CREDIT DERIVATIVES: AN INTRODUCTION FOR PORTFOLIO MANAGERS

Moorad Choudhry
Department of Management
Birkbeck College, University of London

ABSTRACT

With the exception of holders of *default-free* instruments such as Treasuries or Gilts, a key risk run by investors in bonds is *credit risk*, the risk that the bond issuer will default on the debt. To meet the need of investors to hedge this risk, the market uses *credit derivatives*. These are financial instruments originally introduced to protect banks and other institutions against losses arising from *credit events*. As such they are instruments designed to lay off or take on credit risk. Since their inception, they have been used by portfolio managers to enhance returns, to trade credit, for speculative purposes and as hedging instruments.

In this article we provide a description of the main types of credit derivatives and how they may be used by fixed income portfolio managers. We also consider how the risks in credit default swaps may sometimes not be fully understood, and how this highlights the need for more awareness on legal definitions.

INTRODUCTION

Credit derivatives allow investors to manage the credit risk exposure of their portfolios or asset holdings, essentially by providing insurance against a deterioration in credit quality of the borrowing entity.[1] If there is a technical default by the borrower[2] or an actual default on the loan itself, and the bond is marked down in price, the losses suffered by the investor can be recouped in part or in full through the payout made by the credit derivative.

<u>Credit Risk</u>

Credit risk is the risk that a borrowing entity will default on a loan, either through inability to maintain the interest servicing or because of bankruptcy or insolvency leading to inability to repay the principal itself. When technical or actual default occurs, bondholders suffer a loss as the value of their asset declines, and the potential greatest loss is that of the entire asset. The extent of credit risk fluctuates as the fortunes of borrowers changes in line with their own economic circumstances and the macroeconomic business cycle. The magnitude of risk is described by a firm's credit rating. Ratings agencies undertake a formal analysis of the borrower, after which a rating is announced; the issues considered in the analysis include:

- the financial position of the firm itself, for example, its balance sheet position and anticipated cash flows and revenues;
- other firm-specific issues such as the quality of the management and succession planning;
- an assessment of the firm's ability to meet scheduled interest and principal payments, both in its domestic and foreign currencies;
- the outlook for the industry as whole, and competition within it;
- general assessments for the domestic economy.

---

[1] The simplest credit derivative works exactly like an insurance policy, with regular premiums paid by the protection-buyer to the protection-seller, and a payout in the event of a specified credit event.

[2] A technical default is a delay in timely payment of the coupon, or non-payment of the coupon altogether.

Another measure of credit risk is the credit risk premium, which is the difference between yields on the same-currency government benchmark bonds and corporate bonds. This premium is the compensation required by investors for holding bonds that are not default-free. The credit premium required will fluctuate as individual firms and sectors are perceived to offer improved or worsening credit risk, and as the general health of the economy improves or worsens. For example, exhibit1 illustrates the variability in credit spread premium in the sterling market, illustrated by the change in yields for 10-year bonds rated AAA, AA and A against the benchmark gilt yield during 1998-2000.
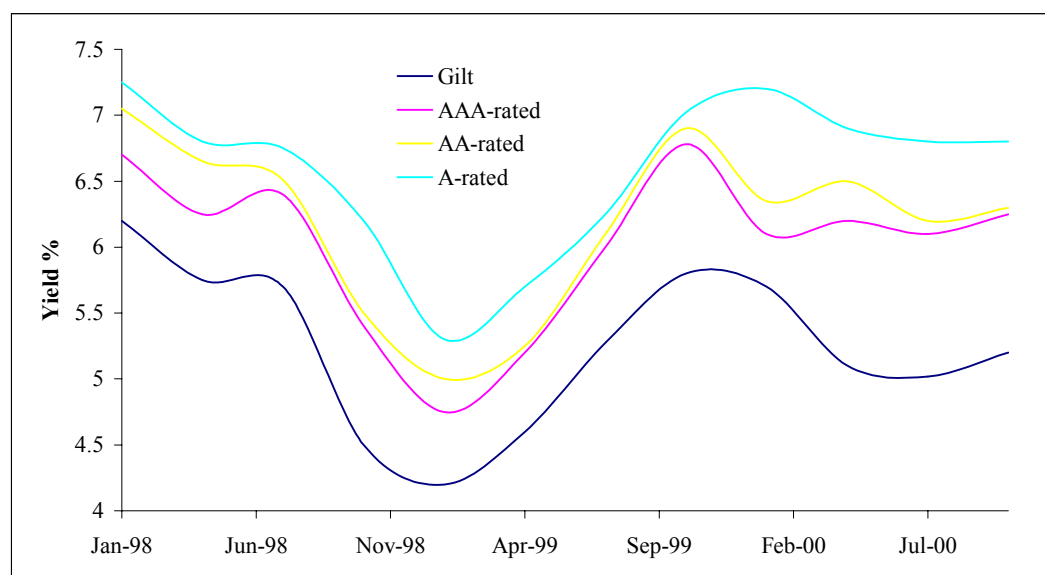

Exhibit 1 10-year sterling bond yields

Credit Risk and Credit Derivatives

Credit derivatives are financial contracts designed to reduce or eliminate credit risk exposure by providing insurance against losses suffered due to credit events. A payout under a credit derivative is triggered by a credit event. As banks define default in different ways, the terms under which a credit derivative is executed usually include a specification of what constitutes a credit event.

The principle behind credit derivatives is straightforward. Investors desire exposure to non-default free sovereign debt because of the higher returns this offers. However such exposure brings with it concomitant credit risk. This can be managed with credit derivatives. At the same time, the exposure itself can be taken on synthetically if for instance, there are compelling reasons why a cash market position cannot be established. The flexibility of credit derivatives provides users a number of advantages and as they are over-the-counter (OTC) products they can be designed to meet specific user requirements.

We focus on credit derivatives as instruments that may be used to manage risk exposure inherent in a corporate or non-AAA sovereign bond portfolio. They may also be used to manage the credit risk of commercial loan books. The intense competition amongst commercial banks, combined with rapid disintermediation, has meant that banks have been forced to evaluate their lending policy, with a view to improving profitability and return on capital. The use of credit derivatives assists banks with re-structuring their businesses, because they allow banks to repackage and parcel out credit risk, while retaining assets on balance sheet (when required) and thus maintain client relationships. As the instruments isolate certain aspects of credit risk from the underlying loan or bond and transfer them to another entity, it becomes possible to separate the ownership and management of credit risk from the other features of ownership associated with the assets in question. This means that illiquid assets such as bank loans, and illiquid bonds, can have their credit risk exposures transferred; the bank owning the assets can protect against credit loss even if it cannot transfer the assets themselves.

The same principles carry over to the credit risk exposures of portfolio managers. For fixed-income portfolio managers some of the advantages of credit derivatives include the following:

- they can be tailor-made to meet the specific requirements of the entity buying the risk protection, as opposed to the liquidity or term of the underlying reference asset;

- in theory, they can be "sold short" without risk of a liquidity or delivery squeeze, as it is a specific credit risk that is being traded. In the cash market it is not possible to "sell short" a bank loan for example, but a credit derivative can be used to establish synthetically the economic effect of such a position;

- as they theoretically isolate credit risk from other factors such as client relationships and interest rate risk, credit derivatives introduce a formal pricing mechanism to price credit issues only. This means a market can develop in credit only, allowing more efficient pricing, and it becomes possible to model a term structure of credit rates;

- they are off-balance sheet instruments[3] and as such incorporate tremendous flexibility and leverage, exactly like other financial derivatives. For instance, bank loans are not particularly attractive investments for certain investors because of the administration required in managing and servicing a loan portfolio. However an exposure to bank loans and their associated return can be achieved by say, a total return swap while simultaneously avoiding the administrative costs of actually owning the assets. Hence credit derivatives allow investors access to specific credits while allowing banks access to further distribution for bank loan credit risk.

---

[3] When credit derivatives are embedded in certain fixed income products, such as structured notes and credit-linked notes, they are then off-balance sheet but part of an on-balance sheet structure.

Thus credit derivatives can be an important instrument for bond portfolio managers as well as commercial banks, who wish to increase the liquidity of their portfolios, gain from the relative value arising from credit pricing anomalies, and enhance portfolio returns. Some key applications are summarised below.

Diversifying the credit portfolio
A bank or portfolio manager may wish to take on credit exposure by providing credit protection on assets that it already owns, in return for a fee. This enhances income on their portfolio. They may sell credit derivatives to enable non-financial counterparties to gain credit exposures, if these clients do not wish to purchase the assets directly. In this respect the bank or asset manager performs a credit intermediation role.

Reducing credit exposure
A bank can reduce credit exposure either for an individual loan or a sectoral concentration, by buying a credit default swap. This may be desirable for assets in their portfolio that cannot be sold for client relationship or tax reasons. For fixed-income managers a particular asset or collection of assets may be viewed as favourable holdings in the long-term, but at risk from short-term downward price movement. In this instance a sale would not fit in with long-term objectives, however short-term credit protection can be obtained via credit swap.

Acting as a credit derivatives market maker
A financial entity may wish to set itself up as a market maker in credit derivatives. In this case it may or may not hold the reference assets directly, and depending on its appetite for risk and the liquidity of the market, it can offset derivative contracts as and when required.

Credit Event

The occurrence of a specified credit event will trigger payment of the default payment by the seller of protection to the buyer of protection. Contracts specify physical or cash settlement. In physical settlement, the protection buyer transfers to the protection seller the deliverable obligation (usually the reference asset or assets), with the total principal outstanding equal to the nominal specified in the default swap contract. The protection seller simultaneously pays to the buyer 100% of the nominal. In cash settlement, the protection seller hands to the buyer the difference between the nominal amount of the default swap and the final value for the same nominal amount of the reference asset. This final value is usually determined by means of a poll of dealer banks.

The following may be specified as credit events in the legal documentation between counterparties:

- downgrade in S&P and/or Moody's credit rating below a specified minimum level;

- financial or debt restructuring, for example occasioned under administration or as required under US bankruptcy protection;

- bankruptcy or insolvency of the reference asset obligor;

- default on payment obligations such as bond coupon and continued non-payment after a specified time period.

- technical default, for example the non-payment of interest or coupon when it falls due;

- a change in credit spread payable by the obligor above a specified maximum level.

The 1999 ISDA credit default swap documentation specifies bankruptcy, failure to pay, obligation default, debt moratorium and restructuring to be credit events. Note that it does not specify a rating downgrade to be a credit event.

CREDIT DERIVATIVE INSTRUMENTS

We now review some of the most commonly encountered credit derivative instruments.

Credit Default Swap

The most common credit derivative is the *credit default swap, credit swap* or *default swap*. This is a bilateral contract in which a periodic fixed fee or a one-off premium is paid to a *protection seller*, in return for which the seller will make a payment on the occurrence of a specified credit event. The fee is usually quoted as a basis point multiplier of the nominal value. The swap can refer to a single asset, known as the reference asset or underlying asset, or a basket of assets. The default payment can be paid in whatever way suits the protection buyer or both counterparties. For example it may be linked to the change in price of the reference asset or another specified asset, it may be fixed at a pre-determined recovery rate, or it may be in the form of actual delivery of the reference asset at a specified price. The basic structure is illustrated at exhibit 2.

However it is structured, the credit default swap enables one party to transfer its credit exposure to another party. Banks may use default swaps to trade sovereign and corporate credit spreads without trading the actual assets themselves; for example someone who has gone long a default swap (the protection buyer) will gain if the reference asset obligor suffers a rating downgrade or defaults, and can sell the default swap at a profit if he can find a buyer counterparty. This is because the cost of protection on the reference asset will have increased as a result of the credit event. The original buyer of the default swap need never have owned a bond issued by the reference asset obligor.

Bank A   **Bank B**
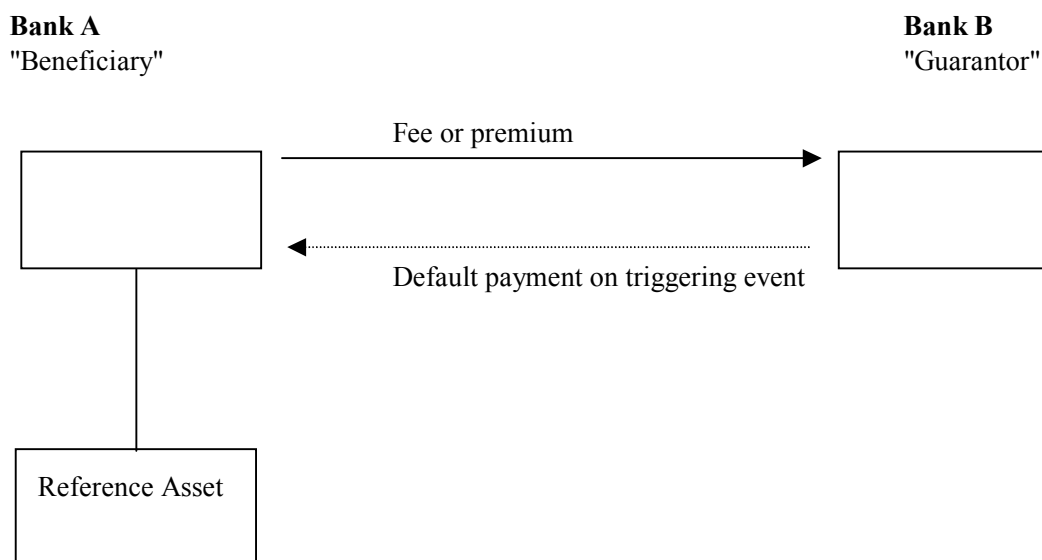"Beneficiary"   "Guarantor"

Exhibit 2 Credit Default Swap

The maturity of the credit swap does not have to match the maturity of the reference asset and in most cases does not. On default the swap is terminated and default payment by the protection seller or guarantor is calculated and handed over. The guarantor may have the asset delivered to him and pay the nominal value, or may cash settle the swap contract.

Credit default swap example
XYZ plc credit spreads are currently trading at 120 bps over government for five-year maturities and 195 bps over for 10-year maturities. A portfolio manager hedges a $10 million holding of 10-year paper by purchasing the following credit default swap, written on the five-year bond. This hedge protects for the first five years of the holding, and in the event of XYZ's credit spread widening, will increase in value and may be sold on before expiry at profit. The 10-year bond holding also earns 75 bps over the shorter-term paper for the portfolio manager.

Term   5 years
Reference credit   XYZ plc five-year bond
Credit event   The business day following occurrence of specified credit event
Default payment   Nominal value of bond x [100 – price of bond after credit event]
Swap premium   3.35%

We assume now that midway into the life of the swap there is a technical default on the XYZ plc five-year bond, such that its price now stands at $28. Under the terms of the swap the protection buyer delivers the bond to the seller, who pays out $7.2 million to the buyer.

<u>Credit options</u>

Credit options are also bilateral OTC financial contracts. A credit option is a contract designed to meet specific hedging or speculative requirements of an entity, which may purchase or sell the option to meet its objectives. A credit call option gives the buyer the right without the obligation to purchase the underlying credit-sensitive asset, or a credit spread, at a specified price and specified time (or period of time). A credit put option gives the buyer the right without the obligation to sell the underlying credit-sensitive asset or credit spread. By purchasing credit options banks and other institutions can take a view on credit spread movements for the cost of the option premium only, without recourse to actual loans issued by an obligor. The writer of credit options seeks to earn premium income.

Credit option terms are similar to those used for conventional equity options. A *call* option written on a stock grants the purchaser the right but not the obligation to purchase a specified amount of the stock at a set price and time. A credit option can be used by bond investors to hedge against a decline in the price of specified bonds, in the event of a credit event such as a ratings downgrade. The investor would purchase an option whose payoff profile is a function of the credit quality of the bond, so that a loss on the bond position is offset by the payout from the option.

As with conventional options, there are both vanilla credit options and exotic credit options. The vanilla credit option[4] grants the purchaser the right but not the obligation to buy (or sell if a *put* option) an asset or credit spread at a specified price (the *strike* price) for a specified period of time up to the maturity of the option. A credit option allows a market participant to take a view on credit only, and no other exposure such as interest rates. As an example consider an investor who believes that a particular credit spread, which can be that of a specific entity or the average for a sector (such as "all AA-rated sterling corporates"), will widen over the next six months. She can buy a six-month call option on the relevant credit spread, for which a one-off premium (the price of the option) is paid. If the credit spread indeed does widen beyond the strike during the six months, the option will be in-the-money and the investor will gain. If not, the investor's loss is limited to the premium paid.[5]

Exotic credit options are options that have one or more of their parameters changed from the vanilla norm; the same terms are used as in other option markets. Examples include the barrier credit option, which specifies a credit-event that would *trigger* (activate) the option or inactivate it. A digital credit option would have a payout profile that would be fixed, irrespective of how much in-the-money it was on expiry, and a zero payout if out-of-the-money.

---

[4] Sometimes referred to as the *standard* credit option.
[5] Depending on whether the option is an American or European one will determine whether it can be exercised before its expiry date or on its expiry date only.

<u>Credit linked note</u>

Credit-linked notes exist in a number of forms, but all of them contain a link between the return they pay and the credit-related performance of the underlying asset. A standard credit-linked note is a security, usually issued by an investment-graded entity, that has an interest payment and fixed maturity structure similar to a vanilla bond. The performance of the note however, including the maturity value, is linked to the performance of specified underlying assets as well as that of the issuing entity. The notes are often used by borrowers to hedge against credit risk, and by investors to enhance the yield received on their holdings. Essentially credit-linked notes are hybrid instruments that combine a credit derivative with a vanilla bond. The credit-linked note pays regular coupons, however the credit derivative element is usually set to allow the issuer to decrease the principal amount if a credit event occurs.

For example consider an issuer of credit cards that wants to fund its (credit card) loan portfolio via an issue of debt. In order to reduce the credit risk of the loans, it issues a two-year credit-linked note. The principal amount of the bond is 100 per cent as usual, and it pays a coupon of 7.50%, which is 200 basis points above the two-year benchmark. If however, the incidence of bad debt amongst credit card holders exceeds 10% then the terms state that note holders will only receive back £85 per £100 nominal. The credit card issuer has in effect purchased a credit option that lowers its liability in the even that it suffers from a specified credit event, which in this case is an above-expected incidence of bad debts. The credit card bank has issued the credit-linked note to reduce its credit exposure, in the form of this particular type of credit insurance. If the incidence of bad debts is low, the note is redeemed at par. However if there a high incidence of such debt, the bank will only have to repay a part of its loan liability.

Investors may wish purchase the CLN because the coupon paid on it will be above what the credit card bank would pay on a vanilla bond it issued, and higher than other comparable investments in the market. In addition such notes are usually priced below par on issue. Assuming the notes are eventually redeemed at par, investors will also have realised a substantial capital gain.

An accessible introduction to credit-linked notes is given in Kasapi (1999).[6]

<u>The Total Return Swap</u>

A *total return swap* (TRS), sometimes known as a *total rate of return swap* or *TR swap*, is an agreement between two parties that exchanges the total return from a financial asset between them. This is designed to transfer the credit risk from one party to the other. It is one of the principal instruments used by banks and other financial instruments to manage their credit risk exposure, and as such is a credit derivative. One definition of a TRS is given in Francis *et al* (1999), which states that a TRS is a swap agreement in which the *total return* of a bank loan or credit-sensitive security is exchanged for some other cash flow, usually tied to Libor or some other loan or credit-sensitive security.
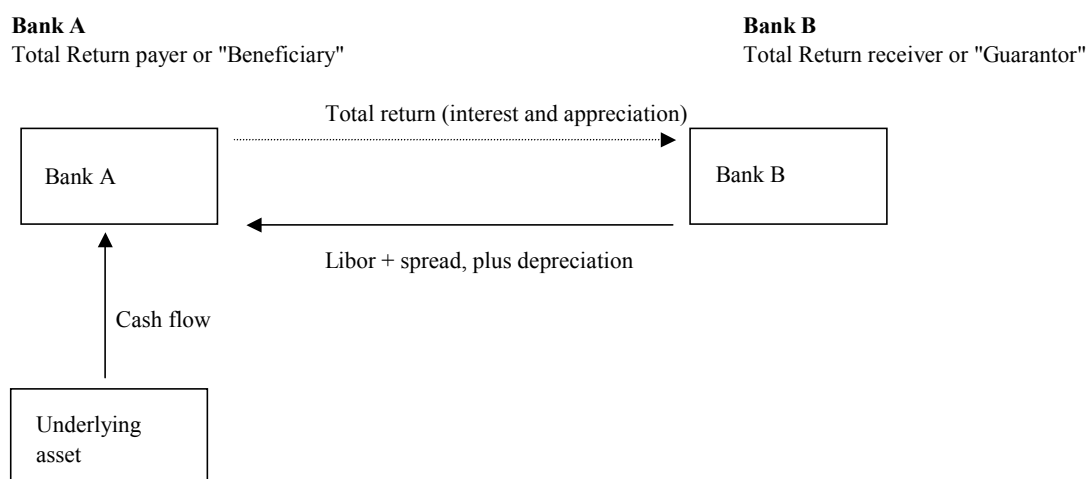
---

[6] Andrew Kasapi, *Mastering Credit Derivatives* (London: FT Prentice Hall, 1999).

In some versions of a TRS the actual underlying asset is actually sold to the counterparty, with a corresponding swap transaction agreed alongside; in other versions there is no physical change of ownership of the underlying asset. The TRS trade itself can be to any maturity term, that is, it need not match the maturity of the underlying security. In a TRS the total return from the underlying asset is paid over to the counterparty in return for a fixed or floating cash flow. This makes it slightly different to other credit derivatives, as the payments between counterparties to a TRS are connected to changes in the market value of the underlying asset, as well as changes resulting from the occurrence of a credit event.

Exhibit 3 illustrates a generic TR swap. The two counterparties are labelled as banks, but the party termed "Bank A" can be another financial institution, including cash-rich fixed income portfolio managers such as insurance companies and hedge funds. In figure Bank A has contracted to pay the "total return" on a specified reference asset, while simultaneously receiving a Libor-based return from Bank B. The reference or underlying asset can be a bank loan such as a corporate loan or a sovereign or corporate bond. The total return payments from Bank A include the interest payments on the underlying loan as well as any appreciation in the market value of the asset. Bank B will pay the Libor-based return; it will also pay any difference if there is a depreciation in the price of the asset. The economic effect is as if Bank B owned the underlying asset, as such TR swaps are synthetic loans or securities. A significant feature is that Bank A will usually hold the underlying asset on its balance sheet, so that if this asset was originally on Bank B's balance sheet, this is a means by which the latter can have the asset removed from its balance sheet for the term of the TR swap.[7] If we assume Bank A has access to Libor funding, it will receive a spread on this from Bank B. Under the terms of the swap, Bank B will pay the difference between the initial market value and any depreciation, so it is sometimes termed the "guarantor" while Bank A is the "beneficiary".

---

[7] Although it is common for the receiver of the Libor-based payments to have the reference asset on its balance sheet, this is not always the case.

Bank A
Total Return payer or "Beneficiary"

Bank B
Total Return receiver or "Guarantor"

Total return (interest and appreciation)

| Bank A | Bank B |

Libor + spread, plus depreciation

Cash flow

Underlying asset

Exhibit 3 Total Return Swap

The total return on the underlying asset is the interest payments and any change in the market value if there is capital appreciation. The value of an appreciation may be cash settled, or alternatively there may be physical delivery of the reference asset on maturity of the swap, in return for a payment of the initial asset value by the total return "receiver". The maturity of the TR swap need not be identical to that of the reference asset, and in fact it is rare for it to do so.

The swap element of the trade will usually pay on a quarterly or semi-annual basis, with the underlying asset being re-valued or *marked-to-market* on the re-fixing dates. The asset price is usually obtained from an independent third party source such as Bloomberg or Reuters, or as the average of a range of market quotes. If the *obligor* of the reference asset defaults, the swap may be terminated immediately, with a net present value payment changing hands according to what this value is, or it may be continued with each party making appreciation or depreciation payments as appropriate. This second option is only available if there is a market for the asset, which is unlikely in the case of a bank loan. If the swap is terminated, each counterparty will is liable to the other for accrued interest plus any appreciation or depreciation of the asset. Commonly under the terms of the trade, the guarantor bank has the option to purchase the underlying asset from the beneficiary bank, and then dealing directly with loan defaulter.

There are a number of reasons why portfolio managers may wish to enter into TR swap arrangements. One of these is to reduce or remove credit risk. Using TR swaps as a credit derivative instrument, a party can remove exposure to an asset without having to sell it. In a vanilla TR swap the total return payer retains rights to the reference asset, although in some cases servicing and voting rights may be transferred. The total return receiver gains an exposure to the reference asset without having to pay out the cash proceeds that would be required to purchase it. As the maturity of the swap rarely matches that of the asset, the swap receiver may gain from the positive funding or *carry* that derives from being able to roll over short-term funding of a longer-term asset.[8] The total return payer on the other hand benefits from protection against market and credit

---

[8] This assumes a positively-sloping yield curve.

risk for a specified period of time, without having to liquidate the asset itself. On maturity of the swap the total return payer may reinvest the asset if it continues to own it, or it may sell the asset in the open market. Thus the instrument may be considered a synthetic repo. A TR swap agreement entered into as a credit derivative is a means by which banks can take on unfunded off-balance sheet credit exposure. Higher-rated banks that have access to Libid funding can benefit by funding on-balance sheet assets that are credit protected through a credit derivative such as a TR swap, assuming the net spread of asset income over credit protection premium is positive.

A TR swap conducted as a synthetic repo is usually undertaken to effect the temporary removal of assets from the balance sheet. This may be desired for a number of reasons, for example if the institution is due to be analysed by credit rating agencies or if the annual external audit is due shortly. Another reason a bank may wish to temporarily remove lower credit-quality assets from its balance sheet is if it is in danger of breaching capital limits in between the quarterly return periods. In this case, as the return period approaches, lower quality assets may be removed from the balance sheet by means of a TR swap, which is set to mature after the return period has passed.

Banks have employed a number of methods to price credit derivatives and TR swaps. Space does not permit an in-depth discussion of these techniques here. Essentially the pricing of credit derivatives is linked to that of other instruments; however the main difference between credit derivatives and other off-balance sheet products such as equity, currency or bond derivatives is that the latter can be priced and hedged with reference to the underlying asset, which can be problematic when applied to credit derivatives. Credit products pricing uses statistical data on likelihood of default, probability of payout, level of risk tolerance and a pricing model. The basic ingredients of a TR swap are that one party "funds" an underlying asset and transfers the total return of the asset to another party, in return for a (usually) floating return that is a spread to Libor. This spread is a function of:

- the credit rating of the swap counterparty;

- the amount and value of the reference asset;

- the credit quality of the reference asset;

- the funding costs of the beneficiary bank;

- any required profit margin;

- the capital charge associated with the TR swap.

The TR swap counterparties must consider a number of risk factors associated with the transaction, which include:

- the probability that the TR beneficiary may default while the reference asset has declined in value;

- the reference asset obligor defaults, followed by default of the TR swap receiver before payment of the depreciation has been made to the payer or "provider".

The first risk measure is a function of the probability of default by the TR swap receiver and the market volatility of the reference asset, while the second risk is related to the joint probability of default of both factors as well as the recovery probability of the asset.

APPLICATIONS FOR PORTFOLIO MANAGERS

Applications Overview

Credit derivatives have allowed market participants to separate and disaggregate credit risk, and thence to trade this risk in a secondary market.[9] Initially portfolio managers used them to reduce credit exposure, subsequently they have been used in the management of portfolios, to enhance portfolio yields and in the structuring of synthetic collateralised debt obligations. We summarise portfolio managers' main uses of credit derivatives below.

Enhancing portfolio returns

Asset managers can derive premium income by trading credit exposures in the form of derivatives issued with synthetic structured notes. The multi-tranching aspect of structured products enables specific credit exposures (credit spreads and outright default), and their expectations, to be sold to specific areas of demand. By using structured notes such as credit-linked notes, tied to the assets in the reference pool of the portfolio manager, the trading of credit exposures is crystallised as added yield on the asset manager's fixed income portfolio. In this way the portfolio manager has enabled other market participants to gain an exposure to the credit risk of a pool of assets but not to any other aspects of the portfolio, and without the need to hold the assets themselves.
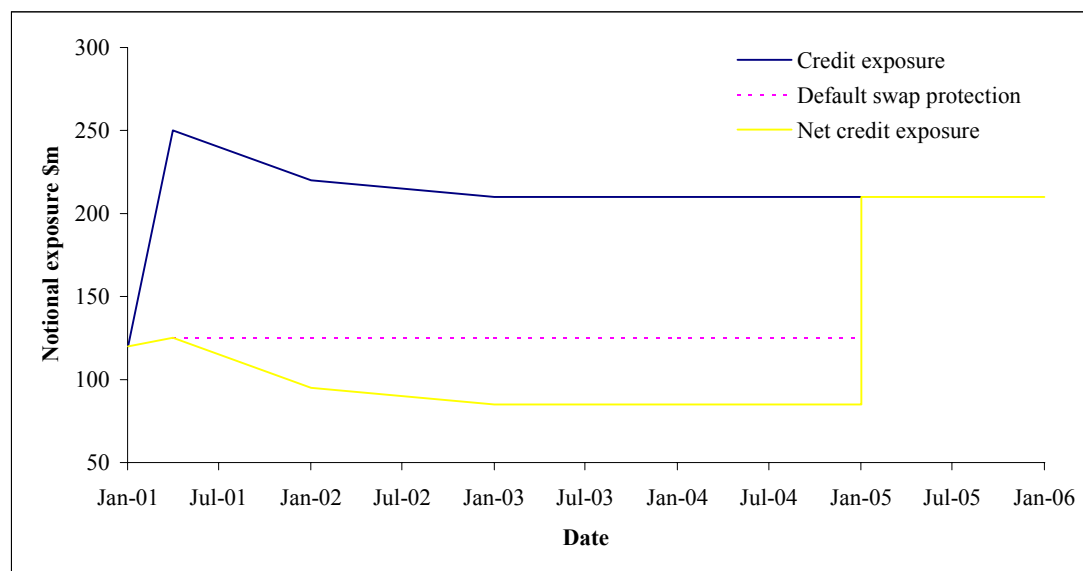
Reducing credit exposure

Consider a portfolio manager that holds a large portfolio of bonds issued by a particular sector (say, utilities) and believes that spreads in this sector will widen in the short term. Previously, in order to reduce its credit exposure it would have to sell bonds, however this may crystallise a mark-to-market loss and may conflict with its long-term investment strategy. An alternative approach would be to enter into a credit default swap, purchasing protection for the short term; if spreads do widen these swaps will increase in value and may be sold at a profit in the secondary market. Alternatively the portfolio manager may enter into total return swaps on the desired credits. It pays the counterparty the total return on the reference assets, in return for Libor. This transfers the credit exposure of the bonds to the counterparty for the term of the swap, in return for the credit exposure of the counterparty.

---

[9] For example, see Satyajit Das, *Credit Derivatives and Credit Linked Notes*, (Singapore: John Wiley and Sons Ltd, 2000, 2nd edition, chapters 2-4)

Consider now the case of a portfolio manager wishing to mitigate credit risk from a growing portfolio (say, one that has just been launched). Exhibit 4 shows an example of an unhedged credit exposure to an hypothetical credit-risky portfolio. It illustrates the manager's expectation of credit risk building up to $250 million as the portfolio is ramped up, and then reducing to a more stable level as the credits become more established. A three-year credit default swap entered into shortly after provides protection on half of the notional exposure, shown as the broken line. The net exposure to credit events has been reduced by a significant margin.

Exhibit 4 Reducing credit exposure

Credit switches and zero-cost credit exposure

Protection buyers utilising credit default swaps must pay premium in return for laying off their credit risk exposure. An alternative approach for an asset manager involves the use of credit switches for specific sectors of the portfolio. In a credit switch the portfolio manager purchases credit protection on one reference asset or pool of assets, and simultaneously sells protection on another asset or pool of assets.[10] So for example, the portfolio manager would purchase protection for a particular fund and sell protection on another. Typically the entire transaction would be undertaken with one investment bank, which would price the structure so that the net cash flows would be zero. This has the effect of synthetically diversifying the credit exposure of the portfolio manager, enabling it to gain and/or reduce exposure to sectors it desires.

---

[10] A pool of assets would be concentrated on one sector, such as utility company bonds.

Exposure to market sectors

Investors can use credit derivatives to gain exposure to sectors for which they do not wish a cash market exposure. This can be achieved with an *index* swap, which is similar to a TR swap, with one counterparty paying a total return that is linked to an external reference index. The other party pays a Libor-linked coupon or the total return of another index. Indices that are used might include the government bond index, an high-yield index or a technology stocks index. Assume that an investor believes that the bank loan market will outperform the mortgage-backed bond sector; to reflect this view the investor enters into an index swap in which he pays the total return of the mortgage index and receives the total return of the bank loan index.

Another possibility is synthetic exposure to foreign currency and money markets. Again we assume that an investor has a particular view on an emerging market currency. If he wishes he can purchase a short-term (say one-year) domestic coupon-bearing note, whose principal redemption is linked to a currency factor. This factor is based on the ratio of the spot value of the foreign currency on issue of the note to the value on maturity. Such currency-linked notes can also structured so that they provide an exposure to sovereign credit risk. The downside of currency-linked notes is that if the exchange rate goes the other way, the note will have a zero return, in effect a negative return once the investor's funding costs have been taken into account.

Credit spreads

Credit derivatives can be used to trade credit spreads. Assume that an investor has negative views on a certain emerging market government bond credit spread relative to UK gilts. The simplest way to reflect this view would be to go long a credit default swap on the sovereign, paying X basis points. Assuming that the investor's view is correct and the sovereign bonds decrease in price as their credit spread widens, the premium payable on the credit swap will increase. The investor's swap can then be sold into the market at this higher premium.

Application of Total Return Swaps

Capital structure arbitrage

A capital structure arbitrage describes an arrangement whereby investors exploit mispricing between the yields received on two different loans by the same issuer. Assume that the reference entity has both a commercial bank loan and a subordinated bond issue outstanding, but that the former pays Libor plus 330 basis points while the latter pays Libor plus 230 basis points. An investor enters into a total return swap in which it effectively is purchasing the bank loan and selling short the bond. The nominal amounts will be at a ratio, for argument's sake let us say 2:1, as the bonds will be more price-sensitive to changes in credit status than the loans.

The trade is illustrated at exhibit 5. The investor receives the "total return" on the bank loan, while simultaneously paying the return on the bond in addition to Libor plus 30

basis points, which is the price of the TR swap. The swap generates a net spread of 175 basis points, given by [(100 bps x ½) + 250 bps x ½)].

Bank loan total return

| Investor | → | TR Bank |

Bond total return plus Libor + 30 bps
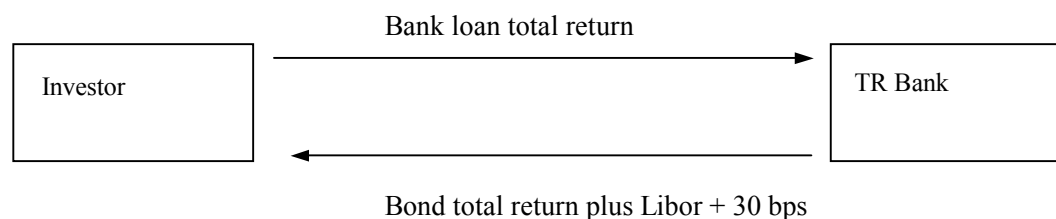
Exhibit 5 Total return swap in capital structure arbitrage

Synthetic repo

A portfolio manager believes that a particular bond that it does not hold is about to decline in price. To reflect this view the portfolio manager may do one of the following.

Sell the bond in the market and cover the resulting short position in repo: The cash flow out is the coupon on the bond, with capital gain if the bond falls in price. Assume that the repo rate is floating, say Libor plus a spread. The manager must be aware of the funding costs of the trade, so that unless the bond can be covered in repo at *general collateral* rates[11], the funding will be at a loss. The yield on the bond must also be lower than the Libor plus spread received in the repo.

As an alternative, enter into a TR swap: the portfolio manager pays the total return on the bond and receives Libor plus a spread. If the bond yield exceeds the Libor spread, the funding will be negative, however the trade will gain if the trader's view is proved correct and the bond falls in price by a sufficient amount. If the breakeven funding cost (which the bond must exceed as it falls in value) is lower in the TR swap, this method will be used rather than the repo approach. This is more likely if the bond is special.

Overview of TR swap applications

Total return swaps are increasingly used as synthetic repo instruments, most commonly by investors that wish to purchase the credit exposure of an asset without purchasing the asset itself. This is conceptually similar to what happened when interest-rate swaps were introduced, which enabled banks and other financial institutions to trade interest-rate risk without borrowing or lending cash funds.

Under a TR swap an asset such as a bond position may be removed from the balance sheet. In order to avoid adverse impact on regular internal and external capital and credit

---

[11] That is, the bond cannot be *special*. A bond is special when the repo rate payable on it is significantly (say, 20-30 basis points or more) below the *general collateral* repo rate, so that covering a short position in the bond entails paying a substantial funding premium.

exposure reporting a bank may use TR swaps to reduce the amount of lower-quality assets on the balance sheet. This can be done by entering into a short-term TR swap with say, a two-week term that straddles the reporting date. Bonds are removed from the balance sheet if they are part of a sale plus TR swap transaction. This is because legally the bank selling the asset is not required to repurchase bonds from the swap counterparty, nor is the total return payer obliged to sell the bonds back to the counterparty (or indeed sell the bonds at all on maturity of the TR swap).

RISKS IN CREDIT DEFAULT SWAPS

Unintended risks in credit default swaps

As credit derivatives can be tailored to specific requirements in terms of reference exposure, term to maturity, currency and cash flows, they have enabled market participants to establish exposure to specific entities without the need for them to hold the bond or loan of that entity. This has raised issues of the different risk exposure that this entails compared to the cash equivalent. A recent Moody's special report highlights the unintended risks of holding credit exposures in the form of default swaps and credit-linked notes.[12] Under certain circumstances it is possible for credit default swaps to create unintended risk exposure for holders, by exposing them to greater frequency and magnitude of losses compared to that suffered by a holder of the underlying reference credit.

In a credit default swap, the payout to a buyer of protection is determined by the occurrence of credit events. The definition of a credit event sets the level of credit risk exposure of the protection seller. A wide definition of "credit event" results in a higher level of risk. To reduce the likelihood of disputes, counterparties can adopt the ISDA Credit Derivatives definitions to govern their dealings. The Moody's paper states that the current ISDA definitions do not unequivocally separate and isolate credit risk, and in certain circumstances credit derivatives can expose holders to additional risks. A reading of the paper would appear to suggest that differences in definitions can lead to unintended risks being taken on by protection sellers. Two examples from the paper are cited below as illustration.

Extending loan maturity

The bank debt of Conseco, a corporate entity, was restructured in August 2000. The restructuring provisions included deferment of the loan maturity by three months, higher coupon, corporate guarantee and additional covenants. Under the Moody's definition, as lenders received compensation in return for an extension of the debt, the restructuring was not considered to be a "diminished financial obligation", although Conseco's credit rating was downgraded one notch. However under the ISDA definition the extension of the loan maturity meant that the restructuring was considered to be a credit event, and thus triggered payments on default swaps written on Conseco's bank debt. Hence this

---

[12] Jeffrey Tolk, "Understanding the Risks in Credit Default Swaps", *Moody's Investors Service Special Report*, March 16, 2001

was an example of a loss event under ISDA definitions that was not considered by Moody's to be a default.

Risks of synthetic positions and cash positions compared

Consider two investors in XYZ, one of whom owns bonds issued by XYZ while the other holds a credit-linked note (CLN) referenced to XYZ. Following a deterioration in its debt situation, XYZ violates a number of covenants on its bank loans, but its bonds are unaffected. XYZ's bank accelerates the bank loan, but the bonds continue to trade at 85 cents on the dollar, coupons are paid and the bond is redeemed in full at maturity. However the default swap underlying the CLN cites "obligation acceleration" (of either bond or loan) as a credit event, so the holder of the CLN receives 85% of par in cash settlement and the CLN is terminated. However the cash investor receives all the coupons and the par value of the bonds on maturity.

These two examples illustrate how, as credit default swaps are defined to pay out in the event of a very broad range of definitions of a "credit event", portfolio managers may suffer losses as a result of occurrences that are not captured by one or more of the ratings agencies rating of the reference asset. This results in a potentially greater risk for the portfolio manager compared to the position were it to actually hold the underlying reference asset. Essentially therefore it is important for the range of definitions of a "credit event" to be fully understood by counterparties, so that holders of default swaps are not taking on greater risk than is intended.

PRICING

There are a number of approaches to the pricing of credit derivatives. A good overview of the main methods is contained in Das (2000). Here we introduce asset-swap pricing.

Asset swap pricing

Credit derivatives are commonly valued using the asset swap pricing technique. In addition to its use by dealers, risk management departments who wish to independently price such swaps also adopt this technique. The asset swap market is a reasonably reliable indicator of the returns required for individual credit exposures, and provides a mark-to-market framework for reference assets as well as a hedging mechanism.

A par asset swap typically combines the sale of an asset such as a fixed-rate corporate bond to a counterparty, at par and with no interest accrued, with an interest-rate swap. The coupon on the bond 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. In effect the asset swap allows market participants that pay Libor-based funding to receive the asset swap spread. This spread is a function of the credit risk of the underlying bond asset, which is why it in effect becomes the cornerstone of the price payable on a credit default swap written on that reference asset.

The generic pricing is given by (1),

$$Y_a = Y_b - ir \tag{1}$$

where

Y_a is the asset swap spread
Y_b is the asset spread over the benchmark
ir is the interest-rate swap spread.

The asset spread over the benchmark is simply the bond (asset) redemption yield over that of the government benchmark. The interest-rate swap spread reflects the cost involved in converting fixed-coupon benchmark bonds into a floating-rate coupon during the life of the asset (or default swap), and is based on the swap rate for that maturity.

Asset Swap Pricing Example

XYZ plc is a Baa2-rated corporate. The seven-year asset swap for this entity is currently trading at 93 basis points; the underlying seven-year bond is hedged by an interest-rate swap with an Aa2-rated bank. The risk-free rate for floating-rate bonds is Libid minus 12.5 basis points (assume the bid-offer spread is 6 basis points). This suggests that the credit spread for XYZ plc is 111.5 basis points. The credit spread is the return required by an investor for holding the credit of XYZ plc. The protection seller is conceptually long the asset, and so would short the asset as a hedge of its position. This is illustrated in exhibit 6. The price charged for the default swap is the price of the shorting the asset, which works out as 111.5 basis points each year.

Therefore we can price a credit default written on XYZ plc as the present value of 111.5 basis points for seven years, discounted at the interest-rate swap rate of 5.875%. This computes to a credit swap price of 6.25%.

Reference	XYZ plc
Term	Seven years
Interest rate swap rate	5.875%
Asset swap	Libor plus 93 bps
Default swap pricing:	
Benchmark rate	Libid minus 12.5 bps
Margin	6 bps
Credit default swap	111.5 bps
Default swap price	6.252%
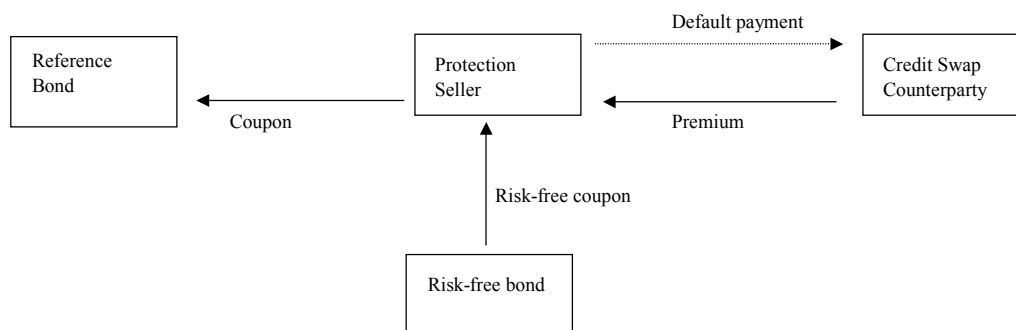
Exhibit 6 Credit default swap and asset swap hedge

<u>Modelling credit spreads</u>

Practitioners increasingly model credit risk as they do interest rates and use spread models to price associated derivatives. For example, the multi-factor Heath-Jarrow-Morton approach has been used, modelling interest-rate risk, default risk and recovery risk.[13] However, spread models do not split the spread elements into default risk and recovery risk, but model the spread as a whole. For example Das (1996)[14] has noted that (2) may be used to model credit spreads,

$$ds = k(\theta - s)dt + \sigma \sqrt{s}\,dZ \qquad\qquad (2)$$

where

s is the credit spread
k is the mean reversion rate
θ is the mean of the spread
σ is the volatility

The standard Brownian motion or Weiner process is indicated by dZ. Under this approach it would be possible to price credit options in the same way as other option products, modelling the credit spread rather than say, the interest rate. An excellent introduction to modelling methods for pricing credit derivatives is given in Francis *et al* (1999).[15]

---

[13] This is the rate of recovery on a defaulted loan. Bonds rarely descend to 0 in price in the event of default; there is always assumed to be some residual recovery value still available.
[14] Sanjiv Das and Peter Tufano, "Pricing Credit Sensitive Debt when Interest Rates, Credit Ratings and Credit Spreads are Stochastic," *Journal of Financial Engineering* (1996), pp. 161-198.
[15] Jan Francis, John Frost and John Whittaker, *The Handbook of Credit Derivatives* (New York, NY: McGraw Hill, 1999)