporate bond of 10 different issuers), it is referred to as a basket credit default swap.
In a credit default swap, the protection buyer pays a fee to the protection seller in return for the right to receive a payment conditional upon the occurrence of a credit event by the reference obligation or the reference entity. If a credit event occurs, then the protection seller must make a payment.

Credit default swaps can be settled in cash or by physical delivery. The latter is more efficient. If no credit event has occurred by the maturity of the swap, both sides terminate the swap agreement and no further obligations are incurred.

The methods used to determine the amount of the payment obligated of the protection seller under the swap agreement can vary greatly. A credit default swap can specify (at the contract date) the exact amount of payment that will be made by the protection seller should a credit event occur. Conversely, the credit default swap can be structured so that the amount of the swap payment by the seller is determined after the credit event.

Single-Name Credit Default Swap

The standard contract for a single-name credit default swap calls for a quarterly payment of the swap premium. The quarterly payment is determined using one of the day count conventions in the bond market. The swap premium payment for a quarter is:

\[
\text{quarterly swap premium payment} = \text{notional amount} \times \text{swap rate (in decimal)} \times \frac{\text{actual number of days in quarter}}{360}.
\]

For example, assume a hypothetical credit default swap where the notional amount is $10 million and there are 92 actual days in a quarter. Since the swap premium is 200 basis points (0.02), the quarterly swap premium payment made by the protection buyer is:

\[
\text{quarterly swap premium payment} = 10,000,000 \times 0.02 \times \frac{92}{360} = \$51,111.11.
\]

In the absence of a credit event, the protection buyer will make a quarterly swap premium payment over the life of the swap. If a credit event occurs, two things happen. First, there are no further payments of the swap premium by the protection buyer to the protection seller. Second, a termination value is determined for the swap. The market practice for settlement for single-name credit default swaps is physical delivery as opposed to a cash settlement. With physical settlement the protection buyer delivers a specified amount of the face value of bonds of the reference entity to the protection seller.

The protection seller pays the protection buyer the face value of the bonds. Since all reference entities that are the subject of credit default swaps have many issues outstanding, there will be a number of alternative issues of the reference entity that the protection buyer can deliver to the protection seller. These issues are known as deliverable obligations.
Basket Credit Default Swaps

With a basket credit default swap, the time of the payout must be specified. Basket default swaps can be structured in different ways. The simplest case is that if any of the reference obligations default, there is a payout and then termination of the swap. This type of swap is referred to as a **first-to-default basket swap**. In general, if it takes \( k \) reference obligations to trigger a payout, the swap is called a \( k \)-to-default basket swap.

Credit Default Swap Index

In a credit default swap index, the credit risk of a standardized basket of reference entities is transferred between the protection buyer and protection seller. The mechanics of a credit default swap index are slightly different from that of a single-name credit default swap. As with a single-name credit default swap, a swap premium is paid. However, if a credit event occurs, the swap premium payment ceases in the case of a single-name credit default swap. In contrast, for a credit default swap index, the swap payment continues to be made by the protection buyer. However, the amount of the quarterly swap premium payment is reduced. This is because the notional amount is reduced as result of a credit event for a reference entity.

Because a credit default swap index provides exposure to a diversified basket of credits, it can be used by a portfolio manager to help adjust a portfolio’s exposure to the credit sector of a bond market index. By entering into a credit default swap index as the protection seller, a portfolio manager increases exposure to the credit sector. Exposure to the credit sector is reduced by a portfolio manager being the protection buyer.

CREDIT SPREAD OPTIONS

A credit spread option is an option whose value/payoff depends on the change in credit spreads for a reference obligation. The underlying can be either a reference obligation (which is a credit-risky bond with a fixed credit spread), or the level of the credit spread for a reference obligation.

**Underlying is a Reference Obligation with a Fixed Credit Spread**

A **credit spread put option** is an option that grants the option buyer the right, but not the obligation, to sell a reference obligation at a price that is determined by a strike credit spread over a referenced benchmark at the exercise date.

A **credit spread call option** is an option that grants the buyer the right, but not the obligation, to buy a reference obligation at a price that is determined by a strike credit spread over a referenced benchmark at the exercise date.

The price for the reference obligation (i.e., the credit-risky bond) is determined by specifying a strike credit spread over the referenced benchmark, typically a default-free government security. There is one problem with using a credit spread option in which the underlying is a reference obligation with a fixed credit spread. The payoff is dependent upon the value of the reference obligation’s price, which is affected by both the change in the level of the interest rates (as
measured by the referenced benchmark) and the change in the credit spread.

To protect against credit spread risk, an investor can buy a credit spread put option where the underlying is a reference obligation with a fixed credit spread.

**Underlying is a Credit Spread on a Reference Obligation**

When the underlying for a credit spread option is the credit spread for a reference obligation over a referenced benchmark, then the payoffs are as given as follows.

The payoff for a credit spread call option equals:

\[
\text{credit spread at exercise} - (\text{strike credit spread} \times \text{notional amount} \times \text{risk factor}).
\]

The payoff for a credit spread put option equals:

\[
\text{strike credit spread} - (\text{credit spread at exercise} \times \text{notional amount} \times \text{risk factor}).
\]

The strike credit spread (in decimal form) is fixed at the outset of the option. The credit spread at exercise (in decimal form) is the credit spread over a referenced benchmark at the exercise date. The risk factor equals 10,000 times the percentage price change for a 1-basis-point change in rates for the reference obligation.

Notice that when the underlying for the credit spread option is the credit spread for a reference obligation over a referenced benchmark, a credit spread call option is used to protect against an increase in the credit spread. In contrast, when the underlying for the credit spread option is the reference obligation, a credit spread put option is used to protect against an increase in the credit spread.

**CREDIT SPREAD FORWARDS**

A credit spread forward requires an exchange of payments at the settlement date based on a credit spread. As with a credit spread option, the underlying can be the value of the reference obligation or the credit spread. The payoff depends on the credit spread at the settlement date of the contract. The payoff is positive (i.e., the party receives cash) if the credit spread moves in favor of the party at the settlement date. The party makes a payment if the credit spread moves against the party at the settlement date.

In general, if a portfolio manager takes a position in a credit spread forward contract to benefit from an increase in the credit spread, then the payoff equals:

\[
\text{credit spread at settlement} - \text{credit spread in contract} \times \text{notional amount} \times \text{risk factor}.
\]

For a portfolio manager taking a position that the credit spread will fall, the payoff is:

\[
\text{credit spread in contract} - \text{credit spread at settlement} \times \text{notional amount} \times \text{risk factor}.
\]
STRUCTURED CREDIT PRODUCTS

Credit derivatives are called structured credit products when they are used to create debt instruments with structures whose payoffs are derived from the credit characteristics of a basket of reference obligations. The two most common structures employing credit derivatives are synthetic collateralized debt obligations and credit-linked notes.

Synthetic Collateralized Debt Obligations

A collateralized debt obligation (CDO) is backed by a diversified pool of one or more types of debt obligations. The funds to purchase the collateral assets are obtained from the issuance of bonds.

A CDO is classified as a cash CDO or a synthetic CDO. The adjective “cash” means that the collateral manager purchases cash market instruments. A synthetic CDO absorbs the credit risk, but not the legal ownership, of the reference obligations.

Credit-Linked Notes

A credit-linked note (CLN) is a security issued by an investment banking firm or another issuer who has credit risk to a second issuer (called the reference issuer), and the return is linked to the credit performance of the reference issuer. Embedded in a CLN is a credit derivative, typically a credit default swap.

The issuer of a CLN is the credit protection buyer; the investor in the CLN is the credit protection seller. Like a standard bond, the basic CLN has a coupon rate, maturity date, and a maturity value. In contrast to a standard bond, the maturity value depends on the performance of the reference issuer. If a credit event occurs with respect to the reference issuer, the bond is paid off and the maturity value is adjusted down.

CLNs usually have a maturity of anywhere from three months to several years, with one to three years being the most likely term of credit exposure. The short maturity of CLNs reflects the desire of investors to take a credit view for such a time period.
ANSWERS TO QUESTIONS FOR CHAPTER 29

(Questions are in bold print followed by answers.)

1. **Why is a portfolio manager concerned with more than default risk when assessing a portfolio’s credit exposure?**

Credit risk includes three types of risk: (i) the risk that the issuer will default (default risk), (ii) the risk that the credit spread will increase (credit spread risk), and (iii) the risk that an issue will be downgraded (downgrade risk). Thus, when assessing a portfolio’s credit exposure, more than just default risk needs to be considered.

2. **Rating transition tables published periodically by rating agencies indicate the percentage of issues with a specific rating change over some specified time period (e.g., one year). How can a rating transition table be used by a portfolio manager to assess downgrade risk?**

To understand a rating transition table, one must first understand that market participants measure the default risk of an issue by looking at the credit ratings assigned to issues by the rating agencies—Moody’s Investors Service, Inc., Standard & Poor’s Corporation, and Fitch Ratings. Once a credit rating is assigned to a debt obligation, a rating agency monitors the credit quality of the issuer and can reassign a different credit rating. An improvement in the credit quality of an issue or issuer is rewarded with a better credit rating, referred to as an upgrade; deterioration in the credit rating of an issue or issuer is penalized by the assignment of an inferior credit rating, referred to as a downgrade.

A rating transition table tracks and uses the changes (upgrades and downgrades) in credit rating. Looking at a rating transition table, a portfolio manager can find out how many specific rating upgrades and downgrades have occurred over a period of time for a specific rating. Thus, if the manager knows the specific rating of an asset in its portfolio, the manager can assign a probability that the rating might change. If the concern is with default, the manager would want to know the probability of a downgrade. If the portfolio manager finds that there have been a significant number of downgrades over the designated time period, then the manager knows there has been a corresponding increase in the credit spread resulting in an increase in downgrade risk. This results in a decline in the price of the issue or the issuer’s bonds.

3. **Answer the following questions.**

   (a) **What is meant by a reference entity?**

   The ISDA documentation will identify the reference entity and the reference obligation. The reference entity is the issuer of the debt instrument and hence also referred to as the reference issuer. It could be a corporation or a sovereign government. For example, a reference entity could be Sunset Chevrolet Credit Company.

   (b) **What is meant by a reference obligation?**
The reference obligation, also referred to as the reference asset, is the particular debt issue for which the credit protection is being sought. For example, if the reference entity is Sunset Chevrolet Credit Company, then the reference obligation would be a specific Sunset Chevrolet Credit Company bond issue.

4. What authoritative source is used for defining a “credit event”?

The International Swap and Derivatives Association (ISDA) provides definitions of what credit events are. The 1999 ISDA Credit Derivatives Definitions (referred to as the “1999 Definitions”) provides a list of eight credit events: bankruptcy, credit event upon merger, cross acceleration, cross default, downgrade, failure to pay, repudiation/moratorium, and restructuring. These eight events attempt to capture every type of situation that could cause the credit quality of the reference entity to deteriorate or cause the value of the reference obligation to decline.

In January 2003, the ISDA published its revised credit events definitions in the 2003 ISDA Credit Derivative Definitions (referred to as the “2003 Definitions”). The revised definitions reflected amendments to several of the definitions for credit events set forth in the 1999 Definitions. Specifically, there were amendments for bankruptcy, repudiation, and restructuring. The major change was to restructuring, whereby the ISDA allows parties to a given trade to select from among the following four definitions: (i) no restructuring; (ii) “full” or “old” restructuring, which is based on the 1993 Definitions; (iii) “modified restructuring,” which is based on the Supplement Definition; and (iv) “modified modified restructuring.” The last choice is new and was included to address issues that arose in the European market.

5. Why is “restructuring” the most controversial credit event?

The most controversial credit event that may be included in a credit default swap is restructuring of an obligation. A restructuring occurs when the terms of the obligation are altered so as to make the new terms less attractive to the debt holder than the original terms. The terms that can be changed would typically include, but are not limited to, one or more of the following: (i) a reduction in the interest rate, (ii) a reduction in the principal, (iii) a rescheduling of the principal repayment schedule (e.g., lengthening the maturity of the obligation) or postponement of an interest payment, or (iv) a change in the level of seniority of the obligation in the reference entity’s debt structure.

The reason why restructuring is controversial is that a protection buyer profits from the inclusion of a restructuring as a credit event and feels that eliminating restructuring as a credit event will erode its credit protection. The protection seller, in contrast, would prefer not to include restructuring since even routine modifications of obligations that occur in lending arrangements would trigger a payout to the protection buyer. Moreover, if the reference obligation is a loan and the protection buyer is the lender, there is a dual benefit for the protection buyer to restructure a loan. First, the protection buyer receives a payment from the protection seller. Second, the accommodating restructuring fosters a link between the lender (who is the protection buyer) and its customer (the corporate entity that is the obligor of the reference obligation).
6. Answer the following questions.

(a) What is an asset swap?

An asset swap is created by an investor when the investor owns an asset and converts its cash flow characteristics. An asset swap is an interest rate swap or cross-currency swap used to convert the cash flows from an underlying security (a bond or floating rate note), from fixed coupon to floating coupon, floating coupon to fixed coupon, or from one currency to another. The underlying security and swap may be transacted together (as a package) with the same counterparty or separately with different counterparts. The asset swap may be transacted at the time of the security purchase or added to a bond or floating rate note already owned by the investor. A fixed-rate bond plus an asset swap converting the bond to floating rate is known as a synthetic floating-rate note. The security plus asset swap can be sold as a package, or separately. If the issuer of the bond defaults on the issue, the investor must continue to make payments to the counterparty of the interest-rate swap (i.e., the swap dealer) and is therefore still exposed to the credit risk of the issuer.

(b) Is an asset swap a true credit derivative?

Asset swaps, like total return swaps, are not categorized as true credit derivatives in that they do not provide protection against all types of credit risk.

Credit derivatives allow investors to manage the credit risk exposure of their portfolios or asset holdings by providing protection against deterioration in credit quality of the borrowing entity. While an asset swap is not a true credit derivative, it is closely associated with the credit derivatives market because it explicitly sets out the price of credit as a spread over LIBOR. It allows the acquiring of credit risk while minimizing interest-rate risk but it does not allow an investor to protect transfer credit risk. It is because of this shortcoming of an asset swaps that the other types of derivative instruments and structured products have been created.

7. Explain how a total return swap can be used by a portfolio manager to increase credit exposure to several issuers of corporate bonds.

A total return swap in the fixed-income market is a swap in which one party makes periodic floating-rate payments to a counterparty in exchange for the total return realized on a reference obligation or a basket of reference obligations. The reference obligations, also referred to as the reference assets, are the particular debt issues for which the credit protection is being sought. A total return payment includes all cash flows that flow from the reference obligations as well as the capital appreciation or depreciation of those reference obligations. A portfolio manager using a total return swap typically will increase credit exposure to the reference obligations (i.e., several issuers of corporate bonds).

The party that agrees to make the floating payments and receive the total return is referred to as the total return receiver; the party that agrees to receive the floating payments and pay the total return is referred to as the total return payer. In a total return swap, the total return receiver is exposed to both credit risk and interest-rate risk. For example, the credit risk spread can decline
A portfolio manager typically uses a total return swap to increase exposure to a reference obligation, in contrast to a credit default swap that is used to hedge a credit exposure. A total return swap transfers all of the economic exposure of a reference obligation or reference obligations to the total return receiver. In return for receiving this exposure, the total return receiver pays a floating or fixed rate to the total return payer.

There are several benefits in using a total return swap as opposed to purchasing reference obligations themselves. First, the total return receiver does not have to finance the purchase of the reference assets itself. Second, the total return receiver can achieve the same economic exposure to a diversified basket of assets in one swap transaction that would otherwise take several cash market transactions to achieve.

8. Explain how a total return swap can be used by a portfolio manager to effectively short corporate bonds.

A total return swap can be utilized by a portfolio manager to effectively short corporate bonds by being a total return payer and receiving a floating payment. More details are given below.

Credit derivatives are used by bond portfolio managers in the normal course of activities to more efficiently control the credit risk of a portfolio and to more efficiently transact compared to using the cash market. For example, credit derivatives allow a mechanism for portfolio managers to more efficiently short a credit-risky security than by shorting in the cash market (the later being often times difficult to do).

An investor who wants to short the corporate bond will find it difficult to do so in the corporate bond market because the bond markets are illiquid, and there are not enough willing parties to provide for shorting bonds. However, an investor can short bonds efficiently by using a total return swap. In this case the investor will employ a total return swap in which it is a total return payer and will receive a floating payment. By being a total return payer, a portfolio manager pays all corporate bond coupon cash flows as well as the capital appreciation or depreciation of the bonds.

9. Why is the total return receiver in a total return swap exposed to more than just credit risk?

The party that agrees to make the floating payments and receive the total return is referred to as the total return receiver. The party that agrees to receive the floating payments and pay the total return is referred to as the total return payer. In a total return swap, the total return receiver is exposed to both credit risk and interest rate risk. For example, the credit risk spread can decline (resulting in a favorable price movement for the reference obligation), but this gain can be offset by a rise in the level of interest rates.

Suppose a portfolio manager’s expectations are realized and there is a decline in the credit spread.
However, this does not guarantee that the portfolio manager will make a net outlay. This is because of a disadvantage of a total return swap, which is that the return to the investor is dependent on both credit risk (declining or increasing credit spreads) and market risk (declining or increasing market rates). Two types of market interest-rate risk can affect the price of a fixed-income asset. Credit-independent market risk is the risk that the general level of interest rates will change over the term of the swap. This type of risk has nothing to do with the credit deterioration of the reference obligation. Credit-dependent market interest-rate risk is the risk that the discount rate applied to the value of an asset will change based on either perceived or actual default risk.

10. Marsha Brady is a fixed-income portfolio manager. After reviewing a research report issued by a major brokerage firm on Worldwide Global Communications Corporation in which it is suggested that within one year the firm’s credit fundamentals will strengthen such that the market will demand a lower credit spread, she decides that she wants to take a credit view on that issuer. Next week, Worldwide Global Communications Corporation will be coming to market with a 15-year senior bond issue at par with a coupon rate of 12%, offering a spread of 600 basis points over the 15-year Treasury issue. Rather than purchase the bonds, Ms. Brady prefers to express her view on the company’s credit risk by entering into a total return swap that matures in one year with the reference obligation being the senior bonds that will be issued by Worldwide Global Communications Corporation. The total return swap calls for an exchange of payments semiannually with the total return receiver paying the six-month Treasury rate plus 350 basis points. The notional amount for the contract is $10 million. Suppose that over the one year, following occurs:

- the six-month Treasury rate is 6% initially
- the six-month Treasury rate for computing the second semiannual payment is 7%
- at the end of one year the 14-year Treasury rates is 8%
- at the end of one year the credit spread for the reference obligation is 400 basis points

Answer the following questions.

(a) Would Ms. Brady enter the total return swap as the total return receiver or total return payer? Explain why.

The party that agrees to make the floating payments and receive the total return is the total return receiver; the party that agrees to receive the floating payments and pay the total return is the total return payer. In a total return swap, the total return receiver is exposed to both credit risk and interest-rate risk. For example, the credit risk spread can decline (resulting in a favorable price movement for the reference obligation), but this gain can be offset by a rise in the level of interest rates. Expecting the credit risk spread to decline and not expecting interest rates to decline, Ms. Brady would enter the total return swap as the total return receiver. Her overriding belief is that the fortunes of Worldwide Global Communications will improve over the next year, and that the firm’s credit spread relative to U.S. Treasury securities will decline resulting in a favorable price movement. As total return receiver, she would profit from the decrease in spread.

(b) What is the 15-year Treasury rate at the time the bonds are issued?
The six-month 15-year Treasury rate at the time the bonds are issued is given as 6%. Also, we know that Worldwide Global Communications Corporation will be coming to market with a 15-year senior bond issue at par with a coupon rate of 12%, offering a spread of 600 basis points over the 15-year Treasury issue. Because 600 basis points is 6%, this means the 15-year Treasury issue will have a rate of 12% – 6% = 6%. Thus, at the time of issuance the 15-year Treasury yield is 6%.

(c) If at the end of year the 14-year Treasury rate is 8% and the credit spread declines to 400 basis points, what will be the price of the reference obligation?

At the end of one year, the reference obligation has a maturity of 14 years. Since the 14-year Treasury rate is assumed to be 8% and the credit spread is assumed to decline from 600 basis points to 400 basis points, the reference obligation will sell to yield 8% plus 400 basis points or 8% + 4% = 12%. The price of a $1,000 par value bond with a market yield of 12% selling to yield 12% is $1,000. Since the par value is $10 million, the price is still $10 million. The capital loss will therefore be zero.

(d) What is the cash flow paid for the year to the total return receiver assuming that the issuer makes the coupon payments?

The payments that will be received by the portfolio manager are (i) the two coupon payments and (ii) the change in the value of the reference obligation.

Since the coupon rate is 12% and the notional amount is $10 million, the manager receives two semiannual payments of \( \frac{0.12}{2} \times 10,000,000 = 0.06 \times 10,000,000 = 600,000 \). Together these two payments = $600,000 + $6,000,000 = $1,200,000.

The change in the value of the reference obligation must be determined. At the end of one year, the reference obligation has a maturity of 14 years. Since the 14-year Treasury rate is assumed to be 8.0% and the credit spread is assumed to decline from 600 basis points to 400 basis points, the reference obligation will sell to yield 8.00% + 4.00% = 12.00%. The price of a 12%, 14-year bond selling to yield 12% is 100. Since the par value is $10 million, the price is still $10 million. The capital loss is therefore $10,000,000 – $10,000,000 = 0. Thus, the change in value of the reference obligation is zero.

The total swap cash flows to the total return receiver are $1,200,000 and are summarized in the following exhibit.

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coupon payment</td>
<td>$1,200,000</td>
</tr>
<tr>
<td>Capital loss</td>
<td>0</td>
</tr>
<tr>
<td>Swap payment</td>
<td>$1,200,000</td>
</tr>
</tbody>
</table>

(e) What are the payments that will be made by the total return receiver?
The first swap payment made by the portfolio manager (total return receiver) is:

\[
\frac{6\% \text{ plus 350 basis points}}{2} \times \$10 \text{ million notional amount} = \frac{9.5\%}{2} \times \$10 \text{ million} = 0.0475 \times \$10 \text{ million} = \$475,000.
\]

The second swap payment made by the portfolio manager (total return receiver) is:

\[
\frac{7\% \text{ plus 350 basis points}}{2} \times \$10 \text{ million notional amount} = \frac{10.5\%}{2} \times \$10 \text{ million} = 0.0525 \times \$10 \text{ million} = \$525,000.
\]

Total payments = \$475,000 \+ \$525,000 = \$1,000,000.

The total swap payments made by the total return receiver are \$1,000,000 and are summarized in the following exhibit.

| First swap payment paid: $10 million times 4.75% = $475,000 |
| Second swap payment paid: $10 million times 5.25% = $525,000 |
| Total payments = $1,000,000 |

(f) What is the net payment made by the total return receiver?

Netting the swap payment received and the swap payment made, the portfolio manager receives a payment of \$1,200,000 \- \$1,000,000 = \$200,000. Thus, the net payment received is \$200,000.

11. Why does a credit default swap have an option-type payoff?

A credit default swap has an option-type payoff because the occurrence of a contingent event triggers the buyer to exercise their right to enhance their value.

Credit default swaps are used to shift credit exposure to a credit protection seller. Their primary purpose is to hedge the credit exposure to a particular asset or issuer. In this sense, credit default swaps operate much like a standby letter of credit or insurance policy. In a credit default swap, the protection buyer pays a fee to the protection seller in return for the right to receive a payment conditional upon the occurrence of a credit event by the reference obligation or the reference entity. If a credit event occurs, then the protection seller must make a payment. Because an option by definition involves a right and not an obligation to do something conditional upon an event occurring, the credit default swap involves an option-type payoff. The payoff is made when the credit event occurs in which case the protection buyer settles with the protection seller and receives the designated payment.

Credit default swaps can be settled in cash or physically. Physical delivery means that if a credit event as defined by the documentation occurs, the protection buyer delivers the reference
obligation to the protection seller in exchange for cash payment. Because physical delivery does not rely upon obtaining market prices for the reference obligation in determining the amount of the payment in a single-name credit default swap, this method of delivery is more efficient.

Finally, the credit default swap can be documented much like a credit put option where the amount to be paid by the protection seller is an established strike price less the current market value of the reference obligation.

12. Answer the following questions.

(a) What is a basket default swap?

A basket credit default swap is a credit default swap in which the required payout must be specified. For example, assume a basket credit default swap has ten reference obligations. How many of the ten reference obligations must have a credit event to trigger a payment by the protection seller must be specified in advance.

(b) When does the protection seller have to make a payment to the protection buyer in a basket default swap?

The protection seller has to make a payment to the protection buyer in a basket default swap depending on how the basket default swap is structured. The simplest case is that if any of the reference obligations default, there is a payout and then termination of the swap. This type of swap is referred to as a first-to-default basket swap. Similarly, if a payout is triggered after two reference obligations default, the swap is referred to as a second-to-default basket swap. In general, if it takes \( k \) reference obligations to trigger a payout, the swap is referred to as a \( k \)-to-default basket swap.

13. For a credit default swap with the following terms, indicate the quarterly premium payment by filling in the following exhibit.

<table>
<thead>
<tr>
<th>Swap Premium (bps)</th>
<th>Notional Amount</th>
<th>Days in Quarter</th>
<th>Quarterly Premium Payment</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) 600</td>
<td>$15,000,000</td>
<td>90</td>
<td></td>
</tr>
<tr>
<td>(b) 450</td>
<td>$8,000,000</td>
<td>91</td>
<td></td>
</tr>
<tr>
<td>(c) 720</td>
<td>$15,000,000</td>
<td>92</td>
<td></td>
</tr>
</tbody>
</table>

In the absence of a credit event, the protection buyer will make a quarterly swap premium payment given by the following formula:

\[
\text{quarterly swap premium payment} = \text{notional amount} \times \text{swap rate (in decimal)} \times \frac{\text{actual number of days in quarter}}{360}.
\]

(a) Inserting the given value into our quarterly swap premium payment formula for our first
problem, we have:

\[
\text{quarterly swap premium payment} = 15,000,000 \times 0.060 \times \frac{90}{360} = 225,000.00.
\]

(b) Inserting the given value into our quarterly swap premium payment formula for our second problem, we have:

\[
\text{quarterly swap premium payment} = 8,000,000 \times 0.045 \times \frac{91}{360} = 91,000.00.
\]

(c) Inserting the given value into our quarterly swap premium payment formula for our first problem, we have:

\[
\text{quarterly swap premium payment} = 15,000,000 \times 0.072 \times \frac{92}{360} = 276,000.00.
\]

Below we fill in the missing values in the previous exhibit. We have:

<table>
<thead>
<tr>
<th>Swap Premium</th>
<th>Notional Amount</th>
<th>Days in Quarter</th>
<th>Quarterly Premium Payment</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) 600 bps</td>
<td>$15,000,000</td>
<td>90</td>
<td>$225,000.00</td>
</tr>
<tr>
<td>(b) 450 bps</td>
<td>$8,000,000</td>
<td>91</td>
<td>$91,000.00</td>
</tr>
<tr>
<td>(c) 720 bps</td>
<td>$15,000,000</td>
<td>92</td>
<td>$276,000.00</td>
</tr>
</tbody>
</table>

14. Comment on the following statement: “Restructuring is included in credit default swaps and therefore the reduction in a reference obligation’s interest rate will result in the triggering of a payout. This exposes the protection seller to substantial risk.”

Reduction in a reference obligation’s interest rate is one term of the contract that can cause a restructuring. This exposes the protection seller to risk because restructuring tends to favor the protection buyer.

The most controversial credit event that may be included in a credit default swap is restructuring of an obligation. A **restructuring** occurs when the terms of the obligation are altered so as to make the new terms less attractive to the debt holder than the original terms. The terms that can be changed would typically include, but are not limited to, one or more of the following: (i) a reduction in the interest rate, (ii) a reduction in the principal, (ii) a rescheduling of the principal repayment schedule (e.g., lengthening the maturity of the obligation) or postponement of an interest payment, or (iv) a change in the level of seniority of the obligation in the reference entity’s debt structure.

The reason why restructuring is so controversial is that a protection buyer benefits from the inclusion of a restructuring as a credit event and feels that eliminating restructuring as a credit event will erode its credit protection. The protection seller, in contrast, would prefer not to include restructuring since even routine modifications of obligations that occur in lending
arrangements would trigger a payout to the protection buyer. Moreover, if the reference obligation is a loan and the protection buyer is the lender, there is a dual benefit for the protection buyer to restructure a loan. The first benefit is that the protection buyer receives a payment from the protection seller. Second, the accommodating restructuring fosters a relationship between the lender (who is the protection buyer) and its customer (the corporate entity that is the obligor of the reference obligation).

Because of this problem, the *Restructuring Supplement to the 1999 ISDA Credit Derivatives Definitions* (the Supplement Definition) issued in April 2001 provided a modified definition for restructuring. There is a provision for the limitation on reference obligations in connection with restructuring of loans made by the protection buyer to the borrower that is the obligor of the reference obligation. This provision requires the following in order to qualify for a restructuring: (i) there must be four or more holders of the reference obligation, and (ii) there must be consent to the restructuring of the reference obligation by a supermajority (66 2/3%). In addition, the supplement limits the maturity of reference obligations that are physically deliverable when restructuring results in a payout triggered by the protection buyer.

15. All other factors constant, for a given reference obligation and a given scheduled term, explain whether a credit default swap using full or old restructuring or modified restructuring would be more expensive.

A credit default swap using the old restructuring should be more expensive to the protection seller to the extent that it allows for a wider range of acceptable credit events through a more liberal interpretation that has fewer constraints as to what qualifies for a credit event. However, to the extent a modified restructuring reduces the costs associated with a credit event, then the expenses can be reduced.

Because of costly squabbles over restructuring, the *Restructuring Supplement to the 1999 ISDA Credit Derivatives Definitions* (the Supplement Definition) issued in April 2001 provided a modified definition for restructuring. There is a provision for the limitation on reference obligations in connection with restructuring of loans made by the protection buyer to the borrower that is the obligor of the reference obligation.

As the credit derivatives market developed, market participants learned a great deal about how to better define credit events, particularly with the record level of high yield corporate bond default rates in 2002 and the sovereign defaults, particularly the experience with the 2001-2002 Argentina debt crisis. In January 2003, the ISDA published its revised credit events definitions in the *2003 ISDA Credit Derivative Definitions* (referred to as the “2003 Definitions”). The revised definitions reflected amendments to several of the definitions for credit events set forth in the 1999 Definitions. Specifically, there were amendments for bankruptcy, repudiation, and restructuring.

The major change was to restructuring, whereby the ISDA allows parties to a given trade to select from among the following four definitions: (i) no restructuring; (ii) “full” or “old” restructuring, which is based on the 1993 Definitions; (ii) “modified restructuring,” which is based on the Supplement Definition; and (iv) “modified modified restructuring.” The last choice
is new and was included to address issues that arose in the European market.

16. Answer the following questions.

(a) For a single-name credit default swap, \textbf{what is the difference between physical settlement and cash settlement?}

For a single-name credit default swap, physical delivery for a credit event means that the protection buyer delivers a reference obligation to the protection seller in exchange for a cash payment. For a single-name credit default swap, physical delivery does not rely on getting market prices for the reference obligation in determining the amount of cash payment.

For a single-name credit default swap, cash settlement is not the preferred method of settlement. However, if settled with cash, the termination value is equal to the difference between the nominal amount of the reference obligation for which a credit event has occurred and its market value at the time of the credit event. The termination value is then the amount of the payment made by the protection seller to the protection buyer. No bonds are delivered by the protection buyer to the protection seller.

The interdealer market has evolved to where single-name credit default swaps for corporate and sovereign reference entities are standardized. While trades between dealers have been standardized, there are occasional trades in the interdealer market where there is a customized agreement. Because physical delivery does not rely upon obtaining market prices for the reference obligation in determining the amount of the payment in a single-name credit default swap, the method of physical delivery is more efficient.

The payment by the credit protection seller if a credit event occurs may be a predetermined fixed amount, or it may be determined by the decline in value of the reference obligation. The standard single-name credit default swap when the reference entity is a corporate bond or a sovereign bond is fixed based on a notional amount. When the cash payment is based on the amount of asset value deterioration, this amount is typically determined by a poll of several dealers. If no credit event has occurred by the maturity of the swap, both sides terminate the swap agreement and no further obligations are incurred. The methods used to determine the amount of the payment obligated of the protection seller under the swap agreement can vary greatly.

To illustrate the mechanics of a single-name credit default swap, assume that the reference entity or reference name is XYX Corporation and the underlying is $10 million par value of XYZ bonds. The $10 million is the notional amount of the contract. The swap premium—the payment made by the protection buyer to the protection seller—is 200 basis points.

The standard contract for a single-name credit default swap calls for a quarterly payment of the swap premium. The quarterly payment is determined using one of the day count conventions in the bond market. The day count convention used for credit default swaps is actual/360, the same convention as used in the interest-rate swap market. A day convention of actual/360 means that to determine the payment in a quarter, the actual number of days in the quarter is used and 360 days are assumed for the year.
Thus, the swap premium payment for a quarter is:

\[
\text{quarterly swap premium payment} = \text{notional amount} \times \text{swap rate (in decimal)} \times \frac{\text{actual number of days in quarter}}{360}.
\]

For example, assume a hypothetical credit default swap where the notional amount is $10 million and there are 92 actual days in a quarter. Since the swap premium is 200 basis points (0.02), the quarterly swap premium payment made by the protection buyer is:

\[
\text{quarterly swap premium payment} = \$10,000,000 \times 0.02 \times \frac{92}{360} = \$51,111.11.
\]

In the absence of a credit event, the protection buyer will make a quarterly swap premium payment over the life of the swap. If a credit event occurs, two things happen. First, there are no further payments of the swap premium by the protection buyer to the protection seller. Second, a termination value is determined for the swap. The procedure for computing the termination value depends on the settlement terms provided for by the swap. This will be either physical settlement or cash settlement.

(b) In physical settlement, why is there a cheapest-to-deliver issue?

There is a cheapest-to-deliver issue because (by convention or design) protection sellers have been granted an embedded option allowing them to deliver that issue which is the least expensive or at least the most convenient.

The market practice for settlement for single-name credit default swaps is physical settlement as opposed to cash settlement. With physical settlement the protection buyer delivers a specified amount of the face value of bonds of the reference entity to the protection seller. The protection seller pays the protection buyer the face value of the bonds. Since all reference entities that are the subject of credit default swaps have many issues outstanding, there will be a number of alternative issues of the reference entity that the protection buyer can deliver to the protection seller. These issues are known as deliverable obligations.

The swap documentation will set forth the characteristics necessary for an issue to qualify as a deliverable obligation. Recall that for Treasury bond and note futures contracts the short has the choice of which Treasury issue to deliver that the exchange specifies as acceptable for delivery. The short will select the cheapest-to-deliver issue, and the choice granted to the short is effectively an embedded option. The same is true for physical settlement for a single-name credit default swap. From the list of deliverable obligations, the protection buyer will select for delivery to the protection seller the cheapest-to-deliver issue.

17. How do the cash flows for a credit default index swap differ from that of a single-name credit default swap?
The cash flows for a credit default index swap differ from that of a single-name credit default swap in that the cash flows cease for the latter when a credit event occurs.

In a credit default index swap, the credit risk of a standardized basket of reference entities is transferred between the protection buyer and protection seller. As of year end 2005, the only standardized indexes are those compiled and managed by Dow Jones. For the corporate bond indexes, there are separate indexes for investment grade and high-grade names. The most actively traded contract as of year-end 2005 is the one based on the North American Investment Grade Index (denoted by DJ.CDX.NA.IG).

The mechanics of a credit default swap index are slightly different from that of a single-name credit default swap. As with a single-name credit default swap, a swap premium is paid. However, if a credit event occurs, the swap premium payment ceases in the case of a single-name credit default swap. In contrast, for a credit default swap index, the swap payment continues to be made by the protection buyer. However, the amount of the quarterly swap premium payment is reduced. This is because the notional amount is reduced as result of a credit event for a reference entity.

For example, suppose that a portfolio manager is the protection buyer for a DJ.CDX.NA.IG and the notional amount is $200 million. Using the formula below for computing the quarterly swap premium payment, the payment before a credit event occurs would be

\[
\text{Payment} = \text{Notional Amount} \times \text{Swap Rate} \times \frac{\text{Actual Number of Days in Quarter}}{360}
\]

After a credit event occurs for one reference entity, the notional amount declines from $200 million to $199,840,000. The reduction is equal to 99.2% of the $200 million because each reference entity for the DJ.CDX.NA.IG is 0.8%. Thus, the revised quarterly swap premium payment until the maturity date or until another credit event occurs for one of the other 124 reference entities is

\[
\text{Payment} = \text{Notional Amount} \times \text{Swap Rate} \times \frac{\text{Actual Number of Days in Quarter}}{360}
\]

As of this writing (2005), the settlement term for a credit default swap index is physical settlement. However, the market is considering moving to cash settlement. The reason is because of the cost of delivering an odd lot of the bonds of the reference entity in the case of a credit event. For example, in our hypothetical credit default swap index if there is a credit event, the protection buyer would have to deliver to the protection seller bonds of the reference entity with a face value of $160,000. Neither the protection buyer nor the protection seller would like to deal with such a small position.

Exhibit 29-3 shows the cash flow for a generic credit default index swap after a credit event for one reference entity.
Because a credit default swap index, such as the DJ.CDX.NA.IG, provides exposure to a diversified basket of credits, it can be used by a portfolio manager to help adjust a portfolio’s exposure to the credit sector of a bond market index. By entering into a credit default swap index as the protection seller, a portfolio manager increases exposure to the credit sector. Exposure to the credit sector is reduced by a portfolio manager being the protection buyer.

18. Answer the following questions.

(a) Explain how a single-name credit default swap can be used by a portfolio manager who wants to short a reference entity.

If a portfolio manager expects that an issuer will have difficulties in the future and wants to take a position based on that expectation, it will short the bond of that issuer. However, shorting bonds in the corporate bond market is difficult. The equivalent position can be obtained by entering into a swap as the protection buyer.

Credit derivatives (like a single-name credit default swap) are used by bond portfolio managers in the normal course of activities to more efficiently control the credit risk of a portfolio and to more efficiently transact than by transacting in the cash market. For example, credit derivatives allow a mechanism for portfolio managers to more efficiently short a credit-risky security than by shorting in the cash market, which is oftentimes difficult to do. For traders and hedge fund managers, credit derivatives provide a means for leveraging an exposure in the credit market.

A portfolio manager who engages in a single-name credit default swap can note that the market practice for settlement is physical delivery. With physical settlement, the protection buyer delivers a specified amount of the face value of bonds of the reference entity to the protection seller. The protection seller pays the protection buyer the face value of the bonds. Since all reference entities that are the subject of credit default swaps have many issues outstanding, there will be a number of alternative issues of the reference entity that the protection buyer can deliver to the protection seller. These issues are known as deliverable obligations. The swap documentation will set forth the characteristics necessary for an issue to qualify as a deliverable obligation. Just like for Treasury bond and note future contracts, the short (in a single-name credit default swap) has the choice of which issue to deliver that is specified as acceptable for delivery. The short will select the cheapest-to-deliver issue, and the choice granted to the short is effectively an embedded option. From the list of deliverable obligations, the protection buyer will select for delivery to the protection seller the cheapest-to-deliver issue.

(b) Explain how a single-name credit default swap can be used by a portfolio manager who is having difficulty acquiring the bonds of a particular corporation in the cash market.

If the portfolio manager desires a bond it is likely because of the cash flows (associated with the bond) help the manager match assets and liabilities. While the “ideal” bond may be hard to find and purchase, a single-name credit default swap can help realize the same desired cash flows. Thus, a single-name credit default swap can be used by a portfolio manager who is having difficulty acquiring the bonds of a particular corporation in the cash market.
The interdealer market has evolved to where single-name credit default swaps for corporate and sovereign reference entities are standardized. While trades between dealers have been standardized, there are occasional trades in the interdealer market where there is a customized agreement. For portfolio managers seeking credit protection, dealers are willing to create customized products. The tenor, or length of time of a credit default swap, is typically five years. Portfolio managers can have a dealer create a tenor equal to the maturity of the reference obligation or have it constructed for a shorter time period to match the manager’s investment horizon.

Exhibit 29-2 shows the mechanics of a single-name credit default swap. The cash flows are shown before and after a credit event. It is assumed in the exhibit that there is physical settlement. Single-name credit default swaps can be used in the following ways by portfolio managers:

• The liquidity of the swap market compared to the corporate bond market makes it more efficient to obtain exposure to a reference entity by taking a position in the swap market rather than in the cash market. To obtain exposure to a reference entity, a portfolio manager would sell protection and thereby receive the swap premium.

• Conditions in the corporate bond market may be such that it is difficult for a portfolio manager to sell the current holding of a corporate bond of an issuer for which he has a credit concern. Rather than selling the current holding, the portfolio can buy protection in the swap market.

• If a portfolio manager expects that an issuer will have difficulties in the future and wants to take a position based on that expectation, it will short the bond of that issuer. However, shorting bonds in the corporate bond market is difficult. The equivalent position can be obtained by entering into a swap as the protection buyer.

• For a portfolio manager seeking a leveraged position in a corporate bond, this can be done in the swap market. The economic position of a protection buyer is equivalent to a leveraged position in a corporate bond.

19. How are credit default index swaps used by portfolio managers?

Exhibit 29-3 shows the cash flow for a generic credit default index swap after a credit event for one reference entity.

Because a credit default index swap provides exposure to a diversified basket of credits, it can be used by a portfolio manager to help adjust a portfolio’s exposure to the credit sector of a bond market index. By entering into a credit default index swap as the protection seller, a portfolio manager increases exposure to the credit sector. Exposure to the credit sector is reduced by a portfolio manager being the protection buyer.

20. Why is a risk factor used in determining the payoff for an option on a credit spread?

The risk factor used in determining the payoff for an option on a credit spread is:
risk factor =

10,000 × percentage price change for 1-basis-point change in rates for the reference obligation.

By including the risk factor, this form of credit spread option overcomes the problem found in
the credit spread option in which the underlying is a reference obligation. The problem is that the
payoff depends on both changes in the level of interest rates (the yield on the referenced
benchmark) and the credit spread. By including the risk factor, the payoff now only depends
upon the change in the credit spread.

Thus, fluctuations in the level of the referenced benchmark’s interest rate will not affect the
value of options.

21. What is the advantage of a credit spread option where the underlying is a credit spread
compared to a credit spread option where the underlying is a credit-risky bond whose
strike price is established by a specified credit spread?

The advantage concerns the problem with using a credit spread option in which the underlying is
a reference obligation with a fixed credit spread. The problem is that the payoff is dependent
upon the value of the reference obligation’s price, which is affected by both the change in the
level of the interest rates (as measured by the referenced benchmark) and the change in the credit
spread. There would be no guaranteed protection against credit spread risk because interest rates
for the referenced benchmark fell enough to offset the increase in the credit spread.

22. The manager of a bond portfolio enters into a European credit spread call option for
Company W based on the credit spread widening from its current level of 320 basis points.
Suppose that the strike credit spread for the option is 320 basis points and the notional
principal amount is $20 million. Suppose also that the risk factor for this issue is 4.

Answer the following questions.

(a) If at the expiration date of this option the credit spread for this issue of Company W is
400 basis points, what is the dollar amount of the payoff?

When the underlying for a credit spread option is the credit spread for a reference obligation over
a referenced benchmark, then the payoff of a call option is as follows:

credit spread call option payoff =

credit spread at exercise – (strike credit spread × notional amount × risk factor).

Inserting in our values, we have:

credit spread call option payoff = (0.040 – 0.032) × $20,000,000 × 4 = $640,000.

The profit realized from this option is $640,000 less the cost of the option.
(b) If at the expiration date of this option the credit spread for this issue of Company W is 200 basis points, what is the dollar amount of the payoff?

Since 200 basis points is less than 320 basis points, the option will expire worthless which is to say $0.

23. The senior and junior portfolio managers of a mutual fund are discussing the use of credit spread options to control the exposure of a position in the fund. The senior portfolio manager believes that a credit spread put option should be employed. The junior portfolio believes that a credit spread call option should be used. Which portfolio manager is correct?

To protect against exposure to credit spread risk, one should seriously heed the advice of the senior portfolio manager and buy a credit spread put option where the underlying is a reference obligation with a fixed credit spread. More details (including when a call option should be used) are as follows.

First, the managers should weigh the two types of credit spread options: (i) an option written on a reference obligation where the strike price for the reference obligation is computed based on a specified credit spread and (ii) an option written on a credit spread. For the former credit spread option, the investor is exposed to interest-rate risk as well as credit risk. For the latter, interest-rate risk is controlled for by including a risk factor that takes into account the sensitivity of a bond to interest rate changes in the payoff function.

Second, if the managers want to sell a reference obligation at a price that is determined by a strike credit spread over a referenced benchmark at the exercise date, then a call option should be used. If the managers want to buy a reference obligation at a price that is determined by a strike credit spread over a referenced benchmark at the exercise date, then a put option should be used.

Before making their decision, the managers can consider the following payoffs when the underlying for the credit spread option is the reference obligation with a fixed credit spread:

<table>
<thead>
<tr>
<th>Type of Option</th>
<th>Positive Payoff if at Expiration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Put</td>
<td>credit spread at expiration &gt; strike credit spread</td>
</tr>
<tr>
<td>Call</td>
<td>credit spread at expiration &lt; strike credit spread</td>
</tr>
</tbody>
</table>

Consequently, to protect against credit spread risk, a portfolio manager can purchase a credit spread put option where the underlying is a reference obligation with a predetermined credit spread.

24. A portfolio manager has a view that the credit spread for the bonds of Zen.com will increase (i.e., widen) to more than the current 450 basis points in one year. How can the manager use a credit spread forward contract to capitalize on this view?

A credit spread forward requires an exchange of payments at the settlement date based on a credit spread. As with a credit spread option, the underlying can be the value of the reference
obligation or the credit spread. The payoff depends on the credit spread at the settlement date of the contract. The payoff is positive (i.e., the party receives cash) if the credit spread moves in favor of the party at the settlement date. The party makes a payment if the credit spread moves against the party at the settlement date.

In our problem, the manager has a view that the credit spread will increase (i.e., widen) to more than the current 450 basis points in one year for a reference obligation. Then the payoff function for this credit spread forward contract would be

\[(\text{credit spread at settlement date} - 450) \times \text{notional amount} \times \text{risk factor}.\]

Assuming that the notional amount is $10 million and the risk factor is 5, and the credit spread at the settlement date is 550 basis points, then the amount that will be received by the portfolio manager is

\[(0.055 - 0.045) \times 10,000,000 \times 5 = 500,000.\]

Instead, suppose that the credit spread at the settlement date decreased to 390 basis points. The portfolio manager would then have to pay out $300,000 as shown below:

\ [(0.039 - 0.045) \times 10,000,000 \times 5 = -300,000.\]

In general, if a portfolio manager takes a position in a credit spread forward contract to benefit from an increase in the credit spread, then the payoff would be as follows:

\[(\text{credit spread at settlement date} - \text{credit spread in contract}) \times \text{notional amount} \times \text{risk factor}.\]

For a portfolio manager taking a position that the credit spread will decrease, the payoff is

\[(\text{credit spread in contract} - \text{credit spread settlement date}) \times \text{notional amount} \times \text{risk factor}.\]

**25. The following questions relate to synthetic collateralized debt obligations. Answer each.**

**(a) What type of credit derivative is used in a synthetic CDO?**

As described below, a credit default swap is used in a synthetic CDO.

A CDO is classified as a **cash CDO** or a **synthetic CDO**. The adjective “cash” means that the collateral manager purchases cash market instruments. A synthetic CDO is so named because the collateral manager does not actually own the pool of assets on which it has the credit risk exposure. Stated differently, a synthetic CDO absorbs the credit risk, but not the legal ownership, of the reference obligations. A credit default swap allows institutions to transfer the credit risk, but not the legal ownership, of the reference obligations it may own.

A synthetic CDO works as follows. There are liabilities issued as with a cash CDO. The proceeds received from the bonds sold are invested by the collateral manager in assets with low
risk. At the same time, the collateral manager enters into a credit default swap with a counterparty. In the swap, the collateral manager will provide credit protection (i.e., the collateral manager is the protection seller) for a basket of reference obligations that have credit risk exposure. Because it is selling credit protection, the collateral manager will receive the credit default swap premium.

(b) Is the collateral manager a credit protection buyer or credit protection seller?

In a synthetic CDO, the CDO collateral manager does not actually own the pool of assets on which it has the credit risk exposure. The collateral manager is the protection seller in a credit default swap and receives the swap premium.

(c) In what types of assets does the collateral manager invest?

The proceeds received from the issuance of the CDO are used by the collateral manager to buy low-risk assets.

(d) What happens if a credit event occurs and how does this impact the ability to pay the CDO bondholders?

If a credit event occurs that requires a payout, the collateral manager must make a payment to the protection buyer, thereby reducing funds available to meet the obligation to the CDO bondholders. If a credit event does not occur, funds available to meet the payments to the CDO bondholders is the return on the collateral consisting of low-risk assets plus the credit default swap premium.

26. Answer the following questions.

(a) In a basic credit-linked note, how does the maturity value differ compared to a standard bond structure?

A credit-linked note (CLN) is a security issued by an investment banking firm or another issuer (typically a special-purpose vehicle) which has credit risk to a second issuer (called the reference issuer), and the return is linked to the credit performance of the reference issuer. Embedded in a CLN is a credit derivative, typically a credit default swap.

The issuer of a CLN is the credit protection buyer; the investor in the CLN is the credit protection seller. The basic CLN is just like a standard bond: it has a coupon rate (fixed or floating), maturity date, and a maturity value. However, in contrast to a standard bond, the maturity value depends on the performance of the reference issuer. Specifically, if a credit event occurs with respect to the reference issuer, (i) the bond is paid off, and (ii) the maturity value is adjusted down. How the adjustment is made is described in the prospectus. The compensation for the investor accepting the credit risk of the reference issuer is an enhanced coupon payment.

(b) What is the maturity date of a credit-linked note?
Typically, CLNs have a maturity of anywhere from three months to several years, with one to three years being the most likely term of credit exposure. The short maturity of CLNs reflects the desire of investors to take a credit view for such a time period.