Merrill Lynch

CREDIT DERIVATIVES

14 February 2006

Credit Derivatives Strategy
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Credit Derivatives Handbook 2006 – Vol. 1

A Guide to Single-Name and Index CDS Products

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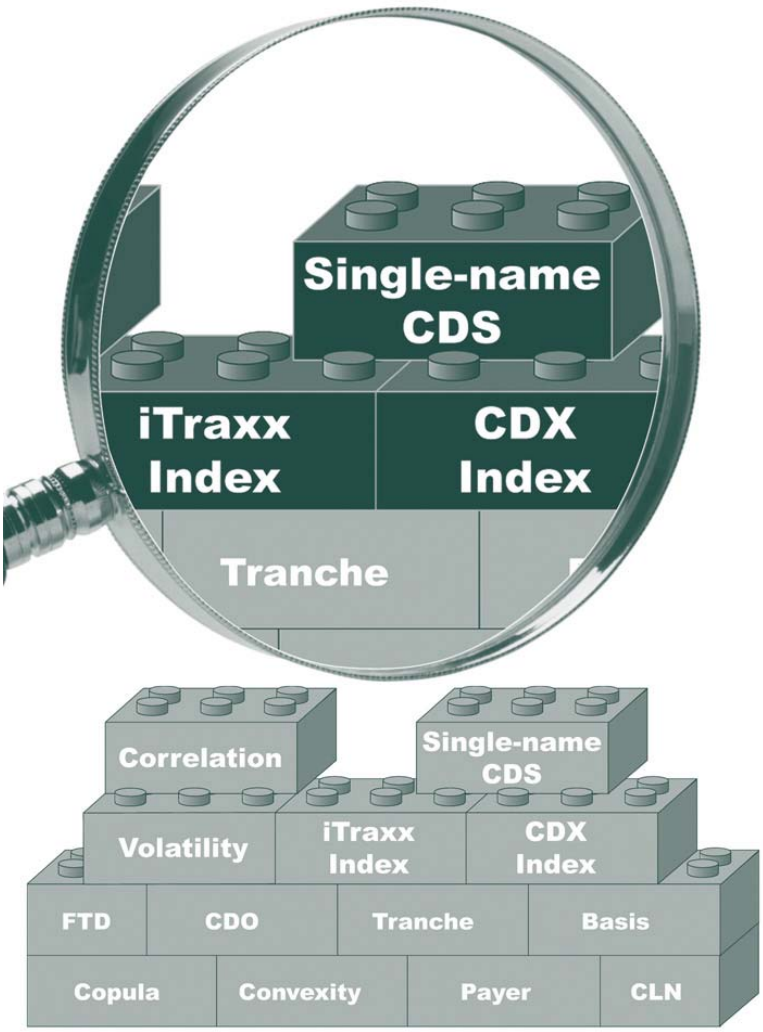

This report has been published in conjunction with "Credit Derivatives Handbook, Volume 2: A Guide to the Exotics Credit Derivatives Market"

Refer to important disclosures on page 118.

CONTENTS

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Refer to important disclosures on page 118.

1. Credit Derivatives – A Market Overview

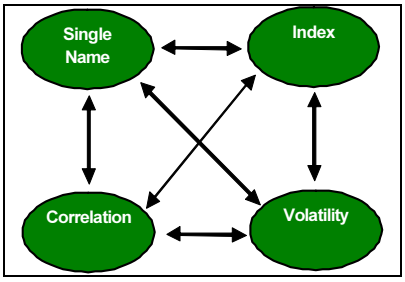
The credit derivatives market has grown significantly over the last few years and now exceeds both equity derivatives and corporate bond markets. We believe the outlook for growth remains strong as the product is increasingly adopted by traditional mainstream credit investors and new instruments are developed.

In this first volume of our handbook, we discuss single-name CDS as well as the CDS index market. The second volume takes an in-depth look at the exotic credit derivatives market including correlation and volatility products.

Moving Beyond Single-Name CDS

■ Evolution of the Credit Derivatives Market

Chart 1: Beyond Single-Name CDS



Source: Merrill Lynch

Credit derivatives are over-the-counter (OTC) instruments designed to transfer credit risk between two parties by way of bilateral agreements. The most poular instrument is the credit default swap (CDS) contract. Over the last few years the credit derivatives market has evolved from a primarily single-name CDS market into a more complex market consisting of not only the more mainstream single-name CDS (in both high grade and high yield credit) but also the liquid CDS indices (CDX, iTraxx) and the more esoteric correlation and volatility products.

CDS contracts can refer to single credits or portfolios, such as indices or synthetic Collateralized Debt Obligations (CDOs); senior or subordinated obligations of the reference entity; asset-backed instruments or loans; and usually have a term anywhere between one and ten years. More recently we have even seen the CDS concept applied to preferred stock.

Since CDS are OTC instruments, they can be tailored to individual requirements. However, in practice the vast majority of transactions in the market are quite standardized. Notably, the development of CDS indices (such as CDX and iTraxx) has also fueled the development of second-generation CDS instruments such as tranches or options on the indices (discussed in Volume 2 of the handbook).

■ Well Tested

The market has been put to the test several times

Since inception, the credit derivatives market has been regularly tested on various documentation issues. Some notable cases[1] relate to Reference Entity specification (Armstrong), Successors (National Power), Restructuring (Conseco, Xerox, Argentina), Deliverability (Railtrack), Guarantees (Marconi). These have been less frequent following the publication of the 2003 credit derivatives definitions which ironed out a lot of these kinks inherent in the earlier 1999 definitions.

2005 was a particularly challenging year

The introduction of new products such as indices and tranches has, however, raised new challenges driven by both complexity as well as immense popularity. In 2005 the market was tested on two fronts:

- The recent spate of defaults in North America tested the operational risk embedded in the settlement procedure for the index and standardized tranche market.
- The credit correlation market was severely tested in May due to the credit deterioration of the auto sector, primarily GM and Ford.

In our opinion, both these tests have strengthened the market. The credit correlation market has seen an increase in activity post the shakeout in May and has the looks of a more mature market. The relatively smooth settlement of multiple defaults in 2005 has increased investor confidence in what was expected to be a fairly volatile issue.

[1] All these cases are discussed in depth in Volume 1, Chapter 7.

The Role of Credit Derivatives

Credit derivatives are relatively pure credit instruments. . .

In an economy a broad variety of entities have a natural need to assume, reduce or manage credit exposures. These include banks (loan books or proprietary trading desks), hedge funds, brokerage firms, insurance companies, fund managers, pension funds, corporations and government agencies. Each type of player will have different economic or regulatory motives for wishing to take positive or negative credit positions at particular times. Credit derivatives enable users to:

- hedge and/or mitigate credit exposure;
- transfer credit risk;
- generate leverage or yield enhancement;
- decompose and separate risks embedded in securities (such as in convertible bond arbitrage);
- synthetically create loan or bond substitutes for entities that have not issued in those markets at chosen maturities;
- proactively manage credit risk on a portfolio basis;
- use as an alternative vehicle to equity derivatives (such as OTM equity put options) for expressing a directional or volatility view on a company; and
- manage regulatory capital ratios.

Conventional credit instruments (such as bonds or loans) do not offer the same degree of structural flexibility or range of applications as credit derivatives.

…which de-couple credit from funding…

A fundamental structural feature of credit derivatives is that they de-couple credit risk from funding. Thus players can radically alter credit risk exposures without actually buying or selling bonds or loans in the primary or secondary markets.

. . . and can drive efficiency in risk allocation . . .

CDS have developed into an increasingly standardized means of transferring credit risk – not just between entities but between different markets for risk. We believe that a deep and relatively liquid credit derivative market should play an important role in efficiently allocating credit risk within economies.

. . . and/or capital efficiency

Arguably, the differing capital adequacy requirements of different types of credit investor can distort this efficient credit allocation. If this is the case then an effective and standardized market for credit risk may tend to promote "capital efficient" in addition to "efficient" allocation of credit.

The Growth of Credit Derivatives

Market surveys highlight the rapid growth trend

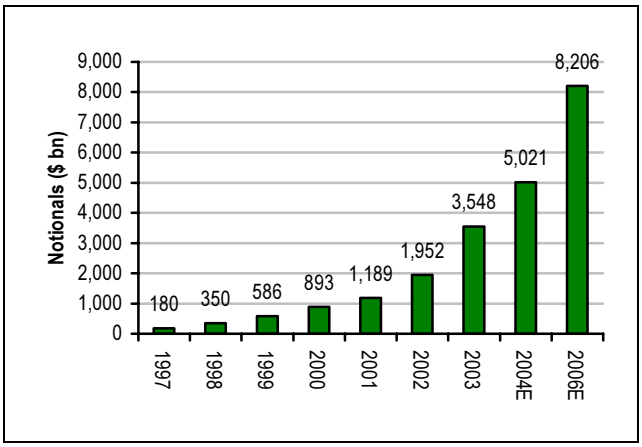
The most recent "Credit Derivatives Report" published by the British Bankers Association (BBA) surveyed 30 institutions across different geographical areas on their involvement in the market. As of year-end 2003 the survey estimated that global market size was $3,548bn (excluding asset swaps) and forecast that it would reach $5,021bn by 2004 and $8,206bn by 2006 (see Chart 2).

In the second half of 2005, ISDA released the results of its semi-annual derivative market survey. Credit derivatives for this survey comprise credit default swaps, baskets and portfolio transactions indexed to single-names, indices, baskets and portfolios. In compiling this data, ISDA surveys its member firms around the world. In the latest release, 86 firms responded with credit default swap data. ISDA adjusts the results to reflect double-counting amongst the dealer community.

Even after such adjustments, the survey shows total notional outstanding of $12.4 trillion as of June 2005. This represents 48% growth from six months earlier and 128% growth from a year earlier (Chart 3). The market has grown almost 50% every six months over the last two years. This growth reflects, in our opinion, the tremendous success of the index product (and its tranche offshoots), synthetic CDOs, as well as a more widespread acceptance of single-name CDS.

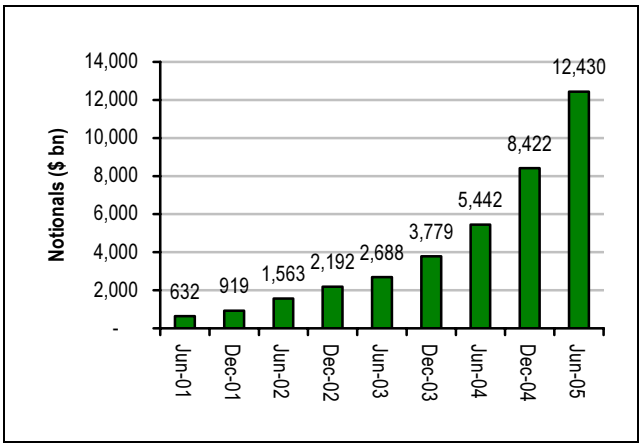
Refer to important disclosures on page 118.

Chart 2: BBA Estimate of Credit Derivatives Market



Source: BBA

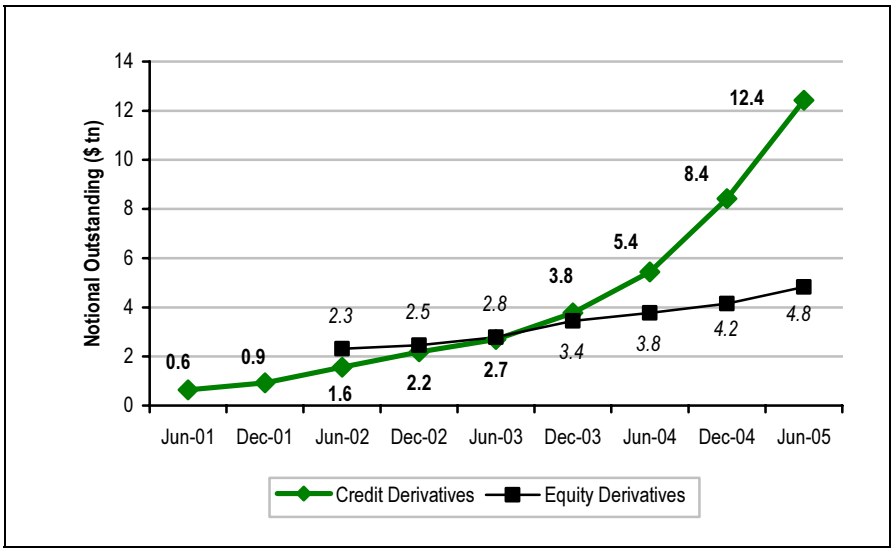
Chart 3: ISDA Estimate of Credit Derivatives Market



Source: ISDA

The same ISDA survey highlights that credit derivatives notionals have outpaced the more mature equity derivatives market (Chart 4). However, this comparison includes only the OTC but not the listed equity derivatives market. As of 23 Dec 2005, the US listed equity derivatives notionals totaled about $2.1tn. We estimate a similar size of the non-US listed equity derivatives market.

Chart 4: Credit Derivatives vs. Equity Derivatives Market



Source: ISDA

Market Structure

By Product

Single name CDS are most widely used instruments

CDS are the most important and widely used product in the credit derivatives market. However, the growth of synthetic-CDO type products remains strong. The BBA survey estimates that single-name CDS would account for 42% of the notional principal outstanding at the end of 2006, followed by synthetic CDOs with estimated 16% share. Over time, however, the largest gains are expected to be registered by liquid instruments such as standardized indices and tranches, away from less liquid ones such as asset swaps and credit-linked notes.

Standardized indices and tranches have gained significant share

Table 1: Composition of the CDS Market

	2003	2006
Single Name Credit Default Swaps	51%	42%
Synthetic CDOs	16%	16%
Indices	9%	12%
Credit Linked Notes	6%	6%
Index Tranches	2%	5%
Basket Products	4%	5%
Total Return Swaps	4%	4%
Asset Swaps	4%	3%
Credit Spread Options	2%	3%
Equity-Linked Credit Products	1%	3%
Swaptions	1%	1%

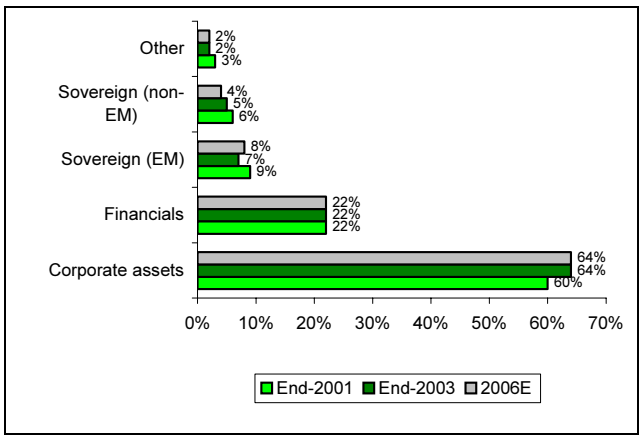
Source: BBA. 2003 actual and 2006 projected.

Where is Activity Concentrated?

In Chart 5 to Chart 8 we use BBA data to highlight the type of contracts that predominate in the market. The most frequent combinations are:

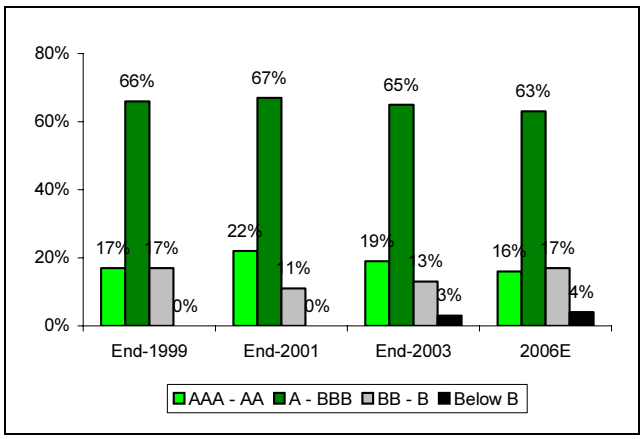
- Non-financial corporate Reference Entities.
- Mid-or-low investment grade ratings.
- 5-year maturity at inception.
- Transactions booked in the US or London.

Chart 5: Credit Derivative Reference Entity By Sector



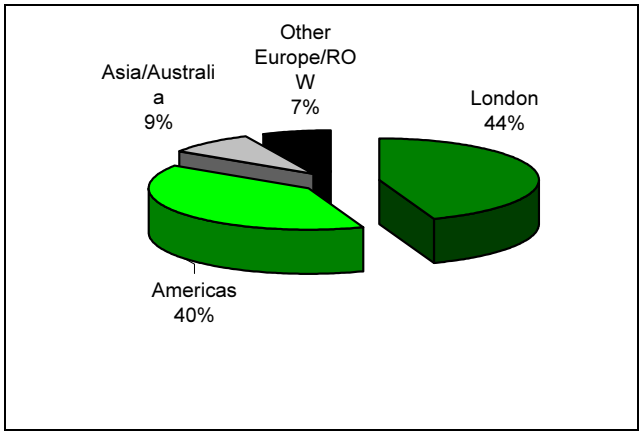
Source: BBA Credit Derivatives Report 2003/2004.

Chart 6: Credit Derivative Reference Entity By Rating



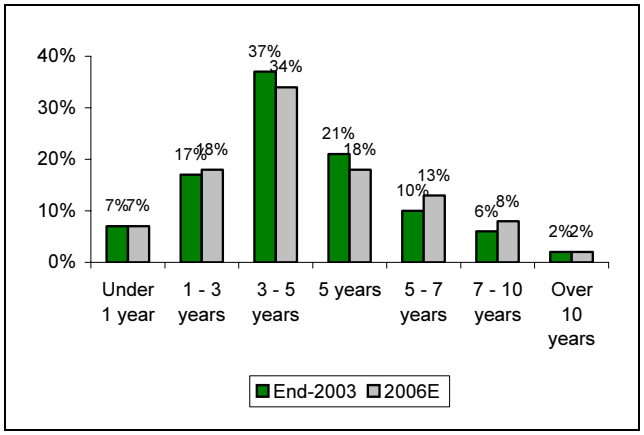
Source: BBA Credit Derivatives Report 2003/2004.

Chart 7: Credit Derivative By Region



Source: BBA Credit Derivatives Report 2003/2004. Based on 2004 estimates.

Chart 8: Credit Derivative Reference Entity By Maturity



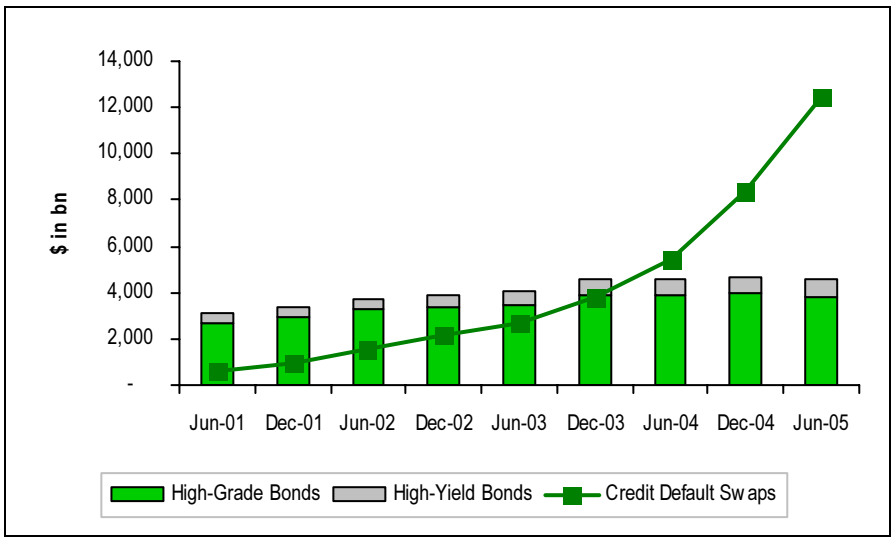
Source: BBA Credit Derivatives Report 2003/2004.

Refer to important disclosures on page 118.

Size Relative to the Corporate Bond Market

Outstanding volumes of credit derivatives comfortably exceed those of corporate bonds, which we attribute both to the growing popularity of credit derivatives and significant slowdown in corporate bond issuance. Recent credit derivatives survey by ISDA puts the size of market at over $12 trillion. In comparison, the market for liquid fixed-rate corporate investment grade and non-investment grade bonds falls inside $4 trillion and $1 trillion, respectively (Chart 9).

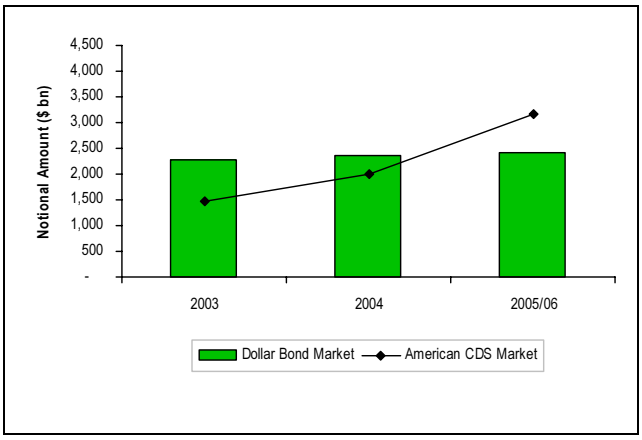
Chart 9: Size of CDS vs. Bond Markets



Source: Merrill Lynch Index System, ISDA.

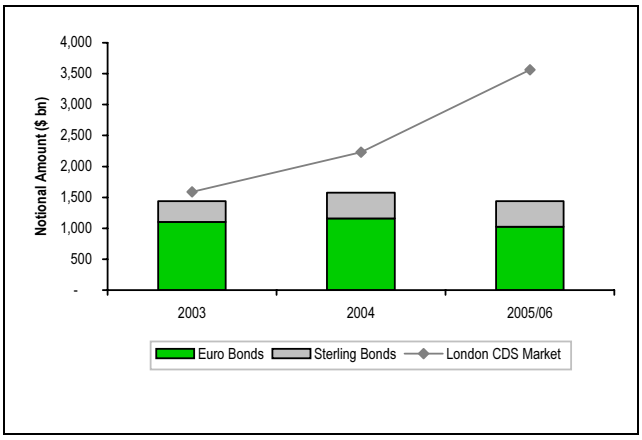
The relative penetration of credit derivatives is somewhat different by geographical region. In Chart 10 and Chart 11, we show the estimated size of the US and European credit derivative market relative to the broad bond indexes (high grade and high yield) in the two regions.

Chart 10: Dollar Bond Market vs. Americas CDS Market



Source: BBA, Merrill Lynch Index System.

Chart 11: European Bond Market vs. London CDS Market



Source: BBA, Merrill Lynch Index System.

On both sides of the Atlantic, there has been a clear secular growth in outstanding credit derivatives, while bond issuance has been muted. In Europe, however, the London CDS market was already larger in size than the Euro and Sterling markets by the end of 2003, whereas the benchmark may only have been reached in 2005 in North America. We believe this contrast reflects 1) the development of London as the hedge fund capital, 2) the early adoption of structured credit derivatives solutions in Europe vs. U.S., 3) the relative youth of the European corporate bond market and 4) a greater proportion of inter-dealer CDS transactions in Europe.

Reference Entities

Strong correlation between issuer size and popularity in CDS contracts

There is, however, a strong relationship between share of bond issuance and outstanding CDS volumes, where General Motors (and GMAC) and Ford Motor (and Ford Motor Credit) top the list of most popular reference entities (Table 2). There is also a generally high correlation between reference entities most popular by protection sellers and buyers.

Table 2: Top CDS Reference Entities in 2004

Rank	Protection Sold	Protection Bought
1	GM/GMAC *	Ford/FMCC
2	Ford/FMCC *	GM/GMAC
3	France Telecom	France Telecom
4	DaimlerChrysler	Russia
5	Russia	DaimlerChrysler
6	Deutsche Telekom	Deutsche Telekom
7	Brazil	Telecom Italia
8	Italy	Brazil
9	Telecom Italia	Korea
10	AT&T Corp	AT&T Corp

Source: Fitch. * Both General Motors and Ford Motor Company have captive finance entities, GMAC and Ford Motor Credit, respectively.

Market Participants

Banks are the largest market participants and biggest net protection buyers; mono-line insurers are biggest net protection sellers

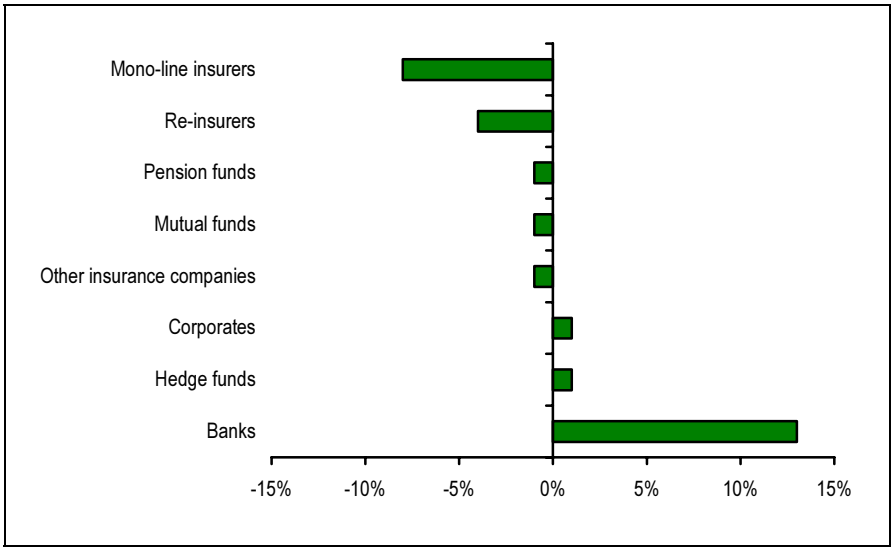
BBA survey data provide indications of credit derivative flows between economic sectors. Table 3 shows that the largest participants in the market are banks, insurance companies and securities companies. More interestingly, the insurance sector stands out as the dominant net seller of protection (Chart 12), absorbing a significant amount of credit risk from banks in particular but also from hedge funds and securities companies. We believe that a significant proportion of the credit risk transferred to monoline insurance companies by banks is in the form of super-senior tranches of synthetic CDOs which represent low-risk low-return assets.

Table 3: Market Share of Protection & Net Flows

	Share of Buying	Share of Selling
Banks	51%	38%
Hedge Funds	16%	15%
Securities Houses	16%	16%
Corporates	3%	2%
Govt / Export Agencies	1%	1%
Mutual Funds	3%	4%
Pension Funds	3%	4%
Insurance *	7%	20%

Source: BBA Credit Derivatives Report 2003/2004.
* Includes mono-line insurers, re-insurers and other.

Chart 12: Net Buyers (Sellers) of Protection by Sector



Source: BBA Credit Derivatives Report 2003/2004.

Refer to important disclosures on page 118.

Banks

Banks are the dominant market users, and have particularly large market share as buyers of protection. While initially focused on regulatory capital relief and portfolio transactions, the focus has migrated to economic capital relief and single name transactions, becoming selective sellers of protection and using the process to facilitate primary market syndications.

Insurance companies

Although default swaps are in many ways similar to insurance policies there are important differences. For example, an insurance policy typically requires an underlying insurable interest and actual loss whereas credit protection can be bought whether or not the buyer has an underlying risk exposure which needs hedging. In most countries insurance companies have regulatory constraints limiting direct usage of derivatives. For this reason, many of the credit derivative transactions are structured into Credit Linked Notes (CLNs) or principal protected notes, which are collateralized by zero coupon bonds. Insurance companies are also significant investors in the various tranches of synthetic CDOs.

Hedge funds

The market share for hedge fund protection selling has tripled from 5% in 2001 to 15% at the end of 2003. The market share of protection buying has remained relatively stable since the previous survey. Hedge funds, however, are growing rapidly and driving the growth of the credit derivatives market. They use CDS not only as an alternative way to buy or sell credit risk but also to trade correlation and volatility. Hedge funds have also been big drivers of growth of the high-yield CDS market. Hedge fund strategies such as convertible bond arbitrage use default swaps to hedge the credit risk component of convertible bond positions and isolate exposure to cheap embedded equity options. Other uses involve combining either long or short CDS positions against offsetting equity or equity derivative positions in capital structure arbitrage opportunities.

Corporations are net buyers of credit protection. Such activity is typically motivated by the need to reduce customer exposure through receivables or vendor financing.

Meeting the Challenges

■ Cash Settlement of Index and Tranches

Cash settlement of index and tranches introduces basis risk

The recent series of defaults[2] in the US have highlighted the operational risk inherent in physical settlement of index and tranches. Significantly larger notionals for index and tranches can make it very difficult to find a bond for physical settlement. The popularity of these products makes it imperative that they are cash-settled. Though each of the defaults in 2005 have been cash-settled through an auction, developing a new protocol for each default is a time consuming process. In addition, dealers also face the uncertainty of whether all their counterparties will agree to the protocol. As a result, we expect cash settlement to replace physical settlement in the documentation for future rolls of the index as well as the tranches based on the index. Single-name CDS, however, is physically settled which implies that investors who use single-name CDS to hedge index or tranche positions will take on basis risk.

■ The Assignment (or Novation) Challenge

Novation protocol reduces operational risk

The other big operational risk that has been a focus of regulators and the Fed is the large backlog of unsigned credit derivative assignments or novations[3]. The rapid growth of hedge funds has resulted in a huge backlog of unsigned novations as hedge fund counterparties have typically signed away credit derivative positions without informing the initial counterparty.

In September 2005, ISDA introduced a novations protocol to address this issue. The protocol replaced verbal notifications of novations with a strict schedule conducted using electronic systems. The protocol stipulates that the counterparties (hedge funds) must obtain written consent from the initial dealer to the trade by

[2] CKC, Delta, Northwest, Delphi & Calpine.
[3] See Volume 1, Chapter 10 for discussion on novation.

the end of the day of the unwind. Otherwise the transaction with the new dealer must be booked as new trade which would be unfavorable to the hedge fund as it would be left paying margin on two offsetting trades.

Despite the initial heavy resistance, ISDA claims that almost 2,000 have signed on to the novations protocol highlighting the importance of this issue.

Deepening the Market

Cash based investors are increasingly active

As depicted in Table 3 traditional cash based credit investors such as mutual and pension funds are currently a very small force in the credit derivative market. However, in our opinion, most major fund managers are investigating the market, making preparations to enter the market or beginning to use CDS based products. (In Europe, regulations have already been passed in several countries permitting their use by funds. Their back-office infrastructure development, however, has generally lagged.) The CDS index market (CDX, iTraxx) has served to spur interest as investors are able to more easily "dip their toes" into the credit derivatives market via the index product. The index is standardized, transparent and extremely liquid and usually the first instrument of choice for players new to the credit derivatives world.

Whilst individual funds and managers will have to continue to address constraints on the use of derivatives we expect a rise in market share as these flexible, efficient and often attractively priced credit tools are used to express direct credit views and for overall portfolio management. Such constraints may be due to nature of mandate, internal policies, legal or regulatory issues. We expect continuing innovation to drive this sector of the market as dealers develop structures which can be used by particular funds whilst also limit the counterparty exposure of the dealer. In addition, as some of the operational challenges are resolved, we anticipate greater interest from this group of investors.

Refer to important disclosures on page 118.

2. CDS Basics & Valuation

Default swaps are a means of transferring credit risk between counterparties. This section gives an overview of the basics using an example transaction. It also discusses the pricing of single-name default swaps including the asset swap approach and the use of default probability models to imply survivability of a reference entity.

What is a Credit Default Swap?

Credit Default Swaps (CDS) are the most important and widely used instrument in the credit derivative market. In essence a default swap is a bilateral OTC agreement, which transfers a defined credit risk from one party to another. The buyer of credit protection pays a periodic fee to an investor in return for protection against a **Credit Event** experienced by a **Reference Entity** (i.e. the underlying credit that is being transferred).

Contracts are documented under International Swap and Derivatives Association Inc. (ISDA) swap documentation and the 2003 ISDA Credit Derivative Definitions as amended by various supplements.

In this section of the report we aim to explain the basic cashflows and mechanisms of a credit default swap and compare these to total return swaps. We also mention other important features such as **Credit Events** and **Reference Entities** and **Deliverable Obligations**. Each of these are important topics in their own rights and are discussed in more detail in Volume 1, Chapter 7.

■ Are You a Buyer or a Seller?

Sellers of protection are buyers of credit

Credit default swaps are also known as "**protection**". Transactions in the market are usually referred to in terms of either buying or selling protection. This can be confusing since a seller of protection is assuming credit risk. In the underlying swap documentation, the fixed payer is the protection buyer (the fixed payment being the regular premium) and the floating payer is the protection seller (the floating payment being the underlying cash payment of the notional amount following a "Credit Event").

Table 4: The Two Parties in a Credit Default Swap

Credit Default Swap Market	Swap Payment	Underlying Credit Position
Protection Buyer	Fixed	Short (selling a bond)
Protection Seller	Floating	Long (buying a bond)

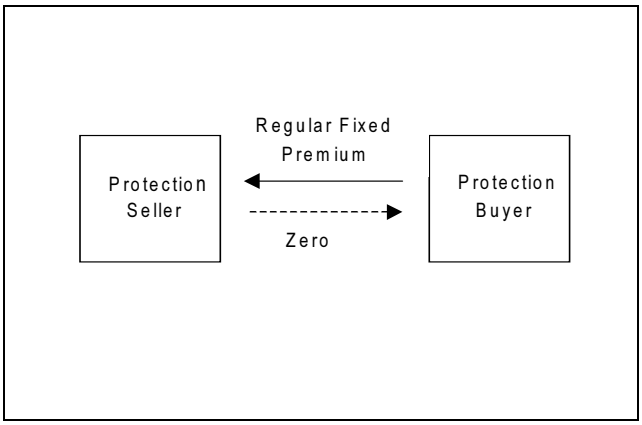
Source: Merrill Lynch

■ What are the Cashflows?

Buyers of protection pay a quarterly "spread"

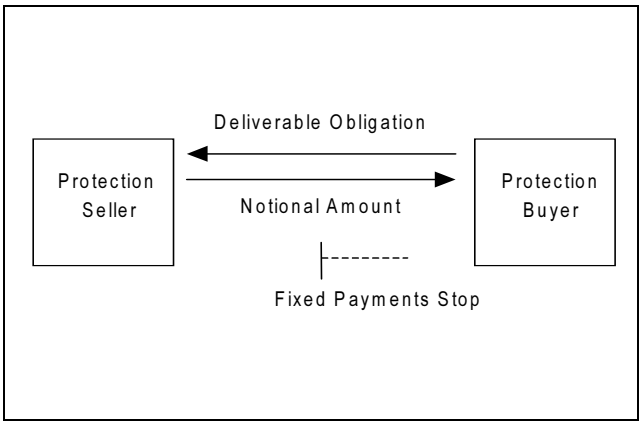
Under a typical default swap the buyer of protection pays to the seller a regular premium (usually quarterly), which is specified at the beginning of the transaction. If no Credit Event, such as default, occurs during the life of the swap, these premium payments are the only cashflows. Like many other swaps there is no exchange of underlying principal. Following a Credit Event the protection seller makes a payment to the protection buyer. Typically this payment takes the form of a physical exchange between the buyer and seller. The protection buyer provides the seller any qualifying debt instrument (known as Deliverable Obligation) of the Reference Entity in return for a cash payment amounting to its full aggregate notional amount (i.e. par). The protection buyer stops paying the regular premium following the Credit Event. The net loss to the protection seller is therefore par less the recovery value on the delivered obligation.

Chart 13: Pre-Credit Event Flows



Source: Merrill Lynch

Chart 14: Flows Flowing Credit Event (physical settlement)



Source: Merrill Lynch

Just because a Credit Event has occurred it does not necessarily mean that the claim on the Reference Entity will be worthless. Credit default contracts are structured to effectively replicate the experience of a cash market holder of an obligation of the Reference Entity. At least some payments may be made to creditors even if the company is wound up. As recovery values (or the market value of debt following default) are typically at a deep discount to par, the default swap buyer has effectively received protection on this price deterioration.

■ Cash or Physical Settlement?

Default swaps are typically subject to physical settlement

The transaction described above involves **physical settlement**. The market convention is for such physical settlement although it is possible to **cash settle**. While single-name CDS is typically physically settled, CDS indices and tranches are moving towards a standardized cash settlement. In such cases, following a credit event, the protection seller would provide a single cash payment reflecting the extent to which a market valuation of a specified debt obligation of the reference entity has fallen in value. This settlement value for index and tranche defaults has been determined via auctions post each default. Cash settlement is expected to be part of the standard documentation for index and tranche contracts in the near future.

■ Maturity

The most liquid maturity term for CDS contracts is 5 years. On-the-run CDS contracts typically have four maturity dates: 20th March, 20th June, 20th September and 20th December. This standardization of maturities has increased the liquidity of CDS contracts and as a result has attracted more participants.

A Working Example

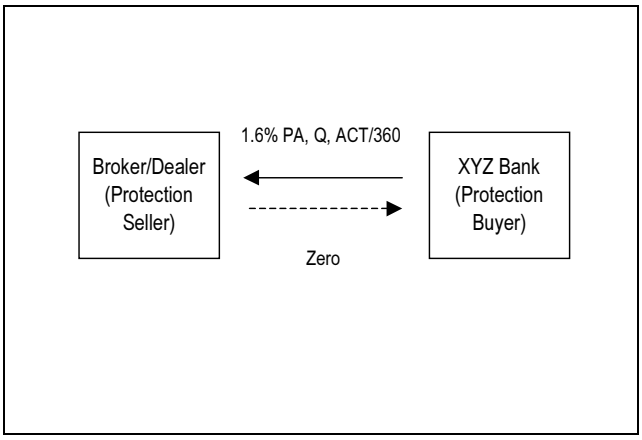
As an example we use a hypothetical transaction between a broker/dealer and XYZ Bank. In this case the broker/dealer sells protection (takes credit risk) on $10mn EuroAutos AG to XYZ Bank.

The term of the transaction is 5 years. In return for the protection that the broker/dealer is providing over this five-year period, XYZ Bank agrees to pay a fixed fee of 1.6% per annum payable quarterly.

Settlement is physical. Thus, should a Credit Event occur, XYZ Bank would be able to deliver any qualifying senior unsecured EuroAutos paper to the broker/dealer in return for a $10mn payment and then the contract (and all future payments) would terminate.

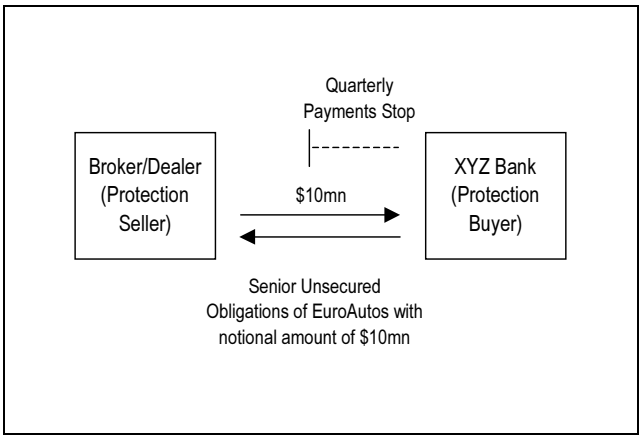
Refer to important disclosures on page 118.

Chart 15: Pre-Credit Event Flows



Source: Merrill Lynch

Chart 16: Flows If a Credit Event Occurred



Source: Merrill Lynch

Chart 15 and Chart 16 illustrate two potential scenarios for this transaction. In the first chart, no EuroAutos Credit Event occurs and XYZ Bank simply continues to pay the 160bps annual premium to the broker/dealer. For XYZ Bank there is, therefore, a negative accrual relating to these payments.

The second chart however depicts a scenario in which a Credit Event occurs two years into the transaction. In this case XYZ Bank pays the broker/dealer the premium of 160bps for the two years preceding the Credit Event and then receives $10mn from the broker/dealer in return for delivering any qualifying senior unsecured debt obligation with a notional amount of $10mn. Following such Credit Event it is likely that EuroAutos' debt would be trading substantially below par – and the broker/dealer would be expected to bear the loss resulting from the diminution of value.

Table 5: Example Cashflows under "no default" and Credit Event At 2 Years Scenarios

	No EuroAutos Credit Event		EuroAutos Credit Event At 2 Years	
	XYZ Bank	Broker/Dealer	XYZ Bank	Broker/Dealer
Pays	160bps for 5 years	zero	160bps for 2 years, then EuroAutos Deliverable Obligation	$10mn
Receives	zero	160bps for 5 years	$10mn	160bps for 2 years, then Recovery Value

Source: Merrill Lynch

A third and more likely scenario, would in fact be that the transaction is hedged, crossed or unwound prior to maturity. For example, if 6 months into this transaction, EuroAutos' credit spreads widen and XYZ Bank is able to hedge by selling protection to the broker/dealer for 190bps, then XYZ Bank will lock in a 30bps running surplus for the remaining life of the swap. Remember, however, that the remaining transaction life is uncertain since it will terminate at the sooner of 4½ years or the occurrence of a Credit Event. Thus the profitability of the hedging transaction cannot be ascertained by simply calculating the present value of a 30bps annuity over 4½ years. In practice, such calculations are usually based on default probabilities and expected recoveries following default[4].

[4] See Volume 1, Chapter 3 for more details on unwinding CDS.

Valuation Factors

Relationship with asset swaps key driver of pricing

In terms of cashflow profile, a credit default swap is most readily comparable with a par floating rate note funded at Libor or an asset swapped fixed-rate bond financed in the repo market. Though default protection should logically trade at a spread relative to a risk-free asset, in practice it trades at a level that is benchmarked to the asset swap market. Most banks look at their funding costs relative to LIBOR and calculate the net spread they can earn on an asset relative to their funding costs. LIBOR represents the rate at which AA-rated banks fund each other in the interbank market for a period of 3-6 months. Although this is a useful pricing benchmark it is not a risk free rate.

Intuitively, the price of a credit default swap will reflect several factors. The key inputs would include the following:

- probability of default of the reference entity and protection seller;
- correlation between the reference entity and protection seller;
- joint probability of default of the reference entity and protection seller;
- maturity of the swap; and
- expected recovery value of the reference asset.

Though several sophisticated pricing models exist in the market, default swaps are primarily valued relative to asset swap levels. This assumes that an investor would be satisfied with the same spread on a credit default swap as the spread earned by investing the cash in the asset (taking into account the funding cost of the institution for the particular asset).

The Asset Swap Approach to Pricing

A credit default swap is equivalent to a financed purchase of a bond with an interest rate hedge

Default swap pricing is based on arbitrage relationships between the derivative and cash instruments. Rather than using complicated pricing models to estimate default probability, we can use a simpler pricing mechanism which assumes that the expected value of credit risk is already captured by the cash market credit spreads.

A credit default swap is equivalent to a financed purchase of a bond with an interest rate hedge. It is an unfunded transaction requiring no initial cash outlay. As a result, the relative value of a credit default swap is compared to an asset swap rather than a bond's underlying spread over treasuries. An unfunded position in the bond would have to be financed in the repo market.

This sub-section is based on earlier work by Mary Rooney

In a simplified model, the default swap should trade at the same level as an asset swap on the same bond. The asset swap provides a context for relative value because reference assets have transparent prices.

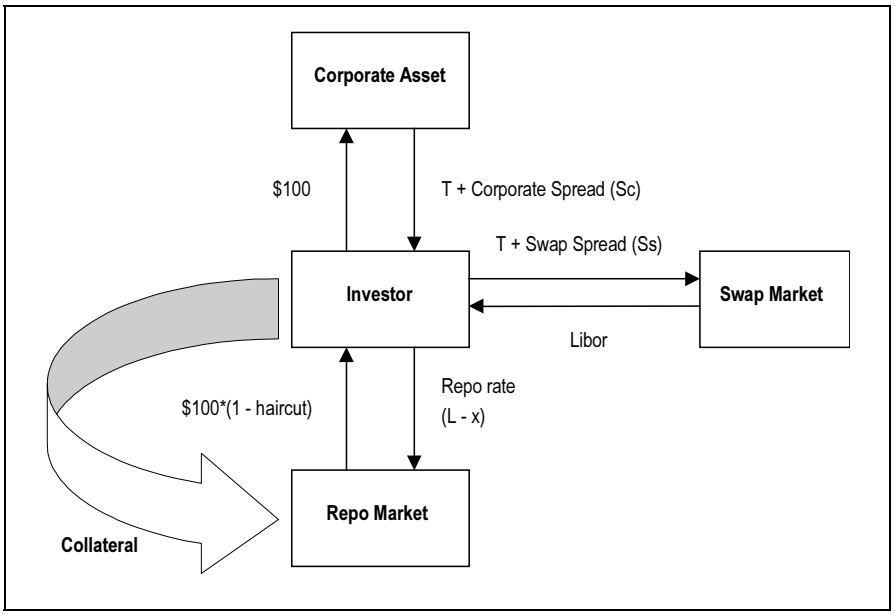
Default swap exposure can be replicated in the following way:

- Purchase a cash bond with a spread of $T + S_C$ for par.
- Pay fixed on a swap ($T + S_S$) with the maturity of the cash bond and receive Libor (L).
- Finance the bond purchase in the repo market. The repo rate is quoted at a spread to Libor (L - x).
- Pledge bond as collateral and is charged a haircut by the repo counterparty.

T = Treasury yield to maturity
S_C = Corporate Spread
S_S = Swap Spread
L = LIBOR rate
x = implied repo premium

Refer to important disclosures on page 118.

Chart 17: Replicating Default Swap Exposure, Protection Seller



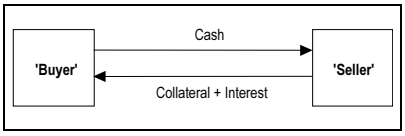
Source: Merrill Lynch

The interest rate swap component eliminates the duration and convexity exposure of the cash bond. Without this hedge, the trade would be equivalent to a leveraged long position in the fixed rate corporate asset ($T + S_C - (L - x)$).

Bond purchase is financed in the repo market

Since a credit default swap is an unfunded transaction, the bond purchase needs to be financed. This financing is achieved with a bond repo. In a repo, collateral is traded for cash. The collateral 'seller' borrows cash and lends collateral (a repo) (see Chart 18). The collateral 'buyer' borrows the collateral and lends cash (a reverse repo). The repo bid/offer refers to the rate at which the collateral can be bought. The bid is higher than the offer since it is the cost of buying cash and selling collateral.

Chart 18: Standard Financing Trade



Source: Merrill Lynch.

Two important components of a repo trade are:

- Haircut: This is defined as the difference between the securities purchased and the money borrowed. The lender of cash charges a haircut for the loan in order to compensate for market risk of collateral as well as counterparty risk.
- Repo rate: This is the financing charge for the collateral. It varies according to the demand to borrow (or lend) the security. This rate has been denoted as L - x, since several liquid credits have repo rates that are usually, but not always, less than Libor.

The haircut represents the capital in the trade. As a result, institutions with the cheapest cost of capital will be able to assume this credit exposure for the lowest net cost. If we assume a haircut of 0 for simplicity, then Table 6 shows that the net cash flow is:

$$(S_C - S_S) + x$$

If the repo rate for the bond was Libor flat (x = 0) the exposure would simply be the asset's swap spread ($S_C - S_S$).

Table 6: Cash Flows of Default Swap Replication (Protection Seller)

Investor Trade	Receive	Pay
Buy Cash Bond	$T + S_C$	100
Swap Hedge	L	$T + S_S$
Repo	100	L - x
Total Cash Flows	$T + S_C +$ $L + 100$	$100 + T +$ $S_S + - x$

Source: Merrill Lynch Assume no haircut.

This cash flow is similar to that received by a protection seller on a default swap, i.e., a simple annuity stream expressed in basis points for the life of the trade. If the bond defaulted, the repo would terminate and the investor would lose the difference between the purchase price and recovery price of the bond.

In efficient markets, arbitrage relationships should drive default swap levels towards the asset swap level. Any mispricing between the markets would be arbitraged away by market makers. For example, if the default premium is greater that the asset swap level, protection sellers would enter the market and drive the default swap premium down towards the asset swap level.

Funding Cost Arbitrage

Funding cost arbitrage is a key driver of the default swap market

From the perspective of a protection buyer there are arbitrage forces which tend to link the cash and default markets. If an investor has purchased a floating rate asset at par, it can fund this either via on-balance-sheet borrowing or in the repo market. The investor's carry would be the differential between the FRN yield and the cost of borrowing. The break-even level the investor should be willing to pay for protection would be this differential between the floating rate asset's yield and the funding cost.

We can explain this credit arbitrage with the aid of the following example:

- Cost of funding for AAA-Rated Institution = L - 20bps
- Cost of funding for A-Rated Institution = L + 25bps
- Income from BBB-Rated Asset = L + 40bps

The net spread for the AAA-rated institution from holding the BBB-rated asset is:

$$L + 40 - (L - 20) = 60bps$$

The net spread for the A-rated institution from holding the BBB-rated asset is:

$$L + 40 - (L + 25) = 15bps$$

If the AAA-rated institution wanted to reduce its risk to the BBB-rated asset without selling it in the public market, it could enter into a credit default swap as a protection buyer.

If the A-rated institution wanted exposure to the BBB-rated asset, it would be more attractive to sell protection on the BBB-rated asset if the default premium was more than its net spread from buying the bond in the cash market, i.e. default premium > 15bps.

In addition, since the credit default swap is an unfunded transaction, the A-rated institution would not have to show the asset on its balance sheet.

Let's assume the AAA-rated and A-rated institutions enter into a credit default swap (Chart 21) where the default premium = 25bps.

Following this transaction, we have the following:

- The net spread for AAA-rated institition (protection buyer) = 60 - 25 = 35bps.
- The net spread for A-rated institution (protection seller) = 25bps (the swap is an unfunded transaction for the seller).

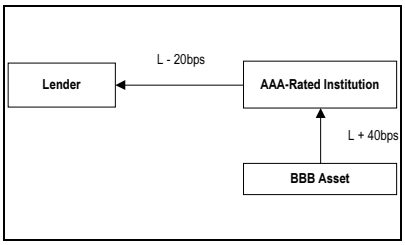
The AAA-rated institution is now exposed to a credit whose rating is defined by the correlation between the BBB-rated asset and the A-rated counterparty. If we assume there is no correlation between the two, the synthetic asset created by a combination of these two would be rated AA-[5]. The coupon on this synthetic asset is L + 15bps (L + 40 - 25).

Both institutions are better off after entering into a credit default swap transaction:

- AAA-rated institution has created a better quality synthetic asset.
- A-rated institution earns a higher spread than cash market for taking on a similar level of credit risk.

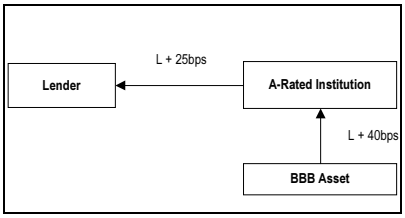
For this arbitrage to work, the funding cost of the protection seller must be greater than the funding cost of the buyer. However supply and demand conditions may lead to trades that are done even when this condition is not satisfied. For example, banks could lower regulatory capital from 100% to 20% by buying credit protection on a 100% BIS risk-weighted asset from an OECD bank. Alternatively, a bank may need to expand credit lines to do more business with the reference entity and may not want to be seen as selling this risk in the public market.

Chart 19: Cash Flows for AAA Institution Holding BBB-rated Asset



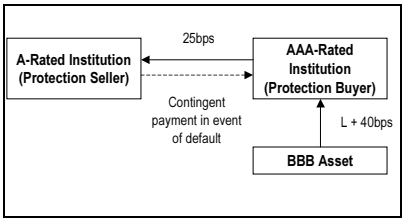
Source: Merrill Lynch.

Chart 20: Cash Flows for A-rated Institution Holding BBB-rated Asset



Source: Merrill Lynch.

Chart 21: Cash Flows After Entering a Credit Default Swap Transaction



Source: Merrill Lynch.

[5] See "Rating Letter & Credit-Backed Bonds", June 1999, S&P.

Refer to important disclosures on page 118.

Trading desks actively look for arbitrage opportunities

In practice, "street" trading desks actively look for such "arbitrage" opportunities. For example, a major bank's credit trading desk, which funds its long credit positions at LIBOR + 10bps, will typically look for situations where protection is available at spreads of 10bps or more tighter than the cash market. Clearly each trading desk has different funding costs and positioning limits, but such market forces tend to limit the extent to which protection in major-bond issuing names can trade through asset swap spreads. In theory, the trading desks with the lowest cost of funding should determine how far through the cash market the default swap can trade. If repo financing is available, the pricing will be driven by the financing rate available.

From the perspective of a protection seller, in theory the analogous types of arbitrage conditions should apply. However, in practice it is very difficult to borrow chosen bonds to establish long-term short positions. Thus when prices diverge substantially between the cash and the default market, it is usually when default spreads are wider and there is a shortage of protection sellers. Assuming this widening of protection costs is not the result of a significant deterioration in the credit quality of the reference entity, the spreads may slowly move back closer together as longer-term credit investors take the opportunity to enhance returns by selling protection directly or indirectly through funded vehicles such as credit linked notes (CLNs).

Default swaps don't trade through LIBOR in the same way that AAA borrowers can

Default swap levels on sub-LIBOR borrowers would clearly not reflect LIBOR spreads but funding cost via, for example, repo. **Thus minimum default spreads are bounded at zero**.

Default Probability Models

Market pricing driven by demand and supply flows

In practice, supply and demand as well as the arbitrage relationship with asset swaps tends to be the dominant factor driving pricing of default swaps. Technical models for pricing default swaps tend to be used more for exotic structures and off-market default swap valuation (unwinds, for example). These models calculate the implied default probability of the reference entity as a means of discounting the cash flows in a default swap. The essential inputs are **credit spreads** and **recovery rates** that are used to interpolate ('bootstrap') a time-series of **survival probabilities** of the reference entity. A typical recovery rate assumption in the default swap market for senior unsecured contracts is 40%.

At inception, CDS contract has zero net present value

A default swap consists of two legs:

- **Fixed Leg or Premium Leg**: The quarterly payments made by the protection buyer to the protection seller until the earlier of a credit event or maturity of the contract.
- **Floating Leg or Default Leg**: The difference between par and the recovery value of the delivered obligation made by the protection seller to the protection buyer should a credit event occur during the contract

These flows are shown in Chart 22 for a default swap with a premium of 100bps. At the inception of a default swap, the PV of the Fixed Leg must equal the PV of the Floating Leg. i.e., an on-market default swap has zero net present value.

The PV of each leg is also called a Risky PV as the future cashflows are not completely certain. The likelihood of receiving any future cashflows depends on their survival probability.

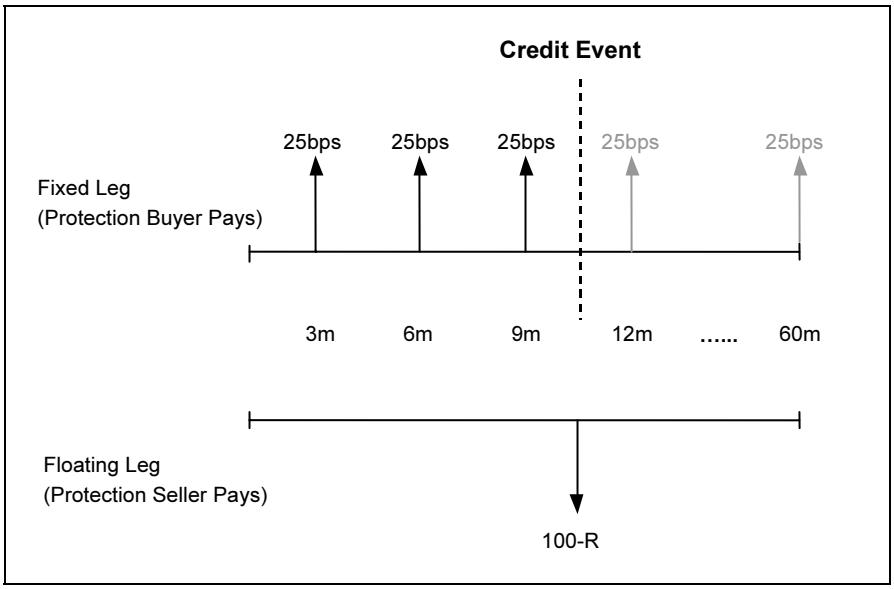
CDS cashflows:

The buyer of protection pays quarterly premium to the seller until the earlier of a credit event or maturity

The seller of protection pays par less recovery to the protection buyer if there is a credit event during the life of the contract

At inception: PV of both legs are equal

Chart 22: Default Swap Cashflows Due from the Buyer and Seller of Protection



Source: Merrill Lynch

Calculating Spreads from Default Probabilities

The premium leg can be written as the sum of the premiums paid by the protection buyer, discounted by the risk-free and by the survival probabilities relative to each coupon date:

The present value of the premiums paid by the protection buyer, weighted by the survival probability

$$PV^{premiumleg} = \sum_{i=1}^{n} premium_t \cdot DF_i \cdot (1 - p_i)$$

Where DF is the discount function and p is the probability of default up to time i.

The default leg will be the discounted sum paid by the protection seller, in case of default. It is therefore weighted by the marginal default probability. We assume that the default can occur only on a series of discrete dates.

The present value of the default payment, weighted by the marginal default probability

$$PV^{defaultleg} = (1 - R) \cdot \sum_{i=1}^{n} (p_i - p_{i-1}) \cdot DF_i$$

By imposing the equality between the two legs, we can solve for the premium:

$$premium_T = \frac{(1 - R) \cdot \sum_{i=1}^{n} (p_i - p_{i-1}) \cdot DF_i}{\sum_{i=1}^{n} DF_i (1 - p_i)}$$

Refer to important disclosures on page 118.

Bootstrapping Default Probabilities from Spreads

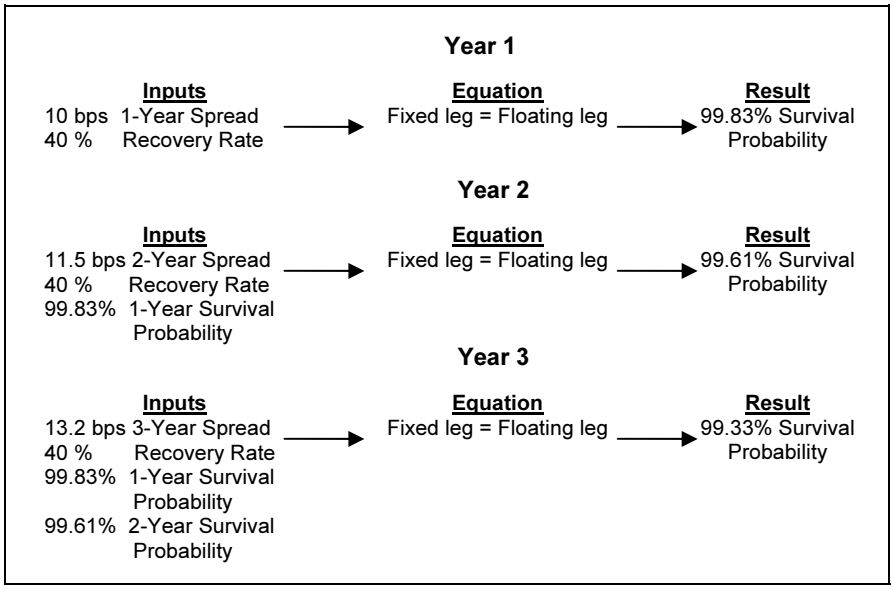
To calculate the survival[6] and default probability curves we use a bootstrap procedure taking the CDS spreads and a recovery rate as inputs. Starting from year 1, we fix the recovery rate and solve the equilibrium equation above such that the resulting premium is 10bps (Table 7). Then, we use the survival probability in year 1 to obtain the survival probability for year 2 corresponding to a spread of 11.5bps. The procedure is repeated for each following maturity, using the prior data as input.

Table 7: Bootstrapping Survival Probability

Year	Spread	Discount Rate	Survival Probability
1	10.0	0.971	99.83%
2	11.5	0.938	99.61%
3	13.2	0.905	99.33%
4	15.2	0.872	98.97%
5	17.5	0.840	98.51%
6	20.1	0.808	97.93%
7	23.1	0.777	97.21%
8	26.6	0.746	96.31%
9	30.6	0.716	95.18%
10	35.2	0.687	93.79%

Source: Merrill Lynch. Assuming 40% Recovery Rate.

Chart 23: Bootstrapping Survival Probability



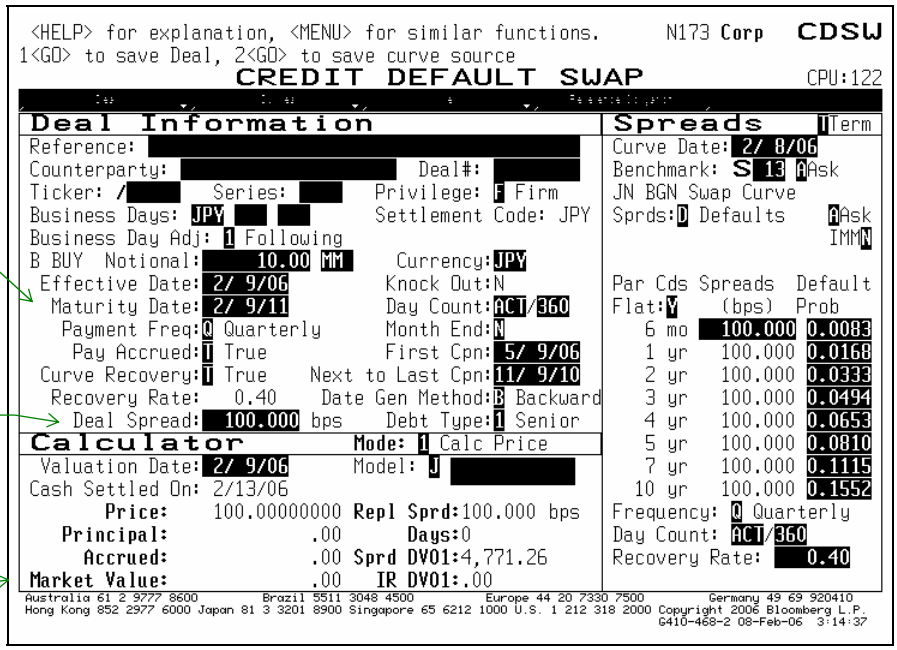
Source: Merrill Lynch

Chart 24: The CDSW Bloomberg Screen

The maturity date is exactly 5 years from now

The deal spread is the hypothetical contractual spread

The market value shows the marking-to-market of the position.



Source: Bloomberg.

[6] Survival Probability = 1 - Default Probability.

Sensitivity of Survival Probability to Recovery Rates

Recovery rate assumptions drive the shape of a survival probability curve

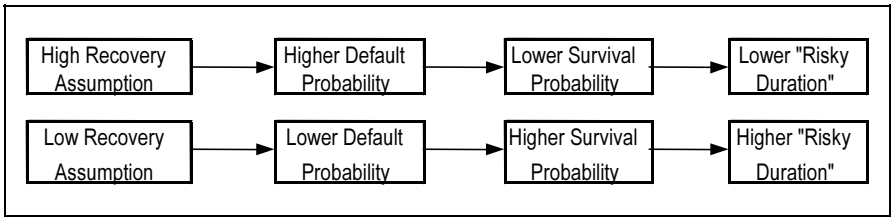
Assumptions about recovery rates will be a factor determining the shape of the Survival Probability curve. In Chart 25 we show how different recovery rate assumptions translate into different survival probability rates. This relationship can be summarized as follows:

For a **given credit spread,** a **high recovery** assumption implies a higher probability of default (relative to a low recovery assumption) and hence a **lower Survival Probability**.

Similarly, for a **given credit spread,** a **low recovery** assumption implies a lower probability of default (relative to a high recovery assumption) and hence a **higher Survival Probability**.

For a give default premium, a high recovery assumption translates into a lower survival probability (relative to a low recovery assumption)

Chart 25: The Effect of Recovery Assumption on Implied Survival Probability (Implied by a Given Default Premium)

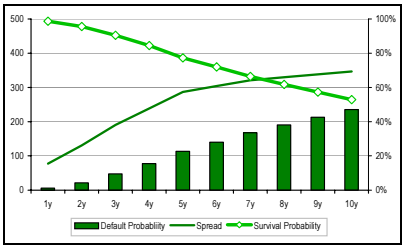


Source: Merrill Lynch

In Chart 27 below we show a time-series of Survival Probability rates for a broad range of recovery rate assumptions. We note that **Survival Probability is a decreasing function of recovery rate and also of time.**

In the case of a 45% recovery, Chart 27 implies a 5yr default swap has approximately an 87% chance of not being triggered before maturity. Chart 26 shows an example for TELDAN.

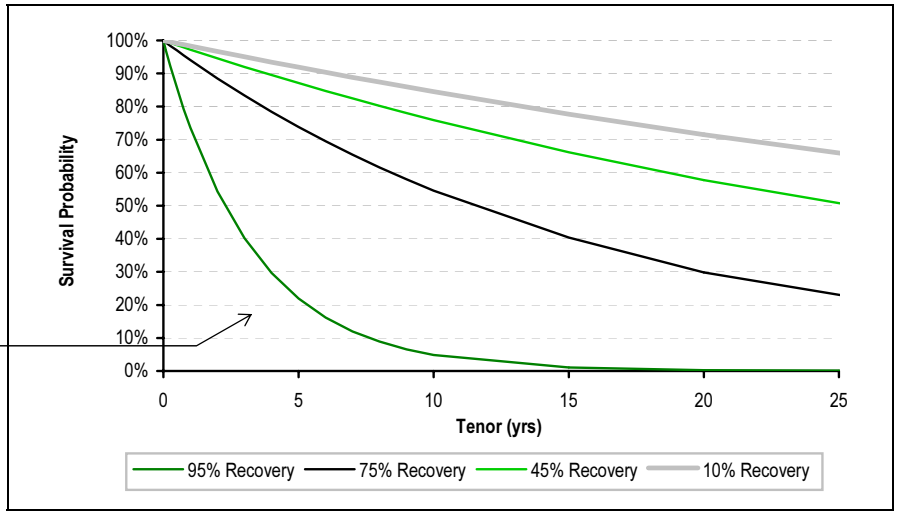
Chart 26: TELDAN Survival and Default Probabilities



Source: Merrill Lynch. Data as of 25-Jan-2006, using 40% recovery rate.

Survival probability is a decreasing function of time and recovery rate

Chart 27: How Survival Probability Varies with Time for Different Recovery Assumptions (For a Given Default Premium)



*For **low recovery rate** assumptions, survival probability decreases approximately **linearly** over time. For **high recovery rate** assumptions, this relationship is more 'convex'*

Assuming Current Default Swap Spread of 150bps.
Source: Merrill Lynch

Refer to important disclosures on page 118.

3. Unwinding CDS

When entering into credit default swaps, the well established arbitrage relationship with the cash market is typically the relative value starting point. The procedure for unwinding default swap trades though is a key difference between cash and synthetic credit markets. The methodology and results can at first be counterintuitive.

Comparing Cash and Default Markets

■ Default Swaps are 'Spread' Products

CDS MTM values move in line with current market premiums . . .

While the payouts on credit default swaps are dependent upon the occurrence of pre-defined credit events, default swaps can nonetheless be thought of as credit 'spread' instruments whose premiums move in relation to the changing credit quality of the underlying reference entity. As a result, the mark-to-market (MTM) value of an existing default swap will move as its default swap premium moves over the course of time.

■ Unwinding Cash Market Positions

. . . but unwind mechanics differ from cash bonds

Unwinding a holding in the cash market is straightforward, simply involving selling the bond. Following this transaction there should be no residual flows or contractual obligations between the investor and its counterparty. And with the exception of unwinding any interest rate hedges the P&L is essentially defined by the change in price of the bond. In the credit derivative market the mechanics of unwinds are typically more involved, and counter-intuitively, the P&L of unwinding a default swap will usually be different from that of unwinding a swapped bond for any given parallel change in spread/default premium.

Three Ways to Unwind a Default Swap

Three ways to book P&L on an existing default swap

An investor with a long or short position in an existing default swap can monetise a change in the default swap premium, and realise P&L, in three ways:

■ Agreeing An Unwind Payment with the Original Default Swap Counterparty in Termination of the Transaction

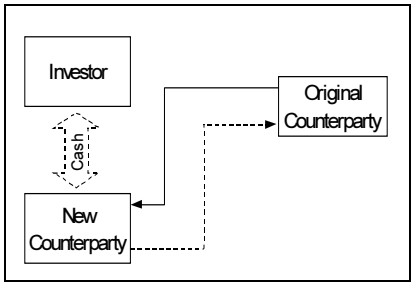
Terminating the swap with the original counterparty

The investor receives/pays the current MTM value of the existing default swap from/to the current default swap counterparty. One of the benefits of terminating (or 'tearing up') an existing trade is that all future cashflow streams are cancelled and ongoing legal risk (i.e. possible disputes over deliverable obligations) is removed. This method also has potentially advantageous capital treatment.

■ Assignment to Another Counterparty

Default swaps can also be assigned to a new counterparty that simply 'replaces' the investor in the default swap. In this case, the investor receives/pays the current MTM value from/to the new counterparty. The original counterparty and the new counterparty become parties to the CDS contract, with the investor ending its involvement (Chart 28). Assignment will also be subject to the protection buyer agreeing to take on the counterparty risk of the protection seller. Again this may reduce legal/capital risk for the investor who has closed its position.

Chart 28: Assigning a CDS to a New Counterparty



Source: Merrill Lynch

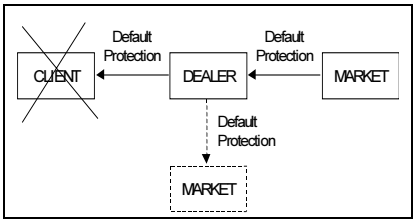
2003 Definitions incorporate a new article to address the assignment (Novation) of credit derivative transactions. A Novation Agreement and a Novation Confirmation are now available to assist counterparties in documenting and obtaining the requisite consents to the assignment of default swap contracts.

Entering into an Offsetting Transaction

Offsetting transaction

The final alternative is to enter into an offsetting long or short protection position with another counterparty. Offsetting transactions are not as popular with end investors as they require the signing of further documentation and added legal risk. Nonetheless, unwinding with another counterparty may be the most desirable option for holders of illiquid positions where better unwind terms may be available away from the original counterparty and where an assignment is not possible.

Chart 29: Replacing Terminated Swaps



Source: Merrill Lynch

Offsetting transactions are used extensively by dealers when unwinding positions for themselves and clients. This is because dealers will need to replace terminated default swaps to remain hedged. Chart 29 shows that following a termination of an existing client default swap contract, the dealer must replace this offsetting transaction by entering into a default swap with the market to remain hedged. For this reason, valuing offsetting transactions is essential to the understanding of swap unwind pricing methodology.

MTM payments, as reflected in the unwind default swap level, will, therefore, reflect the risk that the dealer assumes in having to source an additional default swap to remain hedged.

Conceptualising Default Swap MTM Values

Can think of MTM in terms of an offsetting transaction . . .

Intuitively, the MTM value of a default swap should equate to the cost of entering into an offsetting transaction. For an investor who has sold protection, the offsetting trade constitutes buying protection on the same reference entity with essentially the same terms as the original trade. The main variations in the contracts will be a) Pricing, reflecting market movements and b) Contract Term, so that the new contract expires on the same date as the existing contract.

For example, if an investor sells 5yr protection at 150bps, then a tightening in the default swap premium of the reference entity to 100bps would result in a positive MTM value. The investor is effectively receiving a 150bps cash flow stream while current market levels would only provide him with 100bps (ignoring bid/offer). Similarly, if premiums subsequently widened to 200bps, the MTM value becomes negative. The investor is not being compensated enough in this case.

. . . that results in an annuity

Conceptualising this MTM value requires an analysis of the resultant flows that would arise **if** the two offsetting transactions were put in place. For simplicity, if we assume that the payment dates of the two trades match perfectly, then the investor is effectively long, or short, an annuity payment (the aggregate of the premiums) until the maturity of the original default swap. The MTM is then derived by discounting the annuity.]

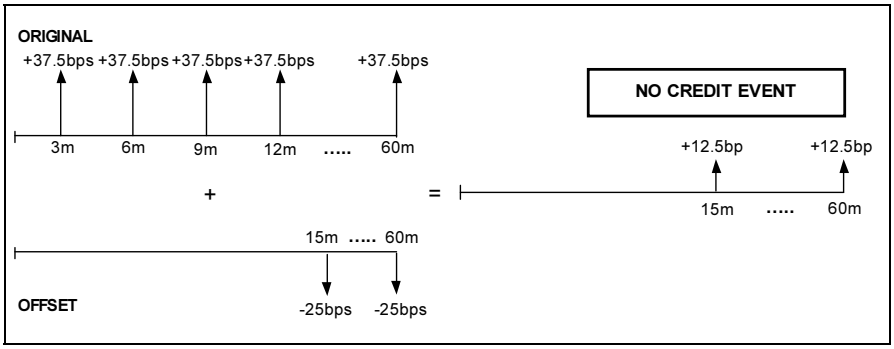
Chart 30: MTM Value Can Be Thought of In Terms of the Resulting Annuity

Resulting cash flows from:

Selling 5yr Protection @150bps

+

Buying 4yr Protection @100bps 1yr later



Source: Merrill Lynch

Discounting this annuity derives the MTM value

Chart 30 shows how the MTM value can be thought of for an investor who has sold 5yr protection at 150bps and wishes to MTM the position after one year. In this case, we assume the current market premium to buy protection on the same reference entity (for 4yrs) is 100bps. Thinking in terms of two offsetting trades,

Refer to important disclosures on page 118.

the investor can be considered long a 4yr 50bps annuity. Discounting this annuity would then give the investor the MTM value of his original default swap position.

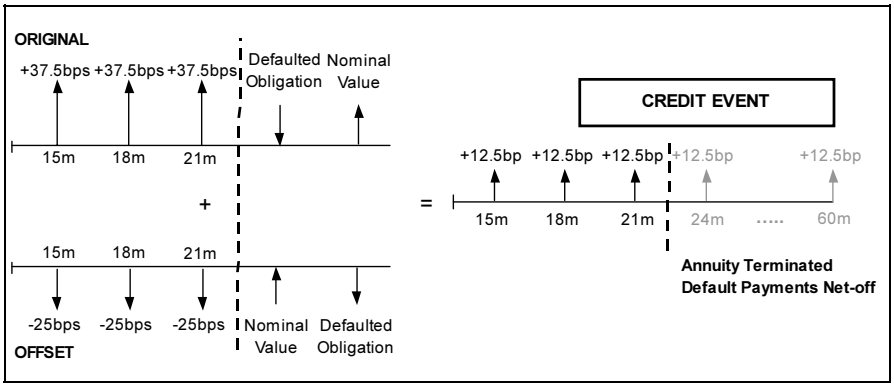
Risky Cash Flows

Annuity is risky . . .

The above methodology is, however, incomplete since the annuity stream is not risk free. Credit events during the remaining life of the parallel contracts would put an end to the annuity payment. Following a credit event, both legs of the long and short protection positions would net out and terminate, leaving the investor flat. Since the annuity may cease prior to its maturity, the carry earned by the investor may fall short of the expected carry. Chart 31 below shows the case where a credit event terminates the annuity prior to its maturity.

Chart 31: Credit Event Terminates The Annuity Leaving An Investor Flat

. . . and terminates following a credit event



Source: Merrill Lynch

■ Survival Probabilities As Weighting Factors

Cash flows are weighted by survival probabilities . . .

To factor this risk into the value of the annuity, each cash flow in the annuity stream must be weighted by the probability of there being **no credit event** before that cash flow date. We introduced these weighting factors, called the **Survival Probabilities** of the credit default swap, in Volume 1, Chapter 2. The expected value of the annuity, and hence our MTM on the existing swap position can now be defined as:

$$\mathbf{MTM} = \sum_{i=1}^{S} \mathbf{Annuity}(\$) \times \mathbf{SP_i} \times \mathbf{DF_i}$$

Where,

Annuity($) is the annuity payment
S is the number of coupon periods in the annuity
SP_i is the Survival Probability of the reference entity from time t_o to t_i
DF_i is the riskless discount factor from time t_o to t_i

. . . which reduce absolute MTM value

The introduction of survival probabilities (between 0 and 1) has the effect of reducing the **absolute** MTM value. This will mean a **smaller gain** from the unwind of a **profitable** default swap position but also a **smaller loss** from the unwind of an **unprofitable** default swap position.

■ From 'Riskless' Curves to 'Risky' Curves

Risk-free discount factors → risky discount factors

Another way of interpreting the above equation is to say that the annuity payments are discounted using Risky Discount Factors. In this case, the Risky Discount Factors are given by (Survival Probability × Risk-Free Discount Factor) at each cash flow date.

Given these Risky Discount Factors, we can restate the above equation as:

$$\mathbf{MTM} = \mathbf{Annuity} \times \mathbf{PV01}\ (\$)$$

where PV01($) is defined as the $ present value of a 1bp risky annuity[7] terminating at the earlier of a credit event or the maturity of the original default swap.

MTM dependent upon survival probabilities

It is immediately clear from the above definitions that the MTM of an existing default swap position will be dependent upon the determined survival probability rates.

Modeling Default and Survival Probabilities

Survival probabilities driven by recovery assumptions

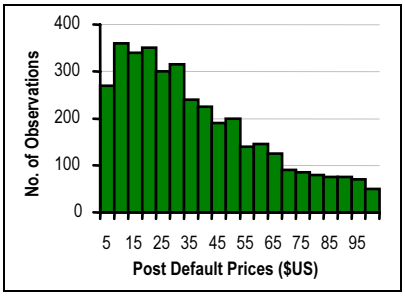
The implied survival probabilities of a credit default swap can be calculated from a model of default and recovery. The normal approach is to calculate them using market data, particularly the on-market CDS spread curve, and also an assumption about the recovery rate of deliverable obligations in the default swap contract. This method is described in Volume 1, Chapter 2.

Determining Recovery Rates

'Recovery' in CDS different from recovery of an obligation

In the bond market, we define the Recovery Rate of a defaultable obligation as the percentage of par claim of the obligation recovered by investors following default. Recovery rates depend not only on the actual recovery rate post default but also the time taken for the recovery rate to be realised. The recovery at the date of default involves discounting the recovery rate on the day it is recovered to the date of default. The delay could be due to legal reasons or the time taken to value the assets following default. The recovery rate assumption by rating agencies is based on the trading price of the defaulted instrument and is valid if the investors can liquidate the position immediately. Empirical studies by rating agencies have looked at recovery rates of defaulted bond issuers over time.

Chart 32: Recovery Rate Distribution



Distribution of Recovery Rates for Straight Bond Issues, 1982-2002
Source: Moody's, ML

Table 8: Average Defaulted Bond Recovery Rates by Security and Priority, 1982-2005

	Average Recovery ($)		
Priority in Capital Structure	**1982-2005**	**2004**	**2005**
Secured Bank Loan	64.2	84.7	91.6
Senior Secured Bonds	52.6	85.7	76.9
Senior Unsecured Bonds	34.6	67.8	54.4
Senior Subordinated Bonds	29.2	43.8	37.0
All Bonds	**35.89**	**69.0**	**53.5**

Source: Moody's:

Recovery in the bond market may not be identical to recovery in CDS markets…

The definition of recovery in the CDS market is slightly different from the definition of recovery in the bond market. In the CDS market, **recovery is defined as the market price of the delivered obligation** in the default swap contract following a credit event. Although rating agency statistics may be a good proxy, they are other reasons why the recovery rates may not be identical. For the purposes of this report we interchangeably use "default" and "credit event". In reality, "default" as captured by rating agency statistics may sometimes be a more severe test than certain credit events. Moody's, for example, notes three categories of default for the purposes of its ratings and historical default statistics:

- missed or delayed interest or principal payments;
- bankruptcy or receivership; and
- distressed exchange either leaving investors with a diminished financial obligation or an exchange for the apparent reason of avoiding default.

…due to 'soft' credit events

Furthermore, restructuring can sometimes be considered a "soft" credit event. Additionally post recovery statistics reflect such "hard default" whereas the expected recovery following for example a "soft" restructuring credit event would likely be significantly higher than for a liquidation. Against this, however, protection sellers assume the cheapest-to-deliver risk following a credit event.

[7] PV01($) = (Notional/10,000) × ∑ (Survival Probability × Risk-Free Discount Factor).

Refer to important disclosures on page 118.

What Do Recovery Statistics Tell Us?

While average recovery rates over a set time period may be a good starting point, they do not highlight the dispersion of recovery values for each class. However, Moody's does highlight the overall recovery rate distribution for straight bond issues from 1982-2002, shown in Chart 32. On the whole, we infer that:

Overall distribution does not appear to be normal

- The recovery rate is a function of the seniority of the obligation.
- The recovery rate distribution is asymmetrical and skewed with a trailing right side tail.

Data from Standard & Poor's highlights the standard deviation of recovery rates for corporate issues and bank debt, shown in Table 9. We infer the following:

Considerable dispersion around the mean

- The data exhibits a considerable amount of dispersion around the mean for each class of debt.
- Bank debt has the highest recovery rate and is generally less volatile than the other debt classes.

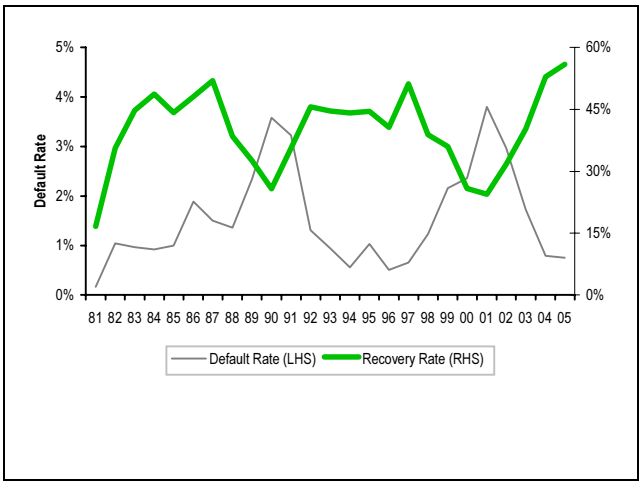
Table 9: Recovery Rates and Their Dispersion for U.S. Corporate Issues

Class of Debt	Recovery Rate (%)	Standard Deviation (%)	Observations
Bank Debt	77.5	30.9	1,204
Senior Secured Bond	62.0	33.3	301
Senior Unsecured Bond	42.6	34.8	769
Senior Subordinated Bond	30.3	33.3	469
Subordinated Bond	29.2	34.2	394
Junior Subordinated Bond	19.1	30.6	49

Source: Standard & Poor's. 1987-2005.

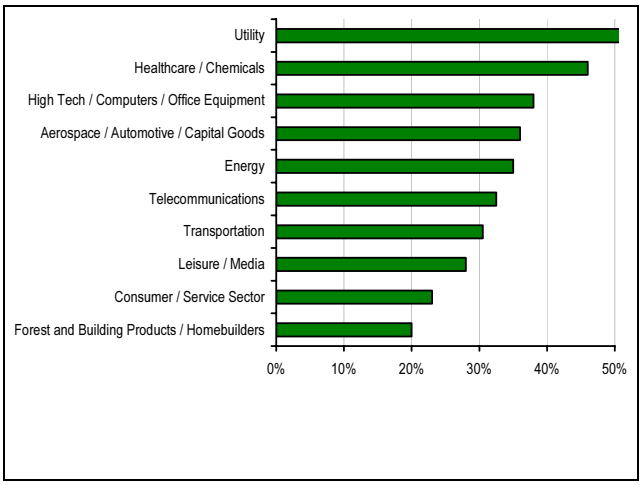
Finally, rating agency data provides insight into the behavior of recovery rates over time and across sectors. Recovery rates are negatively correlated with default rate, meaning that low recovery rates tend to be associated with years of high default rates (Chart 33). Also, recovery rates vary significantly by industry (Chart 34).

Chart 33: Recovery Rates vs. Default Rates Negatively Correlated



Source: Moody's. Correlation = -0.51.

Chart 34: Recovery Rates Differ by Sector



Source: S&P. Since 2000.

Recovery History in CDS Market

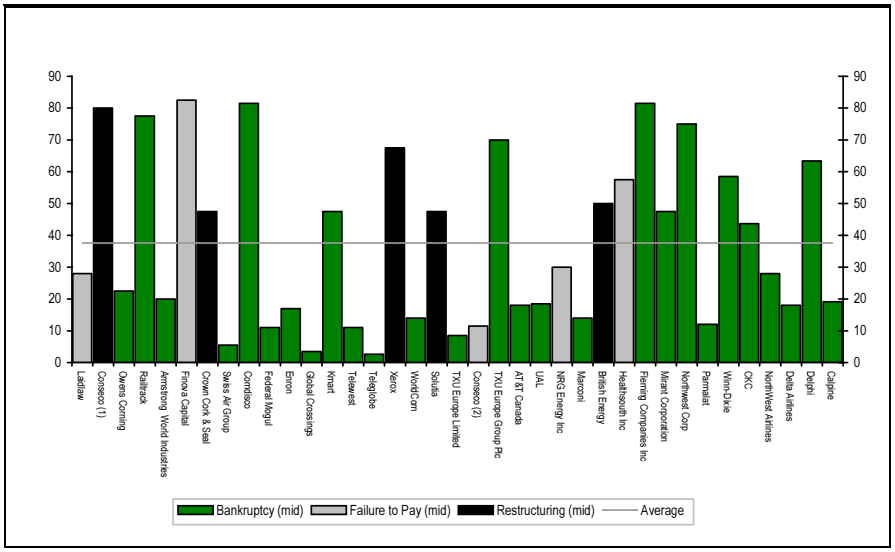
On average, assumptions are correct..

..but in reality rarely realized

The market assumes a recovery of about 40% in the unwind market for senior unsecured CDS contracts. To assess the real-life implications of this assumption, we compared this level to actual recovery rates for recent credit events (Chart 35).

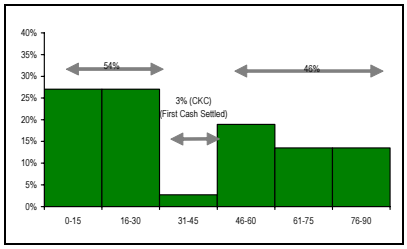
We note that, on average, actual recovery rates had a mean 37.6, or very similar to the market convention. They varied, however, significantly, ranging from a low of 3 to a high of 83. In particular, they appeared to be higher for the Restructuring credit event than Failure to Pay or Bankruptcy credit events. Interestingly, though, the only entity to realize a recovery rate similar to the market standard of 40 was CKC, the first cash-settled index default. Indeed, actual recovery rates appear to have followed a binary distribution around that mean (Chart 36).

Chart 35: Recovery Rates for Selected CDS Credit Events



Source: Merrill Lynch.

Chart 36: Distribution of CDS Recovery Rates



Source: Merrill Lynch

An Example of Unwinding Credit Default Swaps

A Case Study

Investor buys protection from Broker/Dealer and unwinds it one year later at a profit

Table 10: Example of an Existing Trade to be Unwound

Existing Trade Details	
Investor:	Bank A
Counterparty:	Broker/Dealer
Trade Initiation Date:	20-Mar-2005
Trade Maturity	20-Mar-2010
Trade Type:	Bank A buys 5y default protection
Reference Entity:	ABC Corp
Reference Obligation (Senior Debt):	ABC 6% Mar-2010, rated Baa2/BBB
Trade Currency:	USD
Notional:	$10,000,000
Premium:	Bank A pays Broker/Dealer 2% per annum (Quarterly in arrears, ACT/360)
Unwind Details	
Trade Unwind Date:	20-Mar-2006
Unwind Premium:	2.30%
MTM Value	**Positive**

Source: Merrill Lynch

Investor has three options . . .

Bank A can choose one of the following options to unwind the existing default swap position:

Refer to important disclosures on page 118.

1. Ask Broker/Dealer to unwind the position and pay Bank A the positive MTM value. Bank A is no longer party to the default swap transaction.
2. Assignment (with agreement of all three parties involved) of the trade to a third counterparty who pays the investor the MTM value. Bank A is no longer party to the default swap transaction.
3. Bank A enters into an offsetting transaction (sells protection) with another counterparty. Bank A is party to 2 different default swaps.

. . . which provide similar MTM payments

Assuming the same unwind levels and recovery rates are attainable in all three cases, the MTM payment is the same for all three options.

All MTM calculations use the principle of an offsetting transaction.The offsetting transaction, however, is hypothetical in cases 1 and 2 but actual in case 3. Assume Bank A chooses option 1. The trade mechanics are as follows:

- MTM would reflect a hypothetical trade where Bank A sells 4yr protection on ABC Corp at 2.30% on a notional amount of $10,000,000.
- The net position would therefore be economically equivalent to Bank A being long a 30bps risky annuity stream until 20th March 2010.
- At a 45% recovery value assumption and the current market quote of 230bps, we can derive the implied survival probabilities for the default swap (Table 11). Together with the risk-free discount factors we derive a PV01 of $**3,520**.
- A 30bps risky annuity stream has a MTM value of **$105,612. (30 × $3,520)**.

Table 11: Survival Probabilities for Unwinding the Trade Example

Tenor	Survival Probability
0	100.0%
1mo	99.7%
3mo	98.9%
6mo	97.8%
9mo	96.9%
1yr	95.9%
2yr	91.9%
3yr	88.1%
4yr	84.5%

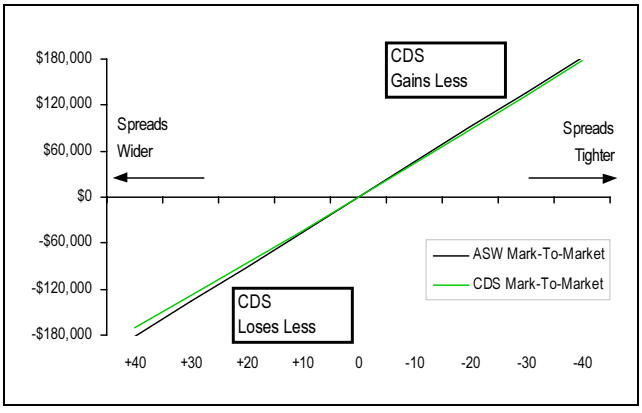
Source: Merrill Lynch

A Note on MTM Differences between Bonds and Default Swaps

Default swaps have a lower "risky duration"

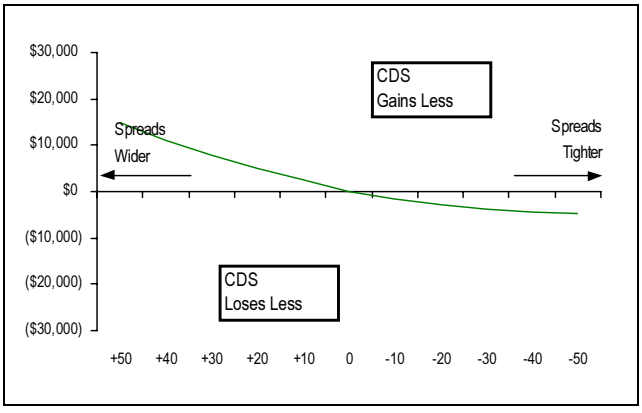
The above example demonstrated a typical unwind valuation. It is important to note that the resultant MTM will typically be different from a comparable cash-market unwind. In general, **a long or short default swap position will have a smaller positive or negative change in value for a given spread change than a comparable asset swap**. In other words, the differing valuation methodology of the two instruments leads to the default swap having a lower "risky duration".

Chart 37: Impact of Spread Change on Short Protection and Long Asset Swap Holdings



Source: Merrill Lynch

Chart 38: Difference in P&L Between the Two Transactions (Default Less Cash) for Simultaneous Spread Changes



Source: Merrill Lynch

Take the following simple example. An investor purchases $10mn of a five-year bond at par which asset swaps to Libor+100bps. The investor also undertakes a similar risk position in the default swap market by selling $10mn of default protection to the same maturity generating a premium of 100bps. If both spreads immediately widen by 20bps, then the loss on the default swap would be lower than the loss on the asset swap. Conversely, however, a simultaneous tightening of spreads would yield a greater profit on the bonds than the gain on the default swap. These two payoffs are plotted in Chart 37 and the difference in payoff between the two trades is shown in Chart 38. For the default swap transaction we have assumed a 45% recovery for the unwind calculation.

Sensitivities of the MTM Amount

Besides recovery, the MTM is also sensitive to other factors:

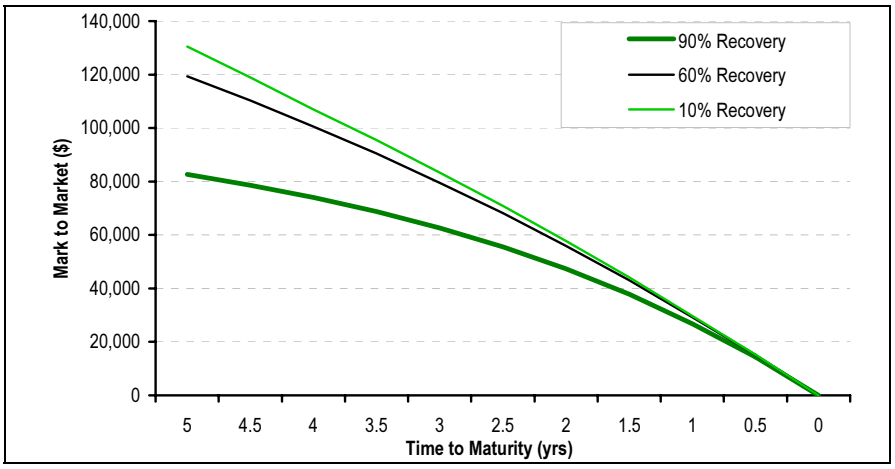
■ Time Sensitivity ('Theta')

MTM also has time dependence – 'Theta'

The MTM of a default swap will also have time dependence. Over time, the MTM declines towards zero with its shortening maturity as less risky cash flows in the annuity remain. This time dependence is shown below in Chart 39. **The MTM becomes more sensitive to changes in the recovery value assumption the longer the default swap has to maturity**.

Recovery value assumption more important the longer the default swap has to maturity

Chart 39: How MTM Values Decline Over Time for Different Recovery Rates



Source: Merrill Lynch

■ Incremental MTM

Given a recovery value, higher premiums mean lower survival probability

For a given recovery rate assumption, survival probability rates are a decreasing function of market premiums. In other words, for a given recovery rate assumption, wider default premiums reflect greater probability of default and hence a lower survival probability.

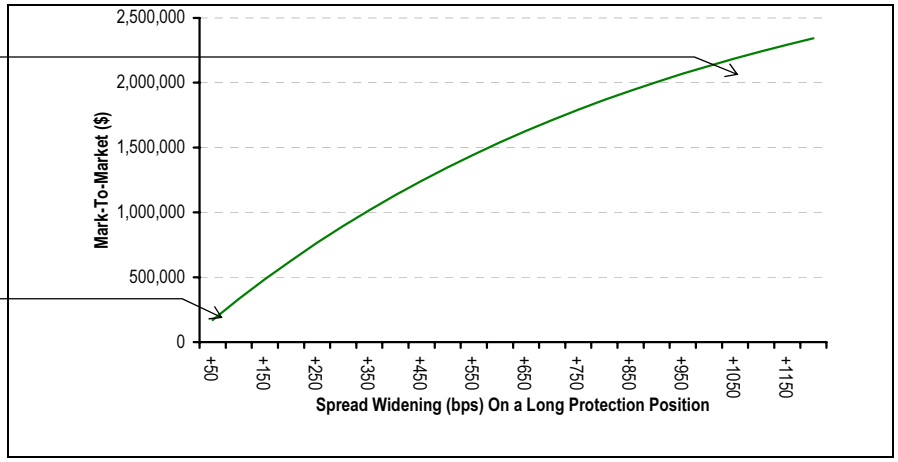
Declining slope of MTM curve

In Chart 40, we show the MTM increase on a long protection position as a result of an increase in premiums. The influence of survival probability at wider premiums can be seen from the declining slope of the MTM curve. Incremental MTM from a long protection position declines as premiums move wider.

Chart 40: Incremental MTM Declines as Default Premiums Increase

Flatter slope of the MTM curve for higher premium levels

Steeper slope of the MTM curve for lower premium levels



Assuming long protection position of 100bps unwound after 1yr with recovery assumption of 65%.
Source: Merrill Lynch

Refer to important disclosures on page 118.

4. Upfront Pricing of CDS

CDS usually trades on a full running spread basis. Under certain conditions, however, it can trade on a full upfront payment basis or on some combination of upfront payment and running spread. The payoff profile of upfront CDS versus running CDS is crucially dependent upon the timing of future defaults. This chapter discusses upfront pricing of CDS in more detail.

Definition, Mechanics and Pricing

■ Running CDS

Every Running CDS premium...

In a standard Running CDS, the protection buyer pays for protection by paying a **regular spread premium** to the protection seller until the earlier of a pre-defined credit event or maturity of the trade. Following a credit event the protection buyer receives the full notional amount of the transaction in return for delivering an equal notional amount of cheapest-to-deliver obligations to the protection seller.

Current convention is for the CDS premium to be paid quarterly, in arrears, throughout the life of the transaction. In a Running CDS, there is **no payment at the initiation of the trade**. Instead the coupon stream paid by the protection buyer is annuity-like but risky.

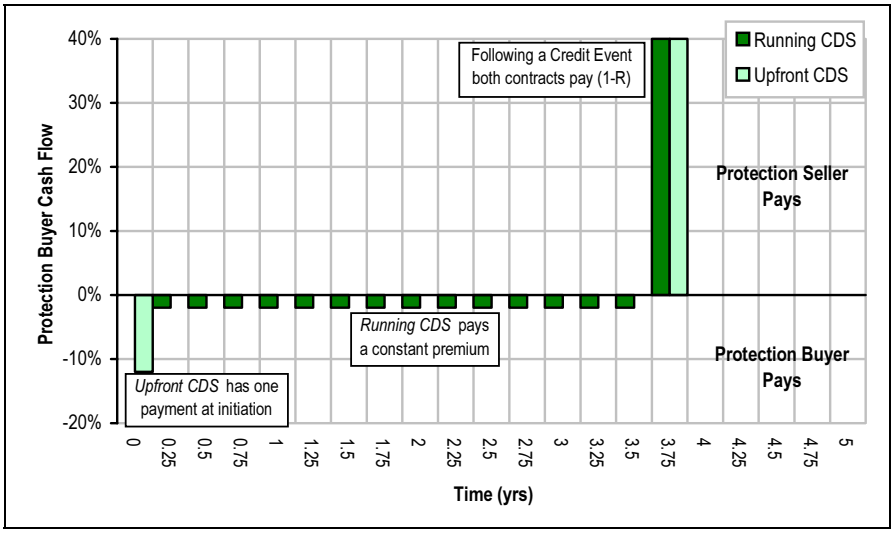
■ Upfront CDS

… has an equivalent Upfront CDS price

When the credit quality of a reference entity deteriorates significantly, the CDS mechanics alter and protection is quoted based on an upfront payment convention. In an Upfront CDS, the protection buyer pays for protection by making **only one cashflow payment to the seller at inception of the trade**. Following a credit event, the settlement mechanics are identical to a Running CDS.

Upfront CDS protection is quoted as a single **lump-sum payment**, essentially 'front-loading' the coupon payments. There is no contractual coupon stream between the protection buyer and seller. For sellers, this type of CDS is appealing as the PV of protection can be **locked-in** as a certain payment as opposed to a risky coupon stream. Upfront CDS can also appeal to protection buyers who do not wish to be locked into paying high contractual spreads during a trade.

Chart 41: Cashflow Dynamics of Upfront and Running CDS



Source: Merrill Lynch. Assuming a recovery rate on the cheapest-to-deliver obligation of 60%.

Following a credit event, both contracts pay 1-R

The cashflow dynamics of both CDS conventions are shown in Chart 41. In the Running CDS, the protection buyer's cashflows are frequent and relatively small, until a credit event when the protection seller effectively pays 1-R. In the Upfront

CDS, the protection buyer's initial cashflow is large by comparison but there are no further payments from the buyer to the seller during the trade.

Upfront CDS reflects weak issuer fundamentals

A majority of trades in the CDS market are Running CDS. When an issuer becomes distressed however and its cash bonds begin to trade on a dollar-price basis, protection tends also to move from a running to an upfront contract. Moreover, when credit curves begin to invert, shorter-dated protection often trades as Upfront CDS whilst the medium to longer maturity contracts remain quoted on a running (albeit high) spread basis.

Upfront price is Risky PV of coupon stream of equivalent running CDS . . .

Every Running CDS spread has an equivalent Upfront CDS price and vice-versa. In fact, the Upfront CDS price is simply the Risky PV of the Coupon Leg of the equivalent Running CDS. Hence, while the cashflow profile changes in moving from a Running to an Upfront CDS, the economic value of the transaction to both the protection buyer and seller remains identical.

. . . but differing dynamics impacts ultimate P&L

However, while the Upfront CDS price is determined such that on a PV basis, the investor is indifferent between Running and Upfront CDS, the differing mechanics with respect to cashflow, funding and carry can alter the variance of P&L outcomes between trading Upfront and Running CDS.

■ Transitioning from Running CDS to Upfront CDS

While there is no clear cut-off point for which a Running CDS transitions to an Upfront CDS, protection sellers have tended to fall shy of quoting Running CDS spreads in excess of around 800-1000bps. In some instances, the single name market has borrowed quoting conventions from the equity tranche market, whereby the name is quoted on a running spread of 500 bps *plus* x% upfront.[8]

More specifically, a move from a Running CDS to an Upfront CDS reflects:

- **Risk Aversion.** Dealers prefer to sell protection on an upfront basis for distressed names to reduce the risk of what the market views as an imminent credit event. Locking-in an upfront payment also reduces counterparty risk arising from the protection buyer's inability to pay a large running premium.
- **MTM sensitivity of an Upfront CDS is less than a Running CDS.** For wide spread credits, this is a crucial difference between Running and Upfront CDS.
- **Cash bonds of the Reference Entity trade on a price and not yield basis** as expected recovery rates become more important. CDS tends also to transition to a different pricing convention at this point. Furthermore, it may be less practical and efficient to quote very large Running CDS spreads.
- **Upfront CDS lowers analytics risk associated with the calculation of accrued premium** post a credit event. This factor becomes much more important as Running CDS spreads become large.

■ Upfront Pricing: A Simple Arbitrage Argument

Simple arbitrage argument . . .

As a first port of call to the pricing of Upfront CDS, we use the cash bond market together with a simple arbitrage relationship to determine the lower bound for the Upfront CDS price for a distressed issuer.

Assume that the issuer has a 5yr bond outstanding, trading at an 80% cash price with a coupon of 4.75%. The Z-Spread on the bond equates to 650bps. Where should upfront protection on this issuer trade? The precise Upfront CDS price requires a model of default and recovery. **However, we use a simple arbitrage argument to provide a lower bound**.

Assume that the Upfront CDS price is quoted at 20%, the bond's discount to par. An investor can purchase the bond and purchase Upfront CDS protection for 100%. Two scenarios arise:

- **No Credit Event over the Life of the Trade**. The investor receives 100% back on the bond at maturity, and a positive carry until maturity.

[8] See Volume 2, Chapter 4 for more on standardized tranches.

Refer to important disclosures on page 118.

- **Credit Event over the Life of the Trade**. The investor delivers the bond in return for a 100% payment. Depending on the timing of the credit event, the investor enjoys some amount of positive carry.

. . . with lower bound being 100%-P . . .

While we have ignored funding costs and counterparty risk issues in the analysis, an arbitrage exists if the Upfront CDS price is less than the bond's discount to par.

We conclude that the Upfront CDS price will cost more than the bond's discount to par. Hence, if **P** is the price of the bond, the **lower bound of the Upfront CDS price is 100%-P**.

. . . and upper bound 100%-R

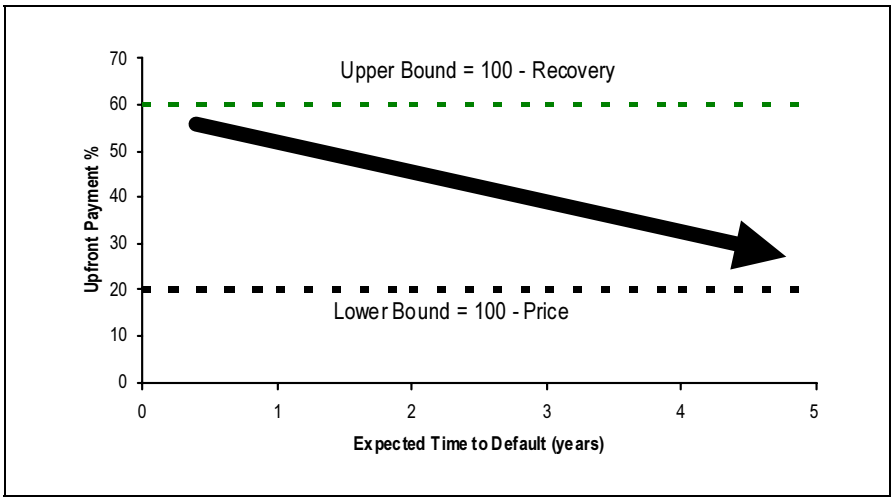
Similarly, consider the worst case situation for the protection seller where a credit event is expected to occur immediately after entering into the CDS contract. Assuming a recovery rate of 40%, the seller would now lose a maximum of 60% (1-R). **The seller would therefore demand a maximum upfront payment of 100%-R, which represents the upper bound of the Upfront CDS price**.

Therefore the Upfront CDS price is bounded as follows:

$$100\% - P < \text{Upfront CDS Price} < 100\% - R$$

The extent to which the actual Upfront CDS price lies between these two bounds will reflect such factors as the expected time-to-default (i.e. credit spreads) and also the "value" of the risky coupon stream on the bond relative to the risk-free rate.

Chart 42: Boundary Conditions for Upfront CDS Pricing



Source: Merrill Lynch. Assume Bond Price = 80%, Recovery = 40%, CDS maturity is 5ys

Upfront or Running?

Upfront vs. running reflects expected default time

What would a protection buyer (seller) choose if given a choice between paying (receiving) the CDS premium upfront or on a running basis? The answer would depend on the buyer's or seller's expectation of the timing of a credit event.

The Upfront CDS price is a function of both the Running CDS spread and the Risky PV01 of the Running CDS:

$$\text{Upfront CDS Price} = S \times \text{Risky PV01}$$

Risky PV01 captures market's view of default time

The Risky PV01 essentially reflects the market's expectation of time to default. For example, a wider spread implies a lower Risky PV01 (risky duration) and vice-versa. The Upfront CDS price 'locks-in' the market's expectation of the timing of a credit event. Consider the following two scenarios:

- Investor expects a credit event before that implied by the market (i.e. the Risky PV01): The investor would prefer to (a) sell protection on an upfront basis, or (b) buy protection on a running basis.

- Investor expects a credit event after that implied by the market: The investor would prefer to (a) sell protection on a running basis, or (b) buy protection on an upfront basis.

Table 12: Relative Performance of an Upfront and Running CDS as a Function of Credit Event Timing

	Protection Buyer Prefers		Protection Seller Prefers	
	Credit Event in the Near-Term	*Credit Event in the Longer-Term*	*Credit Event in the Near-Term*	*Credit Event in the Longer-Term*
Upfront CDS	×	✓	✓	×
Running CDS	✓	×	×	✓

Source: Merrill Lynch

Case Study: Basis Trading With Upfront CDS

Upfront CDS can also be used in basis strategies . . .

To show the relative performance of Upfront vs. Running CDS, we look at a simple basis trade example. In the following scenarios, we have assumed that protection is purchased on the full notional amount of a bond. As the bond is trading at a significant discount to par, this hedging strategy is an *overhedge* following a credit event. Other hedging strategies might involve hedging the Capital-at-Risk or the DV01 of the bond.

. . . with the P&L outcome a function of differing dynamics

What is important to note however, is that the overall P&L is highly influenced by the differing Cashflow, Funding and Carry dynamics of the Upfront CDS relative to the Running CDS.

In this case study, we assume:

- Purchase of a 5yr 7% coupon bond trading at a cash price of 80%.
- 5yr Running CDS spread of 1100bps or Upfront CDS price of 32%.
- Constant funding cost and reinvestment rate of 3%.

To simplify the example, we have assumed that the cashflow dates of the bond and the CDS exactly match. We examine the P&L profiles of the trade under scenarios of no credit event and credit event.

■ Scenario 1: No Credit Event During the Life of the Trade

Bond price and the Upfront CDS price are funded

Table 13 outlines the Cashflows for both the Upfront and Running CDS. With the Upfront CDS, both the bond price and the Upfront CDS need to be funded. The initial cash outlay for the protection buyer is therefore 112%. At each cashflow date thereafter, the protection buyer receives the 7% bond coupon and pays funding costs of 3.4%. There is no further payment due on the CDS so the yearly Net P&L is +3.6%. **This is a positive carry trade**.

Final cashflow is negative

At maturity, the protection buyer receives 100% on the bond but repays the 112% initial funding. However, this final negative cashflow is insufficient to offset the positive cumulative P&L. **Overall, this basis strategy implemented via an Upfront CDS earns a positive P&L of +7.3%**.

Table 13: No Credit Event Cashflows for Protection Buyer Under a 5yr Basis Trade Scenario

		Upfront CDS Convention				Running CDS Convention			
Years	Bond	CDS Cashflow	Cashflow From Funding	Net P&L	Cumulative P&L (with reinvestment)	CDS Cashflow	Cashflow From Funding	Net P&L	Cumulative P&L (with reinvestment)
0	-80%	-32%	+112.00%	0.00%	0%	0%	+80%	0%	0%
1	+7%	0%	-3.36%	+3.64%	+3.64%	-11.00%	-2.40%	-6.40%	-6.40%
2	+7%	0%	-3.36%	+3.64%	+7.39%	-11.00%	-2.40%	-6.40%	-12.99%
3	+7%	0%	-3.36%	+3.64%	+11.25%	-11.00%	-2.40%	-6.40%	-19.78%
4	+7%	0%	-3.36%	+3.64%	+15.23%	-11.00%	-2.40%	-6.40%	-26.78%
5	+107%	0%	-115.36%	-8.36%	**+7.33%**	-11.00%	-82.40%	+13.60%	**-13.98%**

Source: Merrill Lynch. Assuming 35% recovery for calculation of Upfront CDS price.

Refer to important disclosures on page 118.

In the Running CDS only the bond is funded

In the Running CDS, the initial funding is only 80%. However, the running cost of the CDS is the large contractual spread, which more than offsets positive inflows from the coupon i.e. **this is a negative carry trade**. The yearly Net P&L is -6.4%. At maturity, the protection buyer receives 100% on the bond and pays back the 80% funding, resulting in a net positive payment at maturity. However, this final payment is insufficient to offset the negative cumulative P&L. **Overall, this basis strategy implemented via a Running CDS earns a negative P&L of -14%**.

Running CDS has high negative carry

Accordingly, buying a bond and buying Upfront CDS protection is preferable when an investor wishes to gain exposure to a stressed credit that is expected to survive over the trade, but still wishes to retain some downside protection. **In this example the protection buyer would prefer Upfront CDS to Running CDS, as the buyer would benefit over time from not being locked-in to paying a high negative carry**.

■ Scenario 2: Credit Event Immediately After Year 2

Timing of Credit Event a key driver of P&L . . .

Here we assume identical cashflows as above, but that there is a credit event immediately after year 2 (Table 14). We have assumed that the bond recovers 30% and so the CDS payment is 70%.

With the Upfront CDS, the full funding of 112% must be paid back but in the Running CDS only the bond funding of 80% must be paid back. Accordingly, the **P&L is negative for the basis trade implemented via an Upfront CDS but positive for the basis trade implemented via a Running CDS**.

Table 14: Cashflows Under a 5yr Basis Trade Scenario Assuming Credit Event Immediately after Year 2

		Upfront CDS Convention				Running CDS Convention			
Years	Bond	CDS Cashflow	Cashflow From Funding	Net P&L	Cumulative P&L (with reinvestment)	CDS Cashflow	Cashflow From Funding	Net P&L	Cumulative P&L (with reinvestment)
0	-80%	-32%	+112.00%	0.00%	0.00%	0%	+80%	0%	0.00%
1	+7%	0%	-3.36%	+3.64%	+3.64%	-11.00%	-2.40%	-6.40%	-6.40%
2	+7%	0%	-3.36%	+3.64%	+7.39%	-11.00%	-2.40%	-6.40%	-12.99%
C/E	+30%	+70%	-112.00%	-12.00%	**-4.61%**	+70.00%	-80.00%	+20.00%	**+7.01%**

Source: Merrill Lynch

. . . with P&L switching sign depending on this timing

The total P&L of a basis trade structured on a discount bond is clearly a function of the timing of a credit event. **Importantly, the total P&L of a strategy can switch between positive and negative depending on this timing**.

From the two basis trade scenarios we conclude that for a protection buyer:

- A credit event early on in the life of the trade is more beneficial to a Running CDS relative to an Upfront CDS.
- A credit event later on in the life of the trade is more beneficial to an Upfront CDS relative to a Running CDS.
- At a certain point during the basis strategy, there is a Breakeven Point between the two P&L profiles. At this point, the P&Ls following a credit event are identical for both the Upfront and Running CDS.

Investor prefers Running CDS if default is expected soon

Hence, a protection buyer would prefer to implement a basis trade with a Running CDS if it views a credit event as imminent. If a credit event was expected later on in the life of the transaction, the protection buyer would prefer an Upfront CDS.

Running and Upfront basis P&Ls equal at Breakeven Point

In Chart 43 we show the dynamics of the protection buyer's P&L profile over time for both the Running and Upfront CDS basis trade as a function of credit event timing. The longer the reference entity survives the worse the performance of the Running CDS relative to the Upfront CDS.

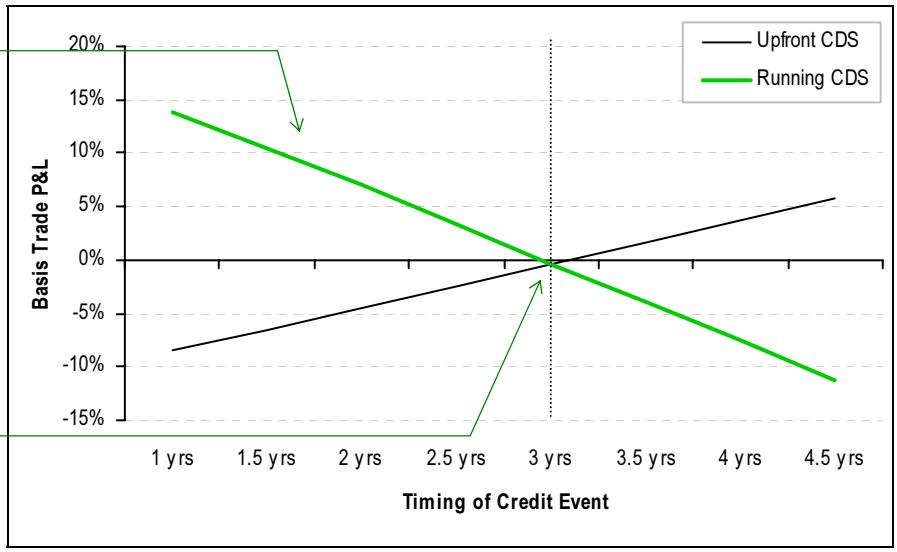
Note that the variance of the P&L is smaller for the Upfront CDS than for the Running CDS. As a result of this property of Upfront CDS, risk-averse protection buyers (and sellers) may prefer to trade on an upfront basis.

***Variance in P&L** is greater for the Running CDS than for the Upfront CDS*

Breakeven Point
*Prior to this date, a basis trade implemented with a Running CDS outperforms (i.e. **Protection Buyer prefers Running CDS**)*

*After this date, a basis trade implemented with an Upfront CDS outperforms (i.e. **Protection Buyer prefers Upfront CDS**)*

Chart 43: Upfront CDS and Running CDS Basis Trade P&Ls: Protection Buyer P&L



Source: Merrill Lynch

Calculating an Upfront CDS Price

At the inception of a CDS, the Risky PV of the Fixed Leg equals the Risky PV of the Floating Leg i.e. an on-market default swap has zero Net PV:

$$\sum \text{Spread} \times \text{Discount Factor} \times \text{Survival Probability} = \sum (1\text{-R}) \times \text{Discount Factor} \times \text{Marginal Default Probability}$$

Fixed Leg *Floating Leg*

Upfront CDS price is Risky PV of Fixed Leg

The left-hand side of the equation is the Fixed Leg cashflows over the life of the transaction: the discounted value of the expected CDS Spread[9]. The right-hand side of the equation is the Floating Leg cash flows over the life of the transaction: the discounted value of the expected **1-R** payment following a credit event.

We calculate the Upfront CDS price as the Risky PV of the Fixed Leg cashflows of the Running CDS (i.e. the left-hand side of the equation). For example, a Running CDS at 800bps translates to an Upfront CDS price (assuming 35% recovery) of 28% and vice-versa[10].

For an Upfront CDS, it is clear from the above definition and equation that the main determinants of price are:

- **Credit Quality of the Reference Entity** impacting the CDS spread.
- **Protection Term** impacting the number of coupon periods.
- **Interest Rate Curve** determining the Discount Factors.
- **Recovery Rate** impacting the Survival Probabilities.

■ Variations in Upfront CDS Pricing

Upfront CDS can also be quoted as a discount to par and a smaller running premium

We have defined the Upfront CDS price as the full discounted value of the Risky coupon stream of a Running CDS. However, the market can also quote Upfront CDS as a combination of upfront payment and a running premium. For instance, if a Running CDS was quoted at 800bps, this could either be quoted as the full upfront payment of 28%, or a combination of 20% upfront (if we wanted the upfront payment to mirror the discount on a bond for instance) and 230bps

[9] Convention is for protection buyer to also pay accrued premium following a credit event.
[10] Although market preference for Upfront CDS at wider spreads may cause it to trade tighter than where the market is quoting Running CDS for the same reference entity.

Refer to important disclosures on page 118.

running. **In other words, once the upfront payment is made, the default swap position becomes economically equivalent to a Running CDS with an off-market spread**. A Running CDS spread can be translated into any combination of upfront payments and (smaller) running premium (Chart 44).

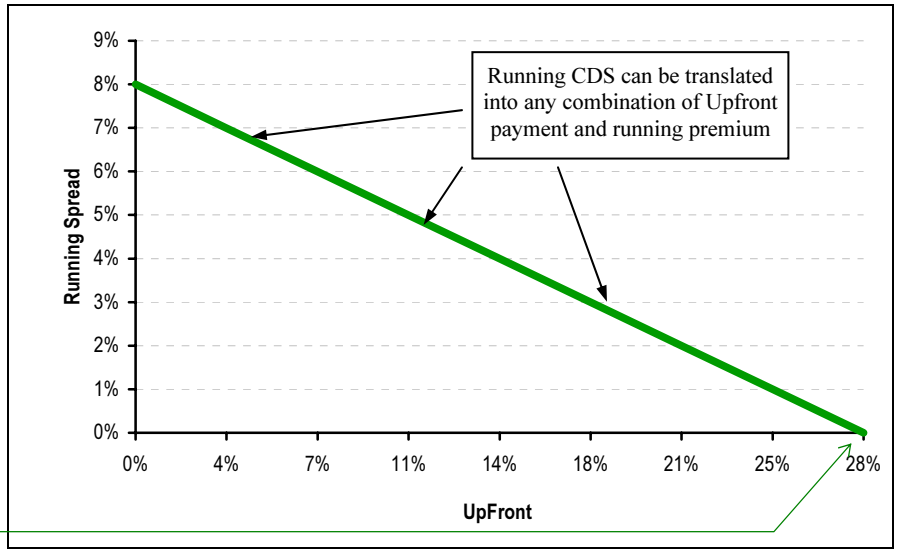
Table 15: Upfront CDS can Either be One Lump-Sum payment or a mixture of Lump-Sum and (smaller) Running Premium

Running CDS Spread	Upfront Only Convention	Upfront and Running Convention
800bps	28%	20% Upfront and 230bps Running

Source: Merrill Lynch

Chart 44: A 800bps Running CDS Can be Quoted as Any Combination of Upfront Payment and Running Premium

Full Upfront CDS Price has many combinations



Source: Merrill Lynch

Unwinding Upfront Trades

Funding and Reinvesting Upfront Payments

Value a Running CDS by 'annuity' arising

A full explanation of unwinding Running CDS is detailed in Volume 1, Chapter 3. In essence, the MTM on a Running CDS can be thought of as the value of the 'annuity' arising from entering into an offsetting transaction until the maturity of the original CDS. If an investor has a positive MTM on an existing Running CDS position then the counterparty has an equal but opposite MTM. To calculate the total P&L on a trade, the value of the coupons paid or received before the unwind date need also to be taken into account.

With Upfront CDS, the crucial new input is funding cost and reinvestment rate . . .

When calculating the MTM of an Upfront CDS we can again think in terms of valuing offsetting transactions. **However, one crucial element that now needs to be taken into account is any funding or reinvestment associated with the initial upfront payment**. In other words, from the perspective of a protection buyer the funding cost of the Upfront CDS payment needs to be considered. Likewise, from the perspective of the protection seller the reinvestment rate of the Upfront CDS payment needs to be considered.

For an investor who has sold Upfront protection on a reference entity until time **T** say, the MTM of the position at time **t** before maturity is:

$$MTM = Upfront(0,T) - Upfront(t,T)$$

Where **Upfront(0,T)** is the value of the initial protection sale and **Upfront(t,T)** is the cost of buying protection as an offsetting transaction at time **t** until time **T**. As

in the case of a Running CDS, if an investor has a positive MTM on an existing Upfront CDS position then the counterparty has an equal but opposite MTM.

. . . which can break the symmetry of P&Ls between buyer and seller

The P&L for a protection seller, incorporating reinvestment rates is therefore:

$$P\&L_{SELLER} = Upfront(0,T) \times k - Upfront(t,T)$$

Where ***k*** is defined as the value of 1 unit of currency invested at time 0 until the unwind date. Similarly, the P&L on a position from the perspective of a protection buyer, incorporating funding costs is therefore:

$$P\&L_{BUYER} = Upfront(t,T) - Upfront(0,T) \times k$$

Note however, that symmetry of P&L between the protection buyer and seller does not have to hold. Importantly, if funding costs and reinvestment rates are different, then the respective P&Ls will not match.

■ Mark-to-Market Implications for Spread Changes

Unwinding Running CDS

$MTM_{RUNNING} = (S_{NEW} - S_{OLD}) \times Risky\ PV01_{NEW}$

where S is the CDS spread.

Buying protection with both an Upfront and Running CDS will have a positive MTM as spreads widen, and negative MTM as spreads tighten. **However, the MTM of a Running CDS is more sensitive to changes in the CDS spread of the reference entity than for an Upfront CDS position**.

Unwinding Upfront CDS

$MTM_{UPFRONT} = MTM_{RUNNING} - S_{OLD} \times (Risky\ PV01_{OLD} - Risky\ PV01_{NEW})$

Note for both old and new levels:

Upfront CDS price = S × Risky PV01

To understand why, note that in an Upfront CDS all the market information with respect to Spread, Recovery and Interest Rates is essentially 'locked-in' to the contract i.e. there is no subsequent exposure to future changes in these variables. However, for a Running CDS, the Fixed Leg is sensitive to all of these factors via the presence of the Risky PV01 (which is itself a function of spread). In other words, the unwind MTM of a running CDS (see side text) is the discounted expectation of a risky coupon stream.

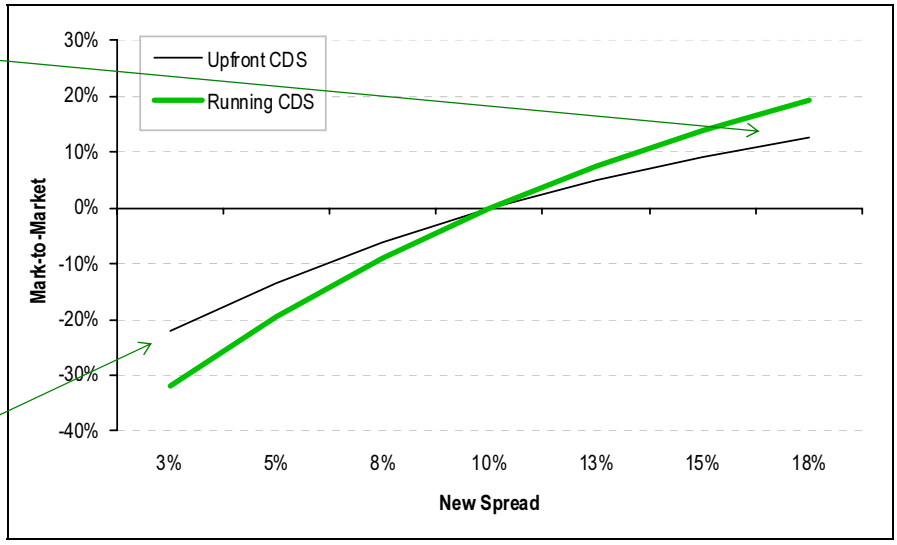
In Chart 45 we show MTM of a long protection position as spreads both widen and tighten. MTM of both Upfront and Running CDS is positive as spreads widen, and negative as spreads tighten. However, the magnitude of the MTM is different. The Upfront CDS exhibits lower sensitivity with respect to spread movements.

Risk-averse investors may therefore prefer Upfront CDS to Running CDS

In other words, a long protection position with Upfront CDS loses less from spread tightening than compared to a Running CDS (but gains less from spread widening). Risk-averse investors may therefore prefer to trade Upfront CDS to Running CDS depending on their views about future spread volatility.

Chart 45: Comparison in Performance of a Long Protection Position as Spreads Change: Upfront CDS vs. Running CDS

*Upfront CDS **gains less** as spreads on a long protection position widen . . .*



*. . . but subsequently **loses less** as spreads on a long protection position tighten*

Source: Merrill Lynch. Assuming protection bought at 10% and immediate spread change.

Refer to important disclosures on page 118.

5. Valuing the CDS Basis

Defining the Basis

The arbitrage relationship[11] provides a fundamental linkage between default swap premiums and asset-swapped par bonds. However, the yields on the two instruments frequently do not correspond to what this arbitrage relationship tells us. The difference between the asset swap spread and the CDS premium is known as the CDS basis. If the CDS premium is higher than the asset swap yield, the basis is said to be **positive**. If the CDS is tighter the basis is **negative**.

CDS BASIS = CDS PREMIUM – ASSET SWAP SPREAD

Which Relative Value Benchmark to Use?

The choice of which asset swap structure to use is crucial when bonds move away from par

However, there is more than one structure of asset-swap package in the market, and when bond prices begin to move away from par these differing structures start to produce different measures of risk.

To further complicate matters there is the Z-spread valuation measure which provides a differing methodology to asset swaps. None of these measures is perfect, but it is important to understand their pluses and minuses when looking at bonds trading away from par. In such circumstances, the correct choice of valuation measure will be crucial in determining absolute (as opposed to relative) value.

Asset Swap Structures

Asset swaps are used to transform the cashflows of bonds

An asset swap is a transaction which transforms the cashflows of a bond through the application of one or more swaps. For example, bond coupons can be swapped from fixed into floating rate or vice versa, interest and principal can be swapped into a different currency, or the yield from a security can be swapped to a cashflow based on an index in another asset class. We concentrate on the first case for comparison with default swaps.

A fixed-floating asset swap is an over-the-counter package product consisting of two simultaneous trades:

- The asset swap buyer purchases a fixed-rate bond from the asset swap seller (usually a bank who has put the structure together).
- The asset swap buyer enters into an off-market interest rate swap with the asset swap seller. In the swap, the bond's coupons form the fixed leg payment, in return for receiving LIBOR plus (or minus) an agreed fixed spread on the floating leg. The maturity of the swap is the same as the maturity of the asset.

Investors can gain synthetic exposure to FRNs or create higher-yielding assets

This structure enables investors to gain exposure to a bond's credit risk with minimal interest rate risk. Creating synthetic floating-rate assets may be desirable if higher yields are available than on the straight floating-rate debt of an issuer, or if the required maturity exposure is not available in floating-rate form. Banks, hedge funds and securities companies, which fund on a floating-rate basis, are natural buyers of such products.

As a result, if there is an active asset swap market, bond prices can never become too cheap relative to similar floating-rate issues. As a result, asset swaps tend to create a natural floor to bond prices and help reduce the price volatility of bonds.

While there are many variations of asset swap structure – forward starting, cross-currency, callable, and others – there are two types of fixed-floating structure that the market uses, both of which can give different asset swap spreads.

[11] See Volume 1, Chapter 2.

Par Structure

Par-Par structure most common swap form

The most frequently used is the "par in-par out" structure. Under a par structure, the asset swap buyer effectively buys the package from the asset swap seller at par, regardless of the cash price of the bond, and the notional amount of the swap is equal to the face value of the underlying bond.

Tax and accounting reasons may make it advantageous to buy and sell non-par assets at par through such an asset swap structure. If the bond is trading below par, the asset swap seller can be thought of as effectively having an upfront "profit". If the bond is trading above par, the asset-swap seller effectively has an upfront "loss".

If P<100, seller has upfront "profit"

If P>100, seller has upfront "loss"

Fixed payments on IR swap

Floating payments on IR swap

At initiation, the PV of all the cashflows must be zero. As such, the asset swap spread satisfies the following equation (from the perspective of the asset swap seller):

$$0 = 100 - P + \sum_{i=1}^{M} C \times d_i - \sum_{i=1}^{M} (L_i + A) \times d_i \times \alpha_i$$

Where,
P is the cash price of the bond,
A is the Par-ASW spread,
d_i is the i^{th} discount factor (derived from swap market),
L_i is the i^{th} LIBOR rate set at time t_{i-1} and paid at time t_i,
C is the bond's coupon,
α_i is the accrual factor in the appropriate daycount basis.

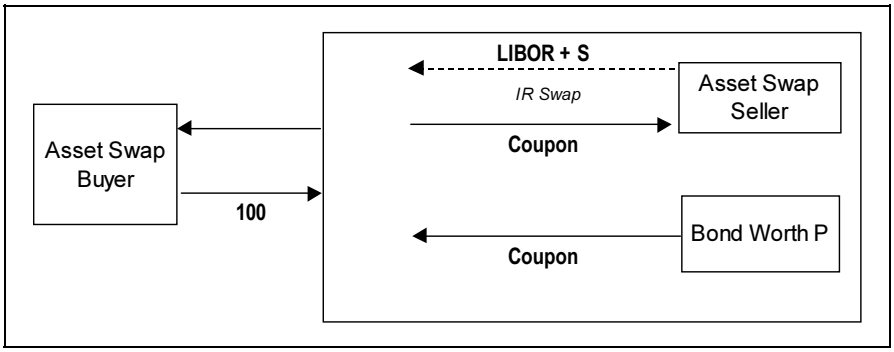
Upfront "profit" or "loss" impacts Par-ASW spread

Thus any upfront profit or loss will impact the spread that the asset swap buyer receives. If the bond is trading at 85c, for example, the remaining 15c can be thought of as "subsidising" the floating rate spread over the life of the asset swap. As the swap progresses towards maturity, this deposit will decrease, and other things being equal, the bond's market price will accrete towards par.

Counterparty risk is greatest at initiation of a par asset swap

Paying par to buy an asset swap on a discount bond results in the asset swap buyer having an immediate exposure to the asset swap seller equal to par minus the bond price (the opposite is true for a premium bond). Hence, under this structure, counterparty risk is greatest at initiation and falls to zero at maturity.

Chart 46: In a Par Structure the Package is Bought for 100 Irrespective of Bond Price



Source: Merrill Lynch. 'S' denotes the Par-ASW Spread.

If the bond defaults the IR swap component does not stop as well

One of the disadvantages of asset swaps is that the credit performance of the underlying bond and the swap are not linked – if the bond defaults before maturity the interest rate swap component of the structure does not automatically stop. In this instance, the asset swap buyer has to continue paying the fixed leg of the swap – despite losing the ability to fund the leg with the coupon of the bond – or unwind the swap position incurring a MTM profit or loss. The asset swap buyer also loses the par redemption of the bond, receiving whatever recovery rate the bond issuer pays.

Refer to important disclosures on page 118.

Market Structure

Market structure asset swaps used less frequently

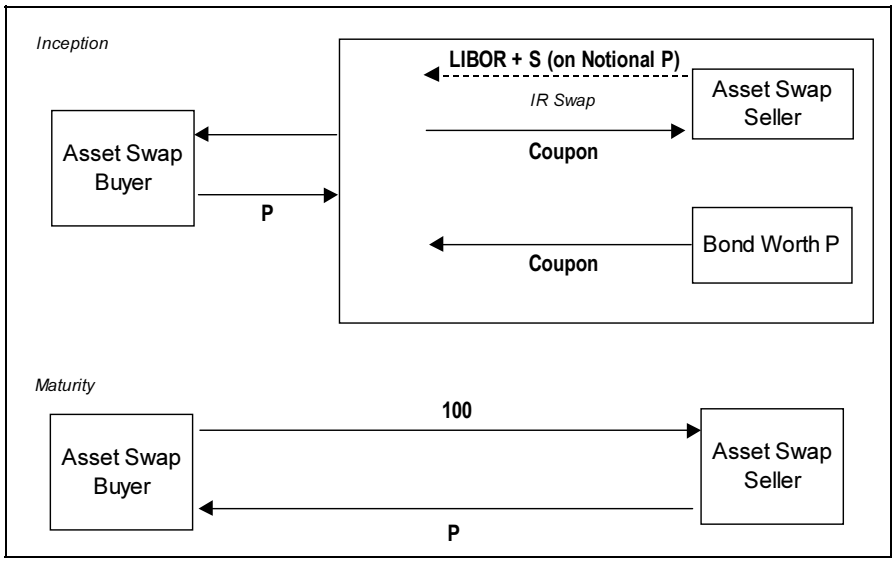
Under a "market in-market out" structure, the investor buys the package at the cash market price (not par) of the bond and the notional amount of the floating leg is equal to the bond price. At maturity there is an exchange of par for the original cash market price. In this structure the asset swap seller has no upfront "profit" or "loss". If a bond is trading at 85c, for example, the asset swap buyer would buy the package at 85c but also make a net payment of 15c to the asset swap seller at the end of the transaction term.

Using the notation above (and with A now the Market-ASW spread), we have at inception that:

$$0 = \sum_{i=1}^{M} C \times d_i - \frac{P}{100} \sum_{i=1}^{M} (L_i + A) \times d_i \times \alpha_i + (100\text{-}P) \times d_M$$

Final exchange of notionals

Chart 47: Market-Market Structure Involves a Net Payment at Maturity



Source: Merrill Lynch. 'S' denotes the Market-ASW Spread.

With this variation of asset swap, counterparty risk starts at zero and increases to its largest at maturity. Moreover, counterparty risk in the market structure is the reverse of the par structure: for a discount bond, the par structure exposes the asset swap buyer to counterparty risk but the market structure exposes the asset swap seller to counterparty risk, and vice versa. In Chart 48 we summarise the counterparty exposures of both structures.

Counterparty exposure is reversed when going from par to market structures

Chart 48: Counterparty Risk for Par and Market ASW Structures

	Discount Bond	Premium Bond
Par Structure	Asset swap buyer takes counterparty risk (Front loaded)	Asset swap seller takes counterparty risk (Front loaded)
Market Structure	Asset swap seller takes counterparty risk (Back loaded)	Asset swap buyer takes counterparty risk (Back loaded)

Source: Merrill Lynch

As bond prices fall, par structure spreads are lower than market structure spreads

It can be shown that the Market-ASW spread will be (100/P) × A, where A is the Par-ASW spread for the same bond. Clearly, as bond prices fall below par, the Market-ASW spread will be higher than the Par-ASW spread, and vice versa for above par bonds.

Interpolated Spread (I-Spread)

Michelle Charles has contributed to the discussion on I-spreads, Z-spreads and par-adjusted Z-spreads.

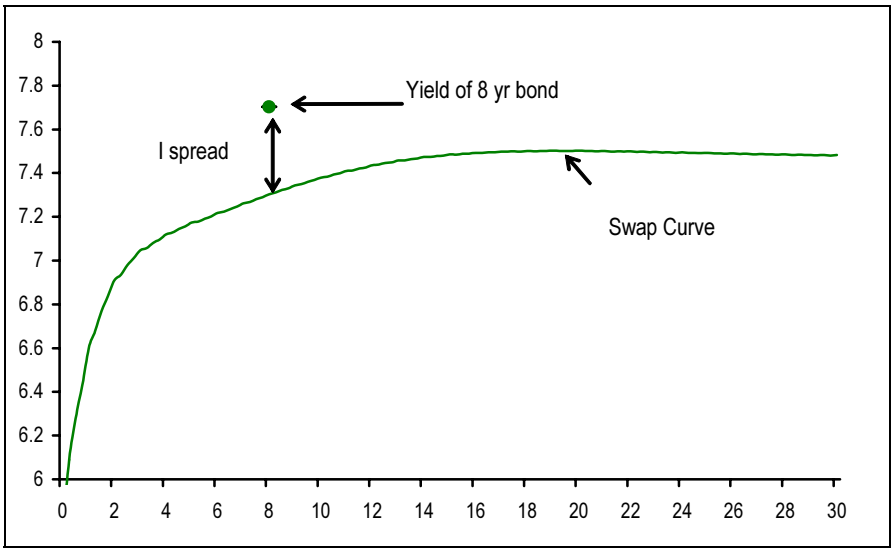
In switching from Treasury space to Libor space in quoting spreads there are several options available. I-Spread, Z-Spread and Asset Swap Spread are the most frequently quoted. All are available on Bloomberg through the YAS and ASW screens and each serves a unique purpose in understanding relative value among bonds and cash flows.

The "I" in I-spread stands for interpolated. I Spread is simply the difference between the yield to maturity of the bond and the interpolated swap rate at the bond's maturity date. It is the easiest to calculate of the three spreads. Consider the following example:

- Bond Yield: 7.7%
- Bond Maturity: 8.1 Yrs
- Interpolated Swap Rate for 8.1; Yrs :7.3%
- I Spread = 7.7 – 7.3 = 50 bps

Chart 49 illustrates I spread of a bond. Differences sometimes arise depending on whether the swap curve is a linear interpolation or a fitted curve between swap points.

Chart 49: I-Spread Illustration



Source: Merrill Lynch

I-spread is limited in that the duration of the bond is not taken into account – only the maturity of the bond. For instance, two bonds, one zero coupon, one 10% coupon, both with the same yield and maturity, will have the same I spread, even though the one with a 10% coupon is inherently less risky because of the timing of the cash-flows. Both the Z-spread and the asset swap spread take into account the distribution of cash flows in their calculation.

Par-ASW spreads tend to underestimate risk as bond prices fall

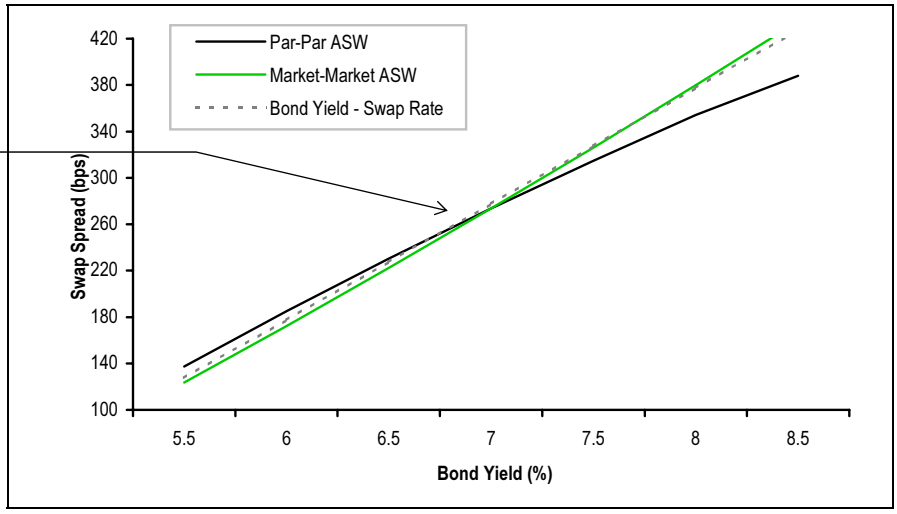
The relationship between the Par-ASW, Market-ASW and the Interpolated Spread (defined as bond yield – implied swap rate) is shown in Chart 50. Where a bond price is near par, both the Par-ASW and Market-ASW spreads are relatively close to each other and furthermore, are very near to the interpolated spread measure of risk. As bond prices fall though, the asset swap measures diverge, with the Par-ASW spread being lower than the Market-ASW spread. Conversely, as bond

Refer to important disclosures on page 118.

prices rise above par, the Market-ASW spread will be lower than the Par-ASW spread (but the divergence between the two measures will be limited as spreads tend to zero).

Chart 50: Relationship Between Par and Market Structure Spreads

Par-ASW and Market-ASW spreads converge when bond prices are at par



Source: Merrill Lynch. € 10yr, 7% annual bond. Market-ASW = (100/P) × Par-ASW.

Asset swap spreads are bond specific measures of credit risk

Due to the different natures and benefits of both structures, an asset swap spread tends to be a bond-specific measure of credit risk. Under the par structure for instance, two bonds with the same maturities and yields may produce different asset-swap spreads if they have different cash market prices, but their interpolated spread would be the same. This is because part of the Par-ASW spread represents the adjustment needed to compensate the asset swap seller for any upfront "profit" or "loss" associated with a non-par bond – but this upfront amount is returned to the asset swap buyer via the floating rate leg with a different daycount basis. This structural feature magnifies the asset swap spread discrepancy the further the bond is trading from par. For a discount bond, this has the effect of "damping" the net return and producing a lower asset swap spread relative to the true risk.

As a result, a better measure for comparing the credit quality of different bonds – and more importantly for relative value with default swaps – is the Z-Spread (or Zero Volatility Spread) measure.

Z-Spread (Zero Volatility Spread)

Interpolated spreads will be volatile and the Z-spread measure attempts to reduce this volatility

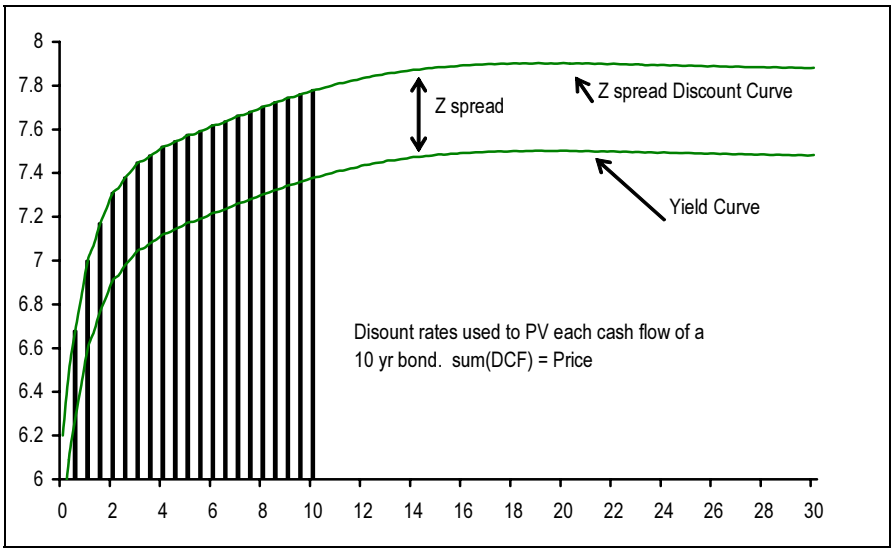
The nominal spread on a bond represents the basis point difference between the yield-to-maturity of the bond and the yield of a comparative maturity benchmark. The yield-to-maturity represents a blended rate received by the investor on the whole series of cash flows of a bond. One drawback of the nominal spread measure is that the term-structure of the benchmark curve is not taken into account. Since in any given period, the benchmark yield differs from the yield-to-maturity, the nominal spread will be "volatile". The Z-spread valuation measure corrects for this volatility by measuring the spread that the investor realises over the entire benchmark curve if the bond is held to maturity.

The Z spread is defined to be the number of basis points which must be added to the spot zero coupon rates along the swap curve used to discount the cash-flows of a security, such that the sum of the cash flows discounted by the zero curve + spread equals its price. Each cash flow is discounted at the appropriate rate based upon when it will be paid. To say it another way, Z is the single number which, when added to each point on the swap curve, produces a discount curve that yields the current price of the bond when used to discount all the bonds cash-flows. This number is calculated through an iterative process.

Because it uses the entire yield curve to value the cash flows rather than just a

single point, the Z spread provides a more accurate reflection of value than I spread, particularly with high coupon or amortizing bonds in steep yield curve environments. Z-spread is also equivalent to OAS with zero interest rate volatility.

Chart 51: Z-Spread Illustration



Source: Merrill Lynch

Cashflows can be valued off the swap market as well

A bond's cash market price indicates the value assigned to its cash flows by the bond market. In the same manner, we can also value the bond's cash flows in the swap market – using discount factors derived from the swap market – which gives an "implied value" of the bond.

Adjust the discount curve until the discounted cash flows equal the cash market price

The Z-spread corrects for discrepancies in the cash market price and "implied value". For instance, a bond trading at par could have an "implied value" of 105 in the swap market. The Z-Spread calculation is the constant spread (continuously compounded) applied to each swap market discount rate, such that the "implied value" is equal to the cash market price.

This is achieved by a trial and error method – if the discounted cash flows produce an "implied value" above the market price, the Z-spread is increased, and vice-versa.

While the bond market values the instrument at 92, the swap market's value of the instrument is 113.01

By applying a constant spread to each discount factor[1] we can equate the "implied value" to the cash market price

Table 16: Example of a Z-Spread Calculation – € 10yr 6% (Annual) Bond at 92 Cash Price

Term	Forward LIBOR Rates	Discount Rates	Swap-Implied PV	New Discount Rates (with Z-Spread Adjustment) [1]	New Swap-Implied PV
today		1.000		1.000	
1yr	2.48%	0.975	5.85	0.950	5.70
2yr	2.95%	0.947	5.68	0.898	5.39
3yr	3.69%	0.913	5.48	0.843	5.06
4yr	4.22%	0.875	5.25	0.787	4.72
5yr	4.57%	0.837	5.02	0.733	4.40
6yr	4.93%	0.797	4.78	0.680	4.08
7yr	5.22%	0.757	4.54	0.629	3.77
8yr	5.42%	0.717	4.30	0.580	3.48
9yr	5.61%	0.679	4.07	0.535	3.21
10yr	5.68%	0.642	68.02	0.492	52.19
PV			**113.01**		**92**
ASW Spread: 252bps					
Z-Spread: 265bps					

Source: Merrill Lynch; [1] New DF= old DF÷ exp(Z × t) , where Z is the Z-Spread (adjusted for daycount).

Refer to important disclosures on page 118.

Relative Value With Default Swaps

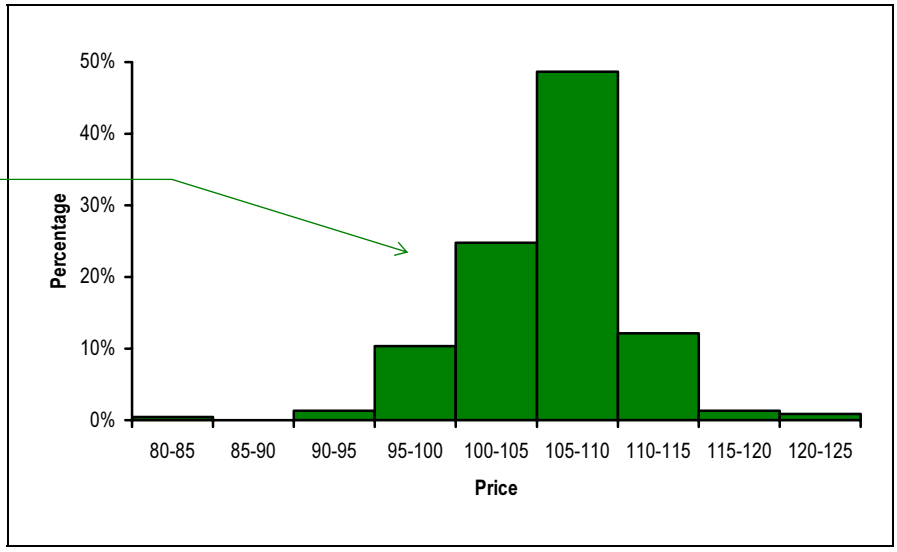
Finding par bonds to asset swap is increasingly rare

The well-established arbitrage relationship with asset swaps is based on a fixed-rate bond trading at par. In practice, finding benchmark par-bonds to assess for relative value may be difficult. On the one hand, credit concerns surrounding many higher profile issuers have driven bond prices below par, and on the other, tightening credit spreads combined with a falling yield environment have put upward price pressure on older bond issues with higher coupons.

Chart 52: Price Distribution for 5-7 Year BBB $ Bonds

Falling yields have pushed corporate bond prices above par

Only about one-third of BBB bonds trade in the par ±5 range (95-105)



Source: Merrill Lynch Index System. At 30 January 2006.

With non-par bonds though, it is dangerous to assume that the arbitrage relationship with asset-swapped bonds still holds. As credit quality worsens, asset swap spreads are influenced by the degree that the bond price is away from par – the par-par structure, for instance, may underestimate the true risk of the bond.

Monitoring value in negative basis trades requires shrewd use of the correct valuation measure

Perhaps the most important practical application of relative and absolute value is with the monitoring of negative basis trades. As credit quality worsens, and the basis strengthens, the choice of bond risk measure becomes critical to assessing whether the package should be held further (in anticipation of further basis strengthening) or unwound for a profit.

Price Adjusted Z-Spread

When bonds trade at a large discount or premium from par, their price impacts the usefulness of spread as a relative value metric because so much less (or more) initial capital is at risk than a standard par bond. One would far prefer to have $90 at risk than $110 to receive the same yield.

We can adjust for dollar price differences by calculating a spread based upon hedging out the difference between the actual price and par using CDS. We calculate the cost of protection to recover the amount over (or under) par and adjust the price by that amount – adding the cost for premium bonds and subtracting the cost for discount bonds. We use a comparable maturity CDS rate.

- Hedge Dollar Amount = (Price - 100)/(1- Recovery)
- $ Cost of Hedge = PV(Hedge $ Amount x CDS Rate) for life of the bond (will be negative for discount bonds)
- Adjusted Price = Price + $ Cost of Hedge
- "Price Adjusted Z Spread" is then calculated based upon this adjusted price.

A simpler, albeit not quite as precise, spread adjustment is:

Spread Adjustment = - (Price - 100) x CDS Rate/(1- Recovery)

Adjusting for the Price Pull

This adjustment is actually an overestimate of the cost/benefit of the premium/discount because it hedges the full premium/discount for the entire life of the bond. In actuality, the bond would amortize to par over time so one would ideally calculate the cost of an amortizing CDS contract where the amount of protection rolls on a similar schedule to the bond amortization. A reasonable back-of-the-envelope approximation is to adjust the cost/premium by half. This assumes a flat CDS curve, a linear bonds roll, and zero cost premium for amortizing CDS vs bullet. However, it is a reasonable approximation as a relative value metric.

- Z Spread Adjustment = - (Price - 100) x CDS Rate/ [(1- Recovery) x 2]

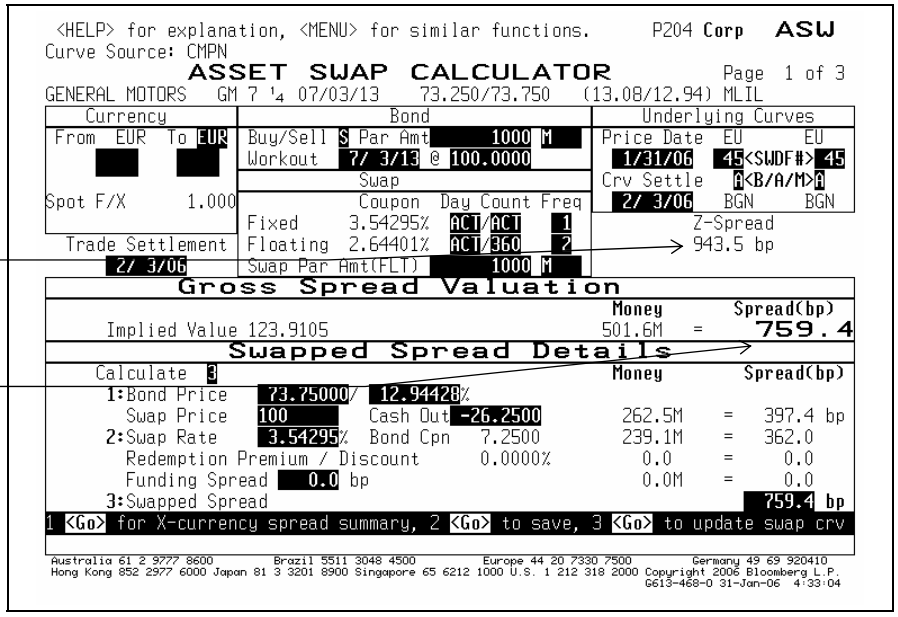
Monitoring Asset Swaps and Z-Spreads

Bloomberg™ provides its own version of an Asset Swap and Z-Spread calculator. Investors can monitor these two measures by typing ASW <GO>. The following example is for the GM €13s, which trade below par. Here, the Z-Spread gives a higher risk measure than the Par-ASW measure.

Chart 53: Using Bloomberg ASW Function to Value Asset Swaps and Z-Spreads

Z-Spread higher than par-par ASW spread as bond price significantly lower than par

Par-Par ASW spread



Source: Bloomberg

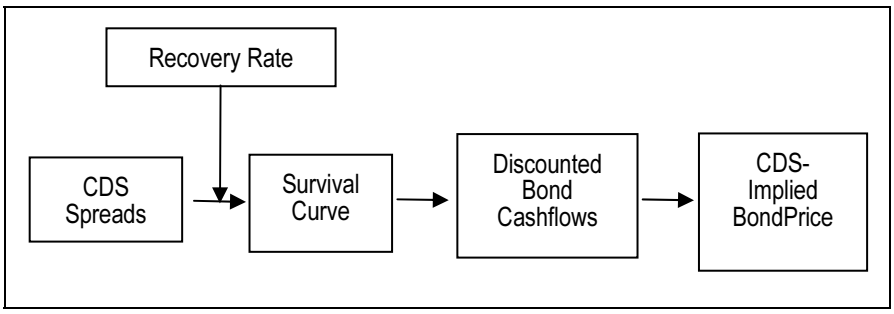
Refer to important disclosures on page 118.

The CDS-Implied Price of a Bond

CDS valuation methods can also help us price bonds better..

CDS valuation methods can also provide insights into the pricing of bonds using risky discount factors. Investors can estimate the recovery rate for a credit, bootstrapping the survival curve obtained from an increasingly liquid curve in nearly all maturities. The cash flows of any underlying bond can then be discounted using the risky discount factors obtained form the survival curve (Chart 54).

Chart 54: Pricing Bond Cashflows with Survival Curves



Source: Merrill Lynch

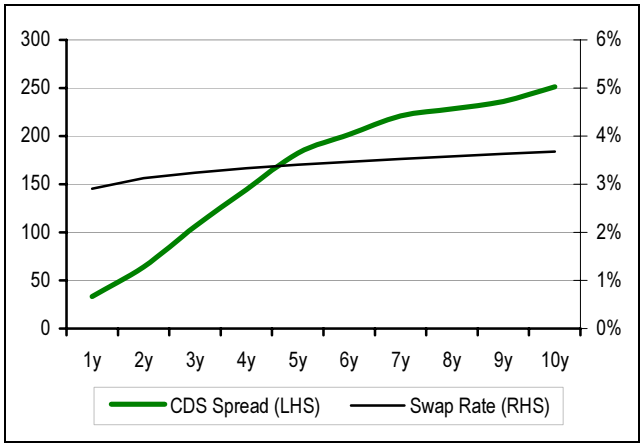
..and identify basis opportunities

These CDS-based valuation methods of bonds not only force investors to establish estimates of recovery rates, thereby incorporating fundamental credit views into the valuation process, but should also facilitate comparisons between risky bonds with high-coupon-price or low-coupon-price. The CDS-derived price of a bond can then be compared to actual trading price to establish whether a bond is cheap or expensive.

Risky discount factors, which incorporate shape of CDS curve, produce lower PVs

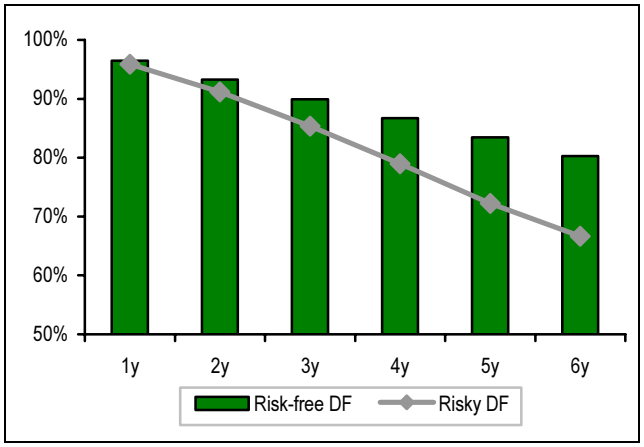
In the case of Corus, we know that both the underlying swap curve and CDS curve are both upward sloping (Chart 55). The Z-spread method only incorporates the shape of the swap curve, but not the CDS curve. Therefore, discount factors applied to bond cash flows using both curves reduce PVs of future cash flows further (Chart 56).

Chart 55: CORUS CDS Spread vs. Swap Rate



Source: Mark-It Partners, Merrill Lynch

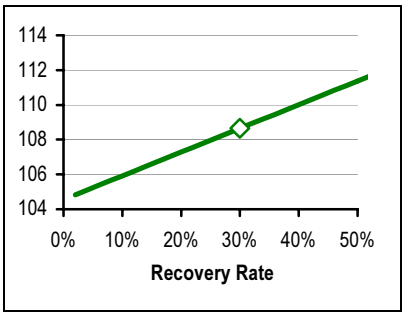
Chart 56: CORUS Risky vs. Risk-free Discount Factor



Source: Mark-It Partners, Merrill Lynch

The price of a defaultable bond can be calculated from the discount curve extracted from the interest rate swap market and survival curve extracted from the default swap market.

Chart 57: CDS-Implied Bond Price for Different Recovery Rates



Source: Merrill Lynch. Fixed default probabilities computed with 30% recovery. White dot represents current market price.

Intuitively, for a given collection of coupon dates, survival curve determines the probability that a coupon payment will be made on each date. Formally, the price of a defaultable bond equals the discounted (and probability adjusted) value of

A. Coupons (up to default) *plus*

B. Par (if no default occurs before maturity, t_n), *plus*

C. Recovery (if default occurs before maturity)

A defaultable bond pays out a series of coupons plus par at maturity. Should default occur at time τ, the coupon flow is interrupted and only a percentage *R* of the par value is recovered. In other words, the cash-flow stream depends on the probability of survival, $P(\tau>t_i)$, at each point in time (t_i). The value (Price) of the bond could thus be summarized as:

$$\underbrace{\sum_{i=1}^{n} c \cdot D(t_i) \cdot P(\tau > t_i)}_{A} + \underbrace{P(\tau > t_n) \cdot D(t_n)}_{B} + \underbrace{R \cdot \sum_{i=1}^{n} D\left(\frac{t_i - t_{i-1}}{2}\right) \cdot P(\tau \in [t_i, t_{i-1}])}_{C}$$

Table 17 shows the CORUS 7 ½ 2011 bonds cashflows discounted using the risk-free rate and survival probability. The last column shows the discounted value of the recovery payment (A + B = 104.56), in case of default between any two dates (C = 4.09). The total price assuming 30% recovery is 108.65, close to the current market price of 108.75.

Table 17: Discounting CORUS 7 ½ 2011 Cashflows Using CDS Survival Curve

Date	Risk-free DF	Survival Probability	Coupon + Principal	Risky DF	Discounted Cashflows	Recovery Rate if Default
11-Feb-06		100.00%				
1-Apr-06	99.66%	99.94%	7.5	99.60%	0.93	0.02
1-Oct-06	98.25%	99.69%	7.5	97.95%	3.67	0.07
1-Apr-07	96.74%	99.34%	7.5	96.10%	3.60	0.10
1-Oct-07	95.20%	98.65%	7.5	93.92%	3.52	0.20
1-Apr-08	93.62%	97.79%	7.5	91.55%	3.43	0.24
1-Oct-08	92.06%	96.40%	7.5	88.74%	3.33	0.38
1-Apr-09	90.48%	94.91%	7.5	85.88%	3.22	0.40
1-Oct-09	88.90%	93.05%	7.5	82.73%	3.10	0.49
1-Apr-10	87.33%	91.20%	7.5	79.64%	2.99	0.49
1-Oct-10	85.76%	88.81%	7.5	76.16%	2.86	0.62
1-Apr-11	84.20%	86.51%	7.5	72.84%	2.73	0.58
1-Oct-11	82.65%	84.52%	107.5	69.86%	71.17	0.49
Total					104.56	4.09

Source: Merrill Lynch. Risky Discount Factor = Risk-free DF * Survival Probability. Using 30% recovery rate

Refer to important disclosures on page 118.

6. What Drives The Basis?

The yield of corporate bonds and premiums on default swaps are linked through the asset swap arbitrage relationship. In theory, the spreads should trade closely in line. In reality it is the exception rather than the norm for CDS to trade on a flat basis to the cash market. In fact, the relationship can be highly volatile and the levels can diverge greatly. The CDS basis can be negative or positive as an end result of a range of forces both structural and technical pulling the CDS in different directions.

The Main Drivers

Market valuations are distorted by lumpy flows

Although the default swap and cash bond markets are essentially just different markets for credit risk, they are not necessarily used by the same participants. In fact certain flows in the protection market can lead to significant default-pricing volatility and substantial divergences in yields for the same underlying credits.

Table 18: Credit Default Swap Basis Drivers

Basis Drivers	Pulls Protection Tighter (Negative Basis)	Drives Protection Wider (Positive Basis)	Either Tighter or Wider (Uncertain Impact)
Market Factors	• Synthetic CDOs/Portfolio Products	• CB Issuance / Arbitrage • Negative Credit View • Repo Market Optionality	• Fixed Rate Debt Illiquid
Structural Factors	• CDS is Unfunded • CDS offers Investment Flexibility • Bonds Trade Above Par • CDS Counterparty Risk • Deferred (Sub) Bond Coupon	• "Soft" Credit Events in CDS • Cheapest-to-Deliver Option • Bonds Trade Below Par	• Coupon Language in Bonds • Multiple Call Dates for Bonds

Source: Merrill Lynch

Market Flows That Drive The Basis

■ Synthetic CDOs/Portfolio Products

Synthetic CDOs imply net protection selling on broad range of credits

A key factor that can drive default swap spreads tighter on a broader range of credits is the launch of large synthetic CDO transactions. In order to sell synthetic credit risk into these structures, the originating investment banks will typically have to build up long credit positions (sell protection) in a wide range of names before or immediately after the transaction which will tend to pull the **overall CDS market tighter.**

In order for a CDO to optimise leverage, rating and funding costs the underlying portfolio of credits must be highly diversified by name, industry and geography. Credits which offer a different profile from the heaviest weightings in the index may not be very liquid in the CDS market but are very important for the overall economics of CDOs and tend to attract a disproportionate offer pulling in CDS premiums. In the cash market by contrast investors tend to focus much more on large liquid issues that have heavy index weightings.

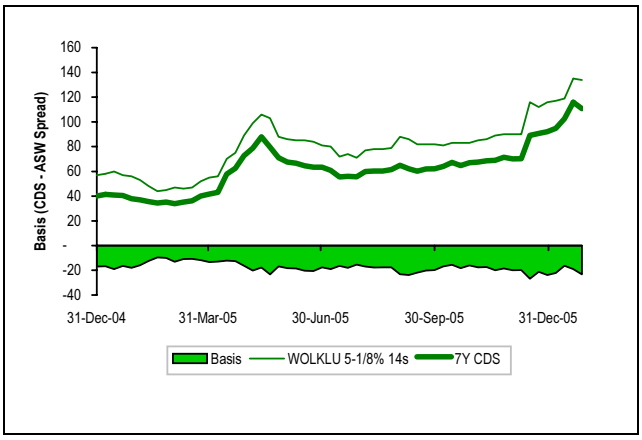
■ Fixed Rate Debt Illiquid

The illiquidity of a company's fixed rate debt can have a distorting impact on the CDS basis. Illiquidity can weaken or strengthen the basis (Chart 58, Chart 59).

If CDS more liquid than debt . . .

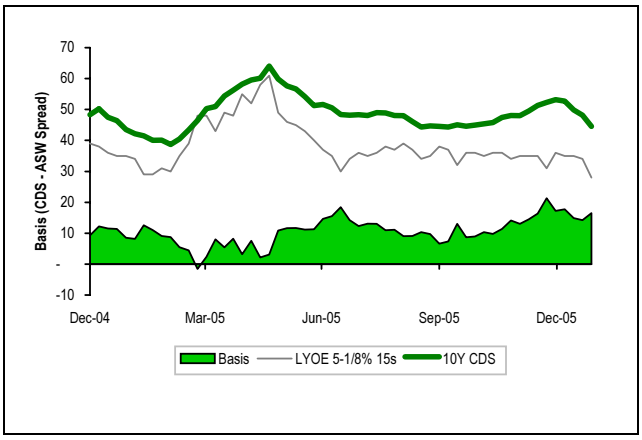
In the cash market, investors will typically favour large liquid benchmark bonds and demand additional spread on illiquid paper. Investors looking for exposure to credits that have illiquid debt outstanding can opt to sell protection on the credit instead. In this case, protection can be more liquid and this tends to **pull CDS spreads tighter**.

Chart 58: WOLKLU Basis Has Been Negative



Source: Merrill Lynch.

Chart 59: Suez (LYOE) Basis Has Been Positive



Source: Merrill Lynch.

. . . but, if debt is tightly held

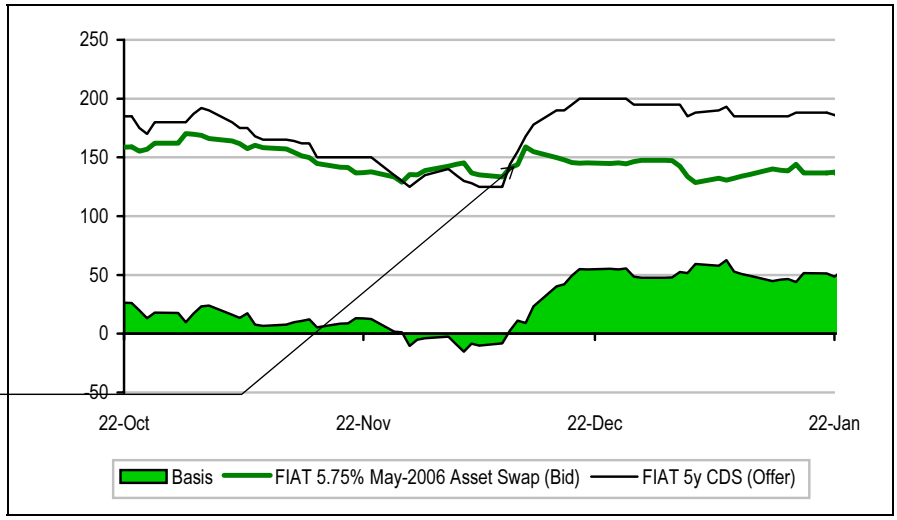
Sometimes, however, the illiquidity of an issue may not be due to its small size but due to its popularity with retail investors and its place as a core holding in domestic funds. In such cases, this debt can trade very tight even through volatile markets and the basis can be positive. A classic example of this is BMW, whose bonds have historically been tightly held, and the **CDS trades wider**.

■ Convertible Bond Issuance

Credit hedging activity by CB investors widens the basis

A typical situation where the **CDS is driven wider** by market flows is during and following the issuance of a convertible bond. In such circumstances CB investors may look to unlock "cheap" equity volatility by hedging credit risk – the credit derivative market typically offers the most effective means of doing this quickly in large size. The following chart illustrates the impact on FIAT's basis following the issuance of a $2.2bn bond exchangeable into GM equity in December 2001.

Chart 60: Fiat Default Swap Widened Sharply Following its Exchangeable Issue in 2001



Fiat issues a $2.2bn Exchangeable Bond in December 2001

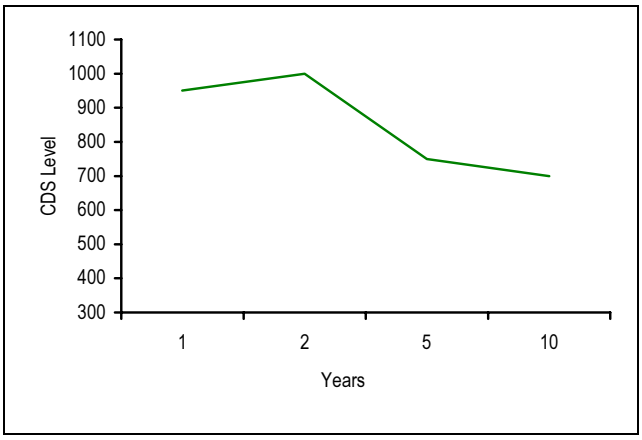
Source: Merrill Lynch

The convertible bond is typically hedged to the put date. This hedging activity impacts the default swap curves by introducing a "kink" at the put date of the convertible and generally **drives the CDS wider**.

This was both the case with Fiat and Vivendi Environnement in mid 2002 (Chart 61, Chart 62), when their convertible/exchangeable bonds were very credit sensitive.

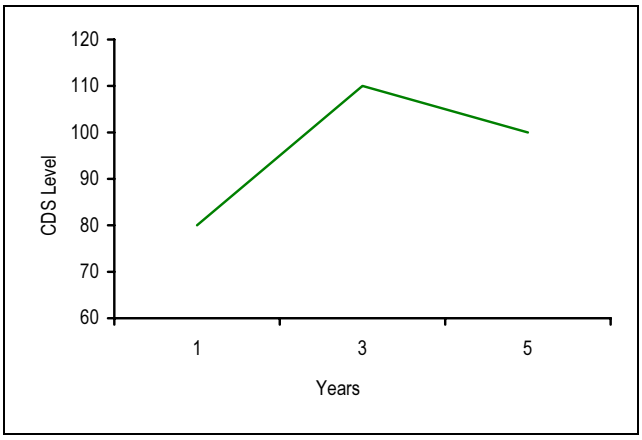
Refer to important disclosures on page 118.

Chart 61: FIAT CDS Curve



Source: Merrill Lynch. Mid 2002.

Chart 62: ViE CDS Curve



Source: Merrill Lynch. Mid 2002.

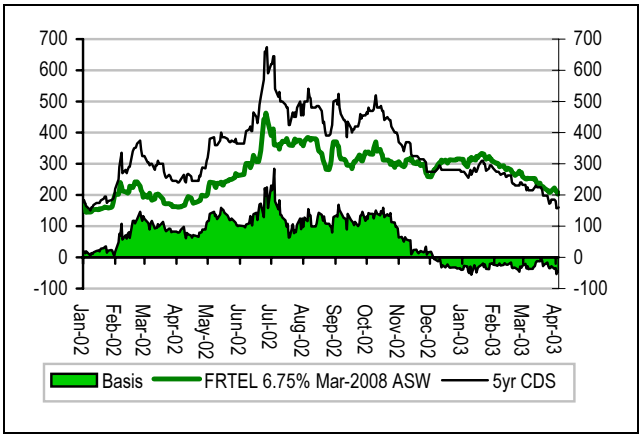
Negative Credit View

Easier to short credit in protection market

Default swaps offer a means of taking a generic credit view by either selling protection (long credit) or buying protection (short credit). This is probably most important when that view is negative, as buying protection is typically much more straightforward than arranging term borrowing of bonds for selling short. As a result, the protection buyer may be willing to pay more for protection than the bid side of the asset swap spread **driving the basis wider**.

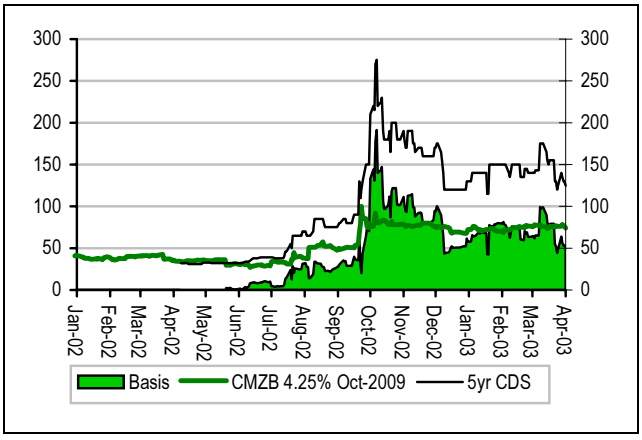
In addition to outright bear strategies, CDS can be extremely useful for hedging illiquid credit exposures (such as loans or counterparty risk concentrations). Indeed the British Bankers Association Credit Derivatives Report 2003/2004 estimated that, with 52% of the market, banks are by far the biggest buyers of protection. Such hedging of credit exposures is made realistic by partial capital relief that is generally made available by bank regulators.

Chart 63: France Telecom CDS Basis



Source: Merrill Lynch.

Chart 64: Commerzbank CDS Basis (Senior)



Source: Merrill Lynch.

As the CDS is typically the instrument of choice for banks hedging worrisome exposures and hedge funds expressing aggressively bearish views, the CDS market is often viewed as a barometer of sentiment towards an issuer. This characteristic is illustrated in Chart 63 and Chart 64 . With France Telecom, the basis widened to almost 300 in the middle of 2002 as the market worried about the company's liquidity and leverage. Interestingly as the markets started to turn more bullish on FRTEL in November that year, this basis collapsed. In the case of Commerzbank, worries about the German banking system in September 2002 saw default swap levels blow out much more rapidly than bond spreads causing the basis to balloon wider.

Repo Market Optionality

Repo market option for cash bond investor widens basis

An investor in a bond typically has alternative means of financing that position either as a normal on-balance sheet holding or in the repo market. The lowest cost option will typically be favored.

Bonds can usually be funded in the repo market at or around Libor. If the bond becomes special, the investor would be able to roll over the funding at a cheaper level. However, the reverse is true if the bond is not special in the repo market, i.e. the funding could increase above Libor. However, this would be capped by the investor's own cost of funding. The cash bond investor, therefore, holds a repo market option that makes the bond more attractive than the default and would tend to **drive the basis wider**.

Structural Basis Drivers

Selling Protection is an Unfunded Investment

Default swaps effectively lock in funding at LIBOR

A key difference between selling protection and buying an asset swap is that the default swap is unfunded. However, the protection seller is effectively locking a spread relative to LIBOR. Thus, for an investor which is funded above LIBOR selling protection tends to be particularly attractive. In our opinion, this represents a key advantage for the synthetic market for two reasons:

1. Most market participants and "street" trading desks fund their credit books at spreads above LIBOR. Default swaps therefore give the opportunity of generating greater carry than similarly yielding asset swaps.
2. Losing the necessity to fund the credit purchase, makes it easier for credit buyers to leverage their credit views without actually borrowing.

The unfunded nature of credit derivatives is an important structural attraction of selling protection which tends to **pull CDS spreads tighter**.

Investment Flexibility

Broadening of credit names and different maturities

A further advantage of default swaps for credit investors is that they can greatly enhance investment flexibility for investors who are reliant wholly on the cash market. Investors who maintain a long credit view can take advantage of the CDS market in the following ways:

- The CDS market can be actively traded in names which are not existing major bond issuers. This can allow credit investors to achieve greater diversification of risk exposures.
- Even amongst existing issuers, the existence of a default swap curve in 1, 3, 5 and 10 years can offer investors a broader range of maturities from which to construct a portfolio.

The flexibility provided above would, other things equal, attract protection sellers leading to tighter protection spreads and consequently a **tighter basis**.

Counterparty Risk

Protection buyers take significant counterparty risk and demand tighter spreads

Default swaps offer a synthetic means of assuming or managing credit risk. The risk profile is, however, more complex than positioning a cash bond where repayment is dependent only on the performance of an underlying bond. With a CDS, the contractual arrangement is with the swap counterparty rather than the underlying credit. Thus, the protection buyer is exposed not only to the default risk of the Reference Entity but also to the ability of the counterparty to make good under the default swap.

A loss due to counterparty risk would occur if following a Credit Event, the counterparty also defaulted – thus correlation of credit risk is central to this joint-event equation. The higher the correlation of default risks the greater the risk for

Refer to important disclosures on page 118.

the protection buyer. Thus, for example buying protection on an Italian bank from another Italian bank should be more risky than buying the protection from a similarly rated U.S. institution. Counterparty risk is discussed in more detail in Volume 1, Chapter 10. As the protection buyer also assumes the counterparty risk of the seller, this will tend to reduce the premium it is willing to pay and therefore **tighten the basis.**

■ Cheapest-to-Deliver Option

All Pari-passu claims rank equal, but some are less equal than others

Following a Credit Event, a protection buyer is able to deliver any qualifying loan or bond in return for a full par payment (assuming physical settlement). Thus, if different pari-passu obligations are trading in the market at significantly different market prices it is likely that the protection seller will likely end up owning the least favourable (lowest price) alternative. Other things equal, protection sellers should be compensated for this risk. Interestingly, however, given the extensive credit derivative activity referencing major credits, following a default there can be large demand for the cheapest-to-deliver bond from protection buyers – this can lead to a market "squeeze" on these bonds with the paradoxical effect of their price rising. The cheapest to deliver option is a structural factor, which tends to **drive CDS premiums wider**.

■ "Soft" Credit Events

Restructuring can give rise to "soft" credit event

CDS contracts that include the Restructuring credit event (old-R, mod-R or mod-mod-R) could give rise to "soft" credit events. A Restructuring credit event can be triggered by any of five events which range from "hard" restructurings such as debt-for-equity swap to "soft" restructurings such as extension of maturity.

In "hard" restructuring situations, it is likely that for a given seniority, the debt of an issuer will trade at a similar cash price irrespective of maturity or currency. In a "soft" scenario though, debt may still trade on a yield basis and cash prices may not converge. The protection buyer's "Cheapest-to-Deliver" option is therefore typically of greater value in "soft" restructuring scenarios and **would tend to drive the basis wider**.

■ Coupon Step-Up Language

Step-up (step-down) language would widen (tighten) the basis

Between 2000 and 2002, it was common for issuers to provide coupon step-up language in their bond issues. Under such structures, coupons increase if the credit rating of the issuer is downgraded and may step-down again if the rating subsequently rises.

In the event of a *downgrade*, holders of bonds with step-up language would benefit from a coupon increase. However, sellers of default protection would not receive this benefit. As a result, the default swap should trade wider than the step-up bonds, i.e. the basis should be positive. The reverse would be true, i.e. basis would be negative, if in the event of an *upgrade*, the bonds with step-down language suffer from a coupon decrease unlike the protection premium.

Where the rating trend is negative, coupon step-up language exerts a widening impact on the basis but can exert a tightening influence when the credit trend is improving.

■ Multiple Bond Call Dates: High Yield Bonds

The CDS curve is (typically) upward sloping, but the spread-to-call curve downward sloping

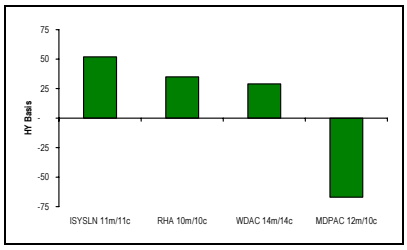
Basis trades have taken on new dimensions with the emergence of CDS on high yield bonds. Original issue 10Y high yield bonds are typically callable after 5Y; initially at a premium equal to the one-half the coupon rate (e.g., 105 for a 10% bond), typically declining ratably to par over a three-year period. High yield bonds are quoted using their price, but assessed from a relative value point-of-view based on their yield-to-worst (YTW) or spread-to-worst (STW). Therefore, a given price of a bond produces a unique spread-to-call bond spread to each of the five call dates, the lowest of which is the STW. The STW date is therefore the

date on which the market believes the bond will be called. The resulting STW can differ from the 5Y CDS, e.g., due to maturity differences (Chart 65).

Given the above, a change in high yield bond prices, either due to changes in credit spreads or interest rates, can shift the STW dates for a bond and produce STW which differ from the underlying CDS. In the case of ISYSLN 11s, a price in the range around 110 could result in YTW date falling on 15 March 2010, 2009 or 2008 (Chart 66). Thus, investors that have strong convictions on when a bond will be called, particularly if they differ from the market's, can dynamically express their credit view in either the CDS or cash market, playing the (typically) upward sloping CDS curve, against the downward sloping spread-to-call curve (Chart 67).

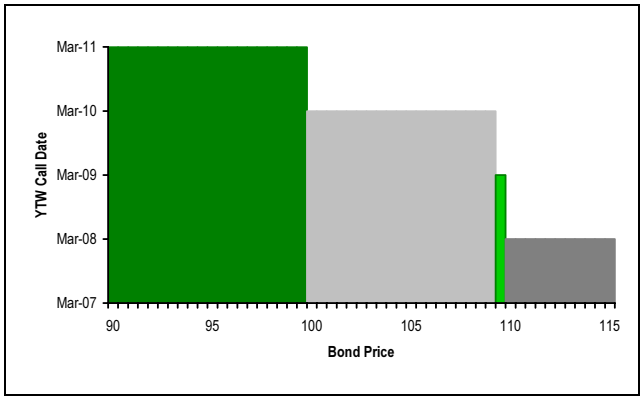
Based on the above, the basis on callable high yield bonds can either be positive or negative.

Chart 65: HY Basis in Europe



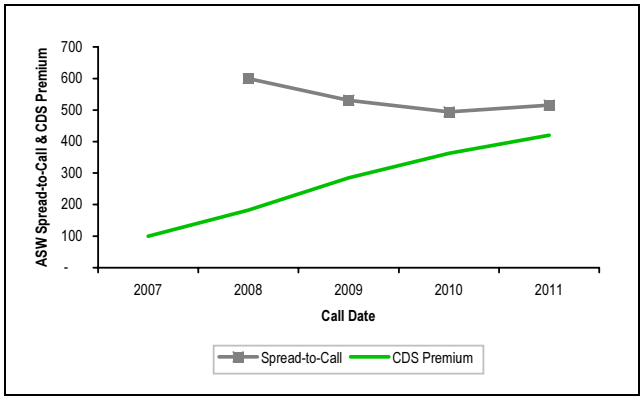
Source: Merrill Lynch. At 25 July 2005. m=maturity date (year); c= call date (year).

Chart 66: Bond Price vs. YTW Call Date (ISYSLN)



Source: Merrill Lynch. For ISYSLN 9-7/8% 2011. At 1 February 2006.

Chart 67: Z-Spread to Call vs. CDS Premiums (ISYSLN)



Source: Merrill Lynch. For ISYSLN 9-7/8% 2011. Price of 106 on 1st Feb 2006.

■ Debt Trades Below or Above Par

Basis widens (narrows) if debt trades below (above) par

Below Par

A seller of protection is exposed to the par amount following a credit event unlike a cash bond where the buyer is exposed only to the price paid for the bond. As a result, the protection seller would demand a higher spread than the bond if the bond is trading at a discount to par, i.e. the **basis should be wider**.

Above Par

The reverse is true when the bond is trading at a premium to par, i.e. the protection seller is exposed to a lower amount than the cash investor. **The basis should therefore be tighter**.

Although . . .

Whilst the above points on bond price are extremely important analytical points when considering the relative riskiness of CDS, there are caveats. The bond market is aware of the increased capital at risk when investing in a bond trading above par and this may already be reflected in a higher yield for higher priced issues (i.e. tighter basis). Secondly, an asset-swap is a package product with the asset swap spread reflecting not only credit risk but also the initial "loan" or "deposit" to/from the asset-swap seller. As a result, a standard par-par asset swap will tend to generate a higher asset swap spread (and therefore tighter basis) than a below par bond with an identical yield-to-maturity.

■ Deferrable Bond Coupons (Insurance Sub Debt)

Lower Tier II instruments are the reference obligations under subordinated CDS for banks and insurers. Insurance bonds, however, have a deferrable coupon

Refer to important disclosures on page 118.

feature. However, interest deferral is not defined as a credit event under insurance sub CDS, but if triggered, would be detrimental to bond investors. Therefore, spreads on insurance sub debt are typically wider than on subordinated insurance CDS. These structural features tend to cause a **structurally negative basis** for insurance company sub debt.

Asset (Equity) Volatility and Default Basis

Credit spreads are viewed as an increasing function of a firm's asset volatility and leverage under contingent claims models. The Enterprise Value (EV) of firms with high asset volatility (which is approximated by the volatility of their equity) has a higher probability of taking on extreme ("tail") values, including those that would be below the debt of the company.

All other things equal, investors should be attracted to buying protection in a company whose assets are volatile (and therefore more likely to reach extreme or "tail" values). Since the return profile of a long protection position is similar to a put option ("small" running premium with the possibility of a "large" terminal pay-off), buyers should be more likely to end up "in the money" owning protection in companies with volatile assets.

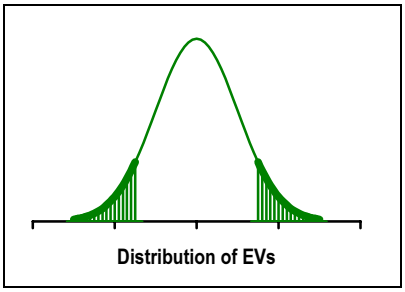
The default basis can also be viewed as a risk indicator. If the basis is negative, then there are investors willing take a long credit position (i.e., sell protection) at lower spreads than the cash market. Conversely, if the basis is positive, there are (risk averse) investors unwilling to accept the asymmetric pay-off of selling default protection at cash market spreads. If cash market spreads are primary indicators of credit risk, the basis can be thought of as a secondary indicator of credit risk.

Given the above, the **sale of default protection** should therefore be more attractive than purchase of a bond when the **basis is high relative to volatility** of the firm. In contrast, the **purchase of default protection** should also be more attractive than sale of a bond when the **basis is low relative to volatility**.

We do not expect to see low basis trades for highly leveraged issuers with volatile assets to remain available for long. Hedge funds could see them as an attractive opportunity to buy firm volatility cheaply, particularly given the longer tenor of the default swap in a market where credit spreads and equities are so correlated.

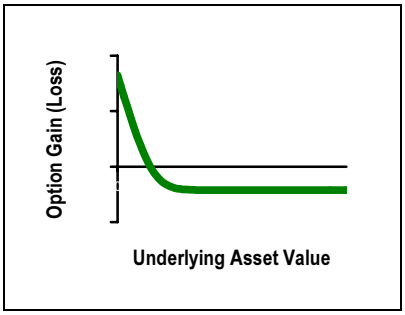
The relationship between volatility and the basis has also information content for cash investors unable to buy credit default swaps. It may be too expensive to purchase default protection (high positive basis) just when one would need it (high volatility), but that may prove to be the best signal to sell the bonds.

Chart 68: High Volatility Increases Probability of Extreme (Tail) EV Values



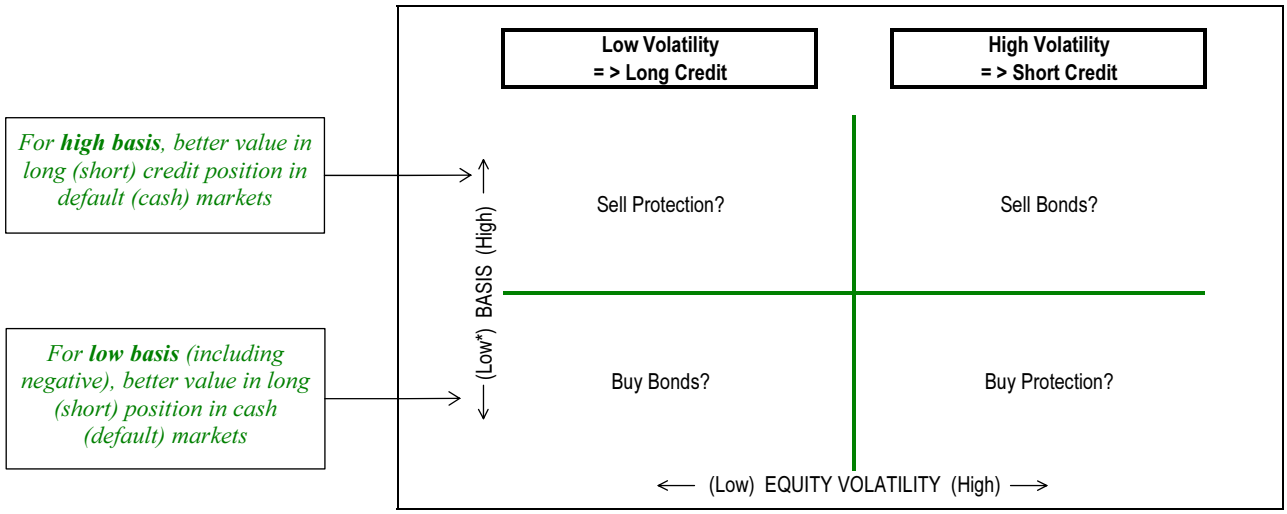
Source: Merrill Lynch

Chart 69: Return Profile of a Long Put/ Protection Position



Source: Merrill Lynch

Chart 70: Using Equity Volatility & Basis for Relative Value in Cash vs Default Markets

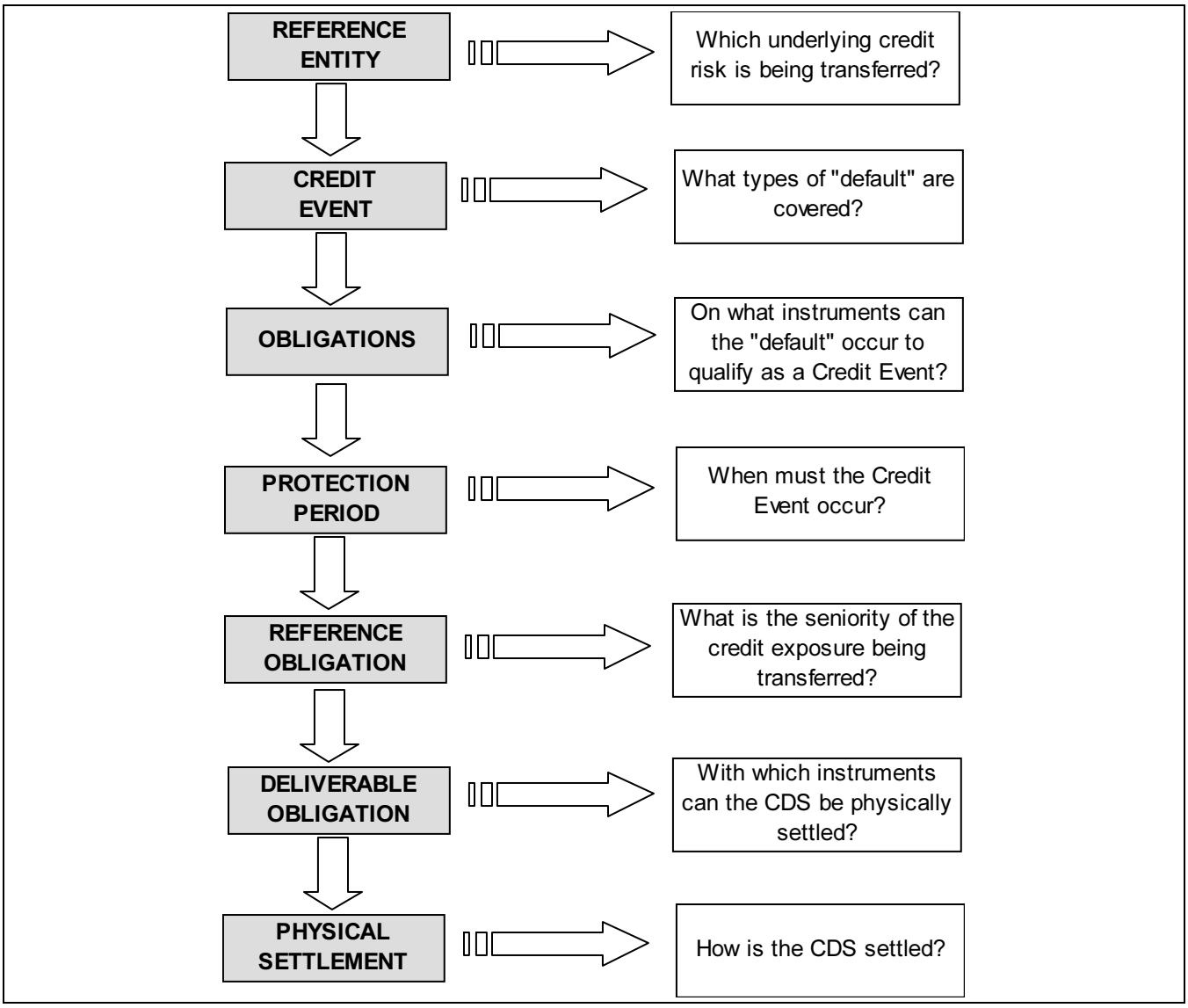


Source: Merrill Lynch. * Including negative basis.

7. CDS Structural Roadmap

We discuss some key structural considerations, with a primary focus on documentation and interpretations of the 2003 ISDA Credit Derivatives Definitions (2003 Definitions). For CDS investors, these structural issues mostly come into focus when credit events occur or when reference entities become subjects of M&A activities. A full legal analysis is beyond the scope of this chapter of a fixed income research report.

Chart 71: CDS Structural Roadmap



Source: Merrill Lynch

Refer to important disclosures on page 118.

Reference Entity

■ Which default risk is being transferred?

Defining the Reference Entity accurately is essential…but not as easy as might be expected

Perhaps the single most important fundamental issue with a credit default swap is defining precisely which entity's credit risk is being transferred. This sounds obvious and simple but is a vital factor in avoiding unexpected losses. Large corporate groups are often comprised of a network of subsidiaries of which various have debt in one form or another.

Sellers and Buyers of protection should be aware that the default risk of different corporate entities within the same group is not necessarily identical and the expected recovery following default is likely to be very different from entity to entity.

The RED (Reference Entity Database) contains list of potential Reference Entities.

Even more fundamentally, protection Buyers should take care that the Reference Entity actually is likely to have some deliverable debt outstanding throughout the term of the transaction – otherwise the protection could prove worthless upon a Credit Event even though the company itself may be bankrupt.

Armstrong World Industries – US company Armstrong World Industries missed payments on its debt, which triggered credit default swaps. Its parent company Armstrong Holdings however, did not default. Many market participants had treated the parent and principal subsidiary interchangeably and had hedged positions with offsetting contracts in the other entity. The lesson here is that there may be substantial credit basis risk between different entities in the same group. Worse still, certain contracts in the market had referenced simply Armstrong without clarifying to which specific entity the contract referred.

■ Successors to the Reference Entity

The National Power case highlighted the need for a revised procedure for determining successors

A further problem is that during the life of the swap contract, it is possible that through a merger or other corporate restructuring, the debt of a Reference Entity could become debt of one or more different entities. Such situations require a methodology for determining whether the Reference Entity should be replaced by Successors. Test for Succession in the 1999 Definitions revolved around the succeeding company assuming "all or substantially all" of the obligations of the Reference Entity through mergers, consolidations, amalgamations or transfers.

Carlton Communications – In February 2004, Carlton Communions and Granada completed their merger to form ITV plc. Carlton remained as the reference entity in CDS market and its 5-5/8% £ bonds due 2009 the reference obligations, an obligation which had been assumed by ITV as a part of the merger. In October 2005, however, ITV issued bonds which were not guaranteed by Carlton, leaving Carlton without a reference obligation beyond 2009. The placement of the ITV bonds caused protection to tighten on Carlton, given the fact that it was a reference entity without any debt after 2009.

National Power – In November 2000, National Power PLC of the UK demerged certain assets and subsidiaries into two entities: Innogy and International Power. In consideration for the transfer of assets to Innogy, shareholders were given holdings in the new entity. National Power then changed its name to International Power. Innogy also assumed certain debt obligations of National Power. This demerger prompted substantial debate as to whether Innogy had become a Successor. Given a lack of case history, whether this debt assumption amounted to "all or substantially all of the obligations" and indeed whether this question could be consistently determined under each of New York law and English law (relevant depending on the governing law of particular credit default swap contracts). It was argued that the interpretation of the "substantially all" test would likely require a significantly higher threshold under English law than New York law.

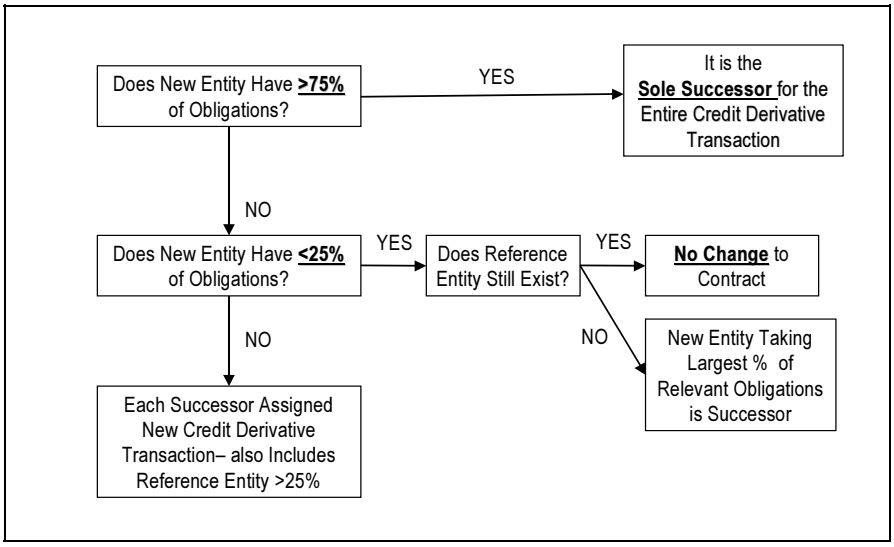
In response to the issues thrown up in the National Power case, ISDA issued a supplement to its 1999 Definitions dealing with Successors, which applied to transactions if specified (it became market custom to use this Supplement). This Supplement replaced the more subjective "substantially all" requirement definitions with set quantitative tests based on how post-restructuring debt is treated. Of course, this set of quantitative tests came too late for pre-demerger National Power credit default swaps. Given that no Credit Event has arisen on either of the entities there has been no trigger to put such contracts to the test. In practice, what has occurred is that many protection Buyers and Sellers have agreed bilaterally about how National Power's post-demerger debt will be treated should Credit Events occur.

2003 Definitions – The latest definitions incorporate the Successor Supplement as the means of identifying Successor Reference Entities.

The test for succession is based on transference of debt obligations

The tests a Successor for a non-Sovereign Reference Entity under the Supplement and the 2003 Definitions are summarised in Chart 72. All scenarios assume the occurrence of a Succession Event, which could be triggered by a merger, consolidation, amalgamation or transfer. In certain circumstances (where the two parties each end up with 25-75% of the debt or an equal proportion with no majority) they can both be Successors and the protection is divided equally between the Successor entities, the terms of which would be defined in a new credit derivative transaction.

Chart 72: Non-Sovereign Successor Summary Decision Tree



Source: Merrill Lynch

Six Continents – In April 2003, Six Continents split into Mitchell & Butlers and Intercontinental Hotels and concurrently tendered for all its outstanding debt. Since there was no debt to succeed to as a result of the transaction, protection buyers were essentially left with protection on an empty shell without any debt.

Refer to important disclosures on page 118.

Credit Events

Credit Events are the key credit triggers in credit default swaps

■ Six potential Credit Events – but some are not used

The default swap confirmation includes details of which "Credit Events" trigger delivery under the transaction. The 2003 Definitions further clarify the six types of Credit Events that can occur with respect to "Obligations"(see below):

1. **Failure to Pay** – This requires a payment default on an Obligation by the Reference Entity and is typically subject to a materiality threshold (the Payment Requirement) of $1mn. The Payment Requirement must be met "in accordance with the terms of such Obligations at the time of such failure" which would occur after any Grace Period Extension.
2. **Bankruptcy** – This was previously identical to the Bankruptcy Event of Default in the 1992 ISDA Master Agreement. It was, however, updated in the Supplement Relating to Successor and Credit Events which removed certain ambiguities and vagueness in the wording – see box below.
3. **Obligation Acceleration** – This refers to a situation where, for reason of default, Obligations of the Reference Entity have become due and repayable prior to maturity and have been accelerated. Since April 2002, it has been market convention for G7 corporate contracts not to use this Credit Event although it is still used in certain emerging market contracts.
4. **Obligation Default** – This would also be triggered by an event of default but requires only that an Obligation has become capable of being made due and payable prior to maturity. In practice Obligation Default is almost never included as a Credit Event in credit derivative contracts.
5. **Repudiation/Moratorium** – the 2003 Definitions made certain amendments to this Credit Event to address concerns that the clause could be triggered inappropriately. A Potential Repudiation/ Moratorium can be triggered by an authorised officer of a Reference Entity or by a Governmental Authority refusing to honour obligations or impose a moratorium which would prevent an entity from making a payment. In particular, this Credit Event will only be triggered if it is followed by an actual Failure to Pay or Restructuring (although note that such Failure to Pay or Restructuring is not subject to any materiality threshold) within a specified time scale. Since April 2002, it has been market convention for G7 corporate contracts not to use this Credit Event although it is still used in emerging market contracts.
6. **Restructuring** – this is probably the most interesting but controversial Credit Event and is worthy of separate comment.

2003 Definitions – The Bankruptcy Credit Event previously contained language that included situations where the Reference Entity took any action in furtherance of, or indicated its consent to, Bankruptcy as defined. The 2003 Definitions require that admission of a general inability to repay debts only constitutes a Credit Event if it is part of a judicial, regulatory or administrative proceeding or filing. The previous wording provoked much debate in the case of Marconi.

■ Restructuring Credit Event

5 objective criteria . . .

The 2003 ISDA Definitions reiterate several tests for determining whether a "Restructuring" has occurred.

- A reduction in the rate or amount of interest payable or the amount of scheduled interest accruals;
- A reduction in the amount of principal or premium payable at maturity or at scheduled redemption dates;
- A postponement or other deferral of a date or dates for either A) the payment or accrual of interest or B) the payment of principal or premium;

- Any change in the ranking in priority of payment of any Obligation, causing the subordination of such Obligation to any other Obligation; or
- Any change in the currency or composition of payment of interest or principal to any currency, which is not a Permitted Currency[12].

. . . plus a subjective dimension

The 2003 Definitions, however, then go on to exclude such occurrences where they do not directly or indirectly result from a deterioration in the creditworthiness or financial condition of the Reference Entity. The 2003 Definitions further add that an analysis of any case should focus on the facts and circumstances at the time of the relevant event.

Xerox Corporation – In the summer of 2002, as part of a wider agreement with its banks, Xerox extended the date for repayment of principal in respect of a major syndicated bank facility that was due for repayment in September. However, market participants have since entered a legal dispute about whether this was a result of a deterioration in creditworthiness and over what period prior to Restructuring such deterioration could reasonably have occurred.

2003 Definitions – The 2003 Definitions amend the previous definition of Restructuring to exclude any reference to Obligation Exchange. Under the 1999 Definitions this term was included to capture restructurings where the underlying terms of an Obligation weren't actually changed but investors were subject to a "mandatory " exchange into other securities which breached one or more of the Restructuring tests.

Argentina – Obligation Exchange requirements became the subject of legal disputes when Argentina, which was facing a tight liquidity situation, "requested" local investors to exchange $50bn of bonds for new issues with lower coupons. In question was the meaning of "mandatory" in such circumstances.

2003 Definitions – The new definitions include four different Restructuring Credit Event options:

- Restructuring (slightly amended version of old-R)
- Modified Restructuring (Mod-R)
- Modified Modified Restructuring (Mod-Mod-R)
- No Restructuring (no-R)

A discussion of these options is included in the next section of this report.

Obligations

Borrowed Money is the most frequently used Obligation Category

The scope of the term Obligation is clearly of great importance in determining whether a Credit Event has occurred. There are six **Obligation Categories** in each of the 1999 & 2003 Definitions. The broadest of these is Payment which covers any present, future or contingent payment or repayment whether borrowed or not. Other more narrow Obligation Categories are Borrowed Money, Bond, Loan, Bond or Loan, Reference Obligations Only. **The most commonly used Obligation Category is Borrowed Money**, which includes Payments in respect of Borrowed Money (which also includes deposits and reimbursement obligations under letters of credit).

2003 Definitions – The 2003 Definitions clarify that Borrowed Money excludes undrawn revolving credit facilities. Thus for example, if an undrawn facility was to be restructured, this would not trigger a Restructuring Credit Event.

[12] Permitted Currency is defined in terms of being a G7 currency or any OECD currency that satisfies certain ratings requirements.

Refer to important disclosures on page 118.

Obligation Characteristics can be specified…but frequently are not

Obligation Characteristics allow the protection Seller to further narrow down the types of Obligation that can trigger a Credit Event. If **Not Subordinated** (replacing Pari Passu Ranking from the 1999 Definitions) is selected, a default in respect of subordinated debt, for example, would not be a Credit Event in respect of senior obligations. The selection of **Specified Currency** would exclude Credit Events in others (if no currency is specified then the currencies of the G7 plus Euros are selected). Similarly **Not Domestic Currency** and **Not Domestic Issuance** and **Not Domestic Law** could reduce the impact of uniquely domestic political and legal factors on default risk. The **Not Sovereign Lender** selection excludes defaults on Obligations to governments or supranationals. The **Listed** option restricts Credit Events to Obligations that are listed or traded on an exchange.

For corporate credit default swap transactions in Europe or the US it is not the market custom to specify any Obligation Characteristics.

2003 Definitions – The 2003 definitions specify that, the Restructuring Credit Event can be triggered only on Multiple Holder Obligations (having at least four unaffiliated holders and requiring a two-thirds majority to consent to a restructuring). This effectively precludes a Restructuring Credit Event to be triggered on a bilateral loan. This feature was originally introduced in the Restructuring Supplement but in the 2003 Definitions extend it to all Restructurings.[13]

Protection Period

■ Trade Date versus Effective Date

The contract now comes into effect on the calendar day after the trade date

Effective Date – It is market convention for the Effective Date (the date that protection starts) to be the calendar day following the trade date. In the unlikely event that a Credit Event occured on the Trade Date, the protection Buyer would not be covered. This is quite a low probability occurrence for each investor – but given that multiple trades are executed daily on major credits it is likely to eventually impact some when a Credit Event occurs suddenly and unexpectedly.

Until September 2002 the Effective Date was three Business Days after the Trade Date.

Note: any cash payments that are applicable to credit default swaps such as upfront fees, unwind fees or assignment fees continue to settle on the basis of T+3 Business Days or as otherwise agreed between the counterparties.

This procedure is applicable on a global basis irrespective of region, sector, currency or location of participants. In particular it also applies to emerging market sovereign and corporate credits. The T+1 settlement is intended to be applicable to terminations and assignments as well as new trades.

Railtrack – On 7 October 2000, Railtrack plc was placed by the UK government into Special Railways Administration, which constituted a Bankruptcy Credit Event. This announcement date was a Saturday. Investors who bought credit default swap protection on the Wednesday, Thursday or Friday of the previous week would have not been covered for this Credit Event. Under the current conventions, however, such risks are considerably reduced.

■ Potential Failure to Pay versus Failure to Pay

A missed payment is not a Credit Event until any Grace Period expires

Scheduled Termination Date – At this date the protection ends. However, as regards **Failure to Pay**, this is complicated by Grace Periods that may relate to the Obligation in question (if that Obligation does not contain a grace period or has a very short grace period, then ISDA assumes an automatic Grace Period of 3 Business Days).

A key point here is that many bonds or loans may contain grace periods aimed at guarding against technical defaults due to factors such as settlement errors. It is

[13] The Multiple Holder Obligation requirement can be specifically disapplied on any contracts if so desired by the counterparties.

possible that the original missed payment could occur during the transaction term but the grace period ends (and acceleration occurs) after the Scheduled Termination Date. Under such circumstances the settlement would not be triggered under the transaction, unless another Obligation with a shorter grace period was already in default. In other words a Potential Failure to Pay does not become a Failure to Pay until the Grace Period has expired.

A further alternative is for a **Grace Period Extension** to be specified in the Confirmation which gives greater credit protection since it requires only that the default itself occurs before the Scheduled Termination Date and that the default is continuing at the Grace Period Extension Date. It is currently relatively rare for Grace Period Extension language to be included in corporate credit default swap documentation – although it is used in emerging markets.

Reference Obligation

Original Reference Obligation

Pegging the place in the capital structure

The **Reference Obligation** is one particular obligation (typically a large bond issue) either issued by or guaranteed by the Reference Entity. The ranking of the Reference Obligation is determined as of the later of the Trade Date or issue date and no subsequent changes in ranking are taken into account.

The reference obligation effectively pegs the seniority of the default swap in the capital structure of the reference entity. Thus if the Reference Obligation is a senior unsecured bond then following a credit event the protection Buyer would deliver a debt obligation ranking pari passu with this Reference Obligation. The Buyer, however, does not have to deliver this specific obligation. The protection seller therefore is exposed to cheapest-to-deliver (CTD) risk. If certain pari-passu Deliverable Obligations are trading at different market prices following a Credit Event, it is likely that the Seller will be delivered the least favourable (i.e. lowest price) alternative. If no Reference Obligation is specified, the contract is assumed to relate to senior unsecured obligations of the Reference Entity.

Substitute Reference Obligation

Reference obligations are substituted if they are redeemed or become illiquid

If a Reference Obligation is redeemed or outstanding amounts have been reduced, the Calculation Agent (typically protection seller) identifies one or more Substitute Reference Obligation (SRO). The SRO has to:

- Be an obligation (direct or guarantee) of the Reference Entity,
- Rank *pari passu* or senior to the Reference Obligation, and
- Preserve its **economic equivalent** as closely as possible.

Substitutions can be critical in European LBO stories

While these provisions have not been put to the test, to our knowledge, we believe they quite likely would during LBOs, if a reference obligation is redeemed (see below). For direct obligations of the Reference Entity, a senior unsecured bond (U.S.), a guarantee of acquisition financing (Europe) or in their absence, a second-lien bond would be closest in terms of economic equivalent. Under the definitions of Qualifying Guarantee, a guarantee has to have the benefit of being delivered. The deliverability of loan or bond guarantees or leveraged loans may only be determined on a case-by-case basis. Since an SRO does not have to be deliverable (see above), guarantees could qualify as SROs.

Deliverable Obligations

Under physically settled credit default swaps, the Buyer of protection is entitled to deliver any qualifying obligations of the Reference Entity to the protection Seller in return for a full notional amount cash payment. As the Reference Entity may have issued a great variety of bonds or loans with very different market values, the precise details of Deliverable Obligations are extremely important in the risk

Refer to important disclosures on page 118.

equation for protection Sellers. Deliverable Obligation Category is usually Bonds and Loans for corporates and Bonds for emerging market contracts. In addition to the Obligation Characteristics that can be specified in the Confirmation, the characteristics of Deliverable Obligations can also be specified. Table 20 shows the list of potential **Deliverable Obligation Characteristics**.

Table 19: Deliverable Obligation Category and Usage

Category	Frequently Used?
Payment	No
Borrowed Money	No
Reference Obligation Only	No
Bond	Emerging market
Loan	No
Bond or Loan	**Corporates**

Source: Merrill Lynch

2003 Definitions – Specify that Deliverable Obligations must satisfy the Deliverable Obligation Characteristics (a) on the date they are delivered for Corporates, and (b) immediately before a Restructuring for Sovereigns.

A typical corporate trade specifies the following characteristics.

Not Subordinated – The delivered obligation must rank pari passu or senior to the Reference Obligation (this characteristic replaces Pari Passu Ranking from the 1999 Definitions). If no Reference Obligation has been specified in the contract, the Deliverable Obligation must not be subordinated to any unsubordinated borrowed money obligation of the Reference Entity.

Specified Currency: Standard Specified Currencies – The delivered obligation must be denominated in currencies of Canada, Japan, Switzerland, U.S. and euros.

Assignable Loan – If the Buyer of protection delivers a loan, the loan must be capable of being transferred to another holder without the borrower's consent.

Consent Required Loan – If the Buyer of protection delivers a loan, the loan may require the consent of the borrower to any transfer. The additional risk element here is that subsequent transfers may be refused.

If Assignable Loan and Consent Required Loan are both specified as applicable then each Deliverable Obligation need satisfy only one of these characteristics.

Transferable – Whereas the above two characteristics apply only to loans, Transferable applies more broadly to any obligation that might be delivered. Clearly if a non-loan obligation that was delivered contained restrictions on future transfer, this would be a major risk factor for protection Sellers.

Maximum Maturity: 30 years – If a 30 year maximum maturity is specified the protection Seller is given protection from being delivered perpetual or virtually perpetual bonds which could potentially be treated less favorably in a restructuring. However, all protection Sellers should be aware that bonds of up to 30 years in maturity are typically deliverable, even if the protection is short term.

Not Bearer – The delivered obligation must not be a bearer instrument (unless held and traded within Euroclear or another internationally recognized clearing system).

Not Contingent – This characteristic precludes the delivery of obligations in relation to which the outstanding principal balance can be reduced due to the occurrence or non-occurrence of an event or circumstance (other than payment).

Table 20: Deliverable Obligation Characteristics and Usage

Characteristic	Frequently Used*?
Not Subordinated	**Yes**
Standard Specified Currency	**Yes**
Not Sovereign Lender	No
Not Domestic Currency	No
Not Domestic Law	No
Listed	No
Not Contingent	**Yes**
Not Domestic Issuance	No
Assignable Loan	**Yes**
Consent Required Loan	**Yes**
Direct Loan Participation	No
Indirect Loan Participation	No
Transferable	Yes
Maximum Maturity	**Yes** (30 Year)
Accelerated or Matured	No
Not Bearer	Yes

* G7 Corporate Contracts
Source: Merrill Lynch

2003 Definitions – The definition of Non Contingent was completely rewritten from the 1999 Definitions wording and has removed references to repayment being dependent upon formulae, indices as well as a more general requirement not to be subject to any contingency. The new definition also incorporates language from the Convertible Supplement that clarifies the deliverability of (non mandatory) convertible and exchangeable bonds.

The 2003 Definitions also clarify the deliverability of accreting bonds. For such securities the nominal value of securities delivered under the credit default swap is calculated with reference to the Outstanding Principal Amount as defined in the accretion schedule rather than the full face value of the bond.

In the 1999 Definitions, one of the most controversial issues had been whether convertible or exchangeable bonds are deliverable if the Non-Contingent characteristic is included.

Calpine Corporation– In January 2006, ISDA announced a protocol with respect to the determination of the company's contingent convertible notes as Deliverable Obligations following Bankruptcy filing in December 2005. ISDA determined that Calpine 6% contingent convertible notes due 2014 would be deliverable, but not its 7.75% contingent convertible notes due 2014. The company's second-lien bonds were also deliverable, but not the bonds issued by Calpine Canada, a subsidiary.

Railtrack – Following the Railtrack Bankruptcy Credit Event in 2000, the cheapest-to-deliver obligation was the 3.5% of 2009 exchangeable bond. Based on the 1999 Definitions, there was considerable debate as to whether convertible and exchangeable bonds complied with the Non Contingent Deliverable Obligation Characteristic. As the principal is repayable only if the bonds have not been exchanged into the underlying stock it has been argued that including convertible and exchangeable bonds are contingent upon this event not having occurred. However, most of the market took the view that, provided the bond is exchangeable or convertible at the option of the holder, the bondholder should be the beneficiary and the exchange or conversion option within its control. One further complication in the Railtrack case was the inclusion of a so called "widows and orphans" clause in the exchangeable bond which gave the trustee the right to force conversion of the bond on the holder in certain circumstances where it was viewed as being in the interests of the investor. After a protracted legal dispute, in February 2003, UK courts ruled in favour of deliverability.

Interestingly given the extent of credit derivative transactions in medium investment grade credits, when a Credit Event does occur, there can be a sudden surge in demand for the cheapest-to-deliver bond causing its market value to actually rise. This was in fact the case with the Railtrack exchangeable bond.

Treatment of Guarantees

2003 Definitions – One area that has received considerable focus by ISDA is guarantees – and under what circumstances guaranteed instruments are Obligations or Deliverable Obligations.

ISDA has defined two types of guarantee:

Qualifying Guarantee

Qualifying Guarantees involve the Reference Entity giving a written irrevocable guarantee of another entity's debt (but not its subordinated debt). There are a couple of exclusions:

- The guarantee cannot be structured as a surety bond, financial guarantee insurance policy, letter of credit or equivalent legal arrangement.
- Guarantees in which the payment obligations can be removed or altered due to occurrence or non-occurrence of events or circumstances are excluded.

Marconi – The Marconi group had a somewhat unusual guarantee structure. The holding company Marconi PLC provided lenders and bondholders of subsidiary Marconi Corporation PLC with a guarantee. Although the bond guarantees were stated to be "unconditional" they contained a provision that they would fall away upon the repayment of certain other guaranteed obligations. In 2002 a Bankruptcy Credit Event occurred in relation to Marconi, and the approach of market participants was to deliver loans instead of bonds, so as to avoid the risk that the guarantee structure would render the bonds undeliverable (under 1999 Definitions). The main exception to this, was where the bond in question was stated as the Reference Obligation since (in most circumstances) this is deliverable.

Refer to important disclosures on page 118.

Qualifying Affiliate Guarantee

Qualifying Affiliate Guarantees are those Qualifying Guarantees, which are downstream from parent to subsidiary.

Applications

Under the 2003 Definitions, credit default swap counterparties can specify if the contract should relate to either:

- All types of Qualifying Guarantees (All Guarantees Applicable).
- Just Qualifying Affiliate Guarantees (All Guarantees Not Applicable).

The market practice is the use of All Guarantees Not Applicable in the U.S. and the use of All Guarantees Applicable in Europe.

Non-Qualifying Affiliate Guarantees can be deliverable, but only if, at that time, such guarantee is capable of immediate demand.

The Four Restructuring Alternatives

The 2003 Definitions give counterparties four choices with regard to the Restructuring Credit Event. These are:

- Old Restructuring (slightly amended version of old-R).
- Modified Restructuring (Mod-R).
- Modified-Modified Restructuring (Mod-Mod-R).
- No Restructuring (no-R).

Table 21: Summary of Restructuring Alternatives

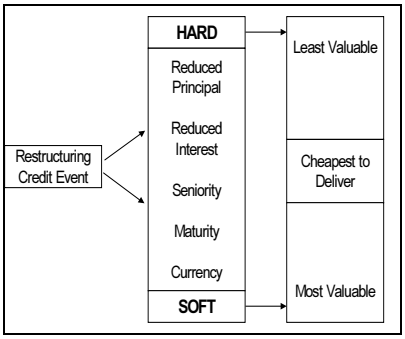
	Old-R	Mod-Mod-R	Mod-R	No-R
Obligations				
Multiple Holder Obligation requirement	Applies under 2003 (a change from 1999)	Applies	Applies	NA
Deliverable Obligations				
Maximum Maturity	30 year maximum is typically selected	Modified Restructuring Maturity Limitation (60 months from Restructuring Date for restructured obligations), 30 months from Restructuring Date for all other obligations)	Restructuring Maturity Limitation (30 months from Restructuring Date)	NA
Transferability of Deliverable Obligations	No restriction on transfer	Must be Conditionally Transferable	Must be Fully Transferable	NA

Source: Merrill Lynch

Old-R has already been described in Restructuring Credit Event earlier in this chapter. Before we discuss the alternative approaches, some background is appropriate.

Soft" and "Hard" Types of Restructuring

Chart 73: The Restructuring Spectrum

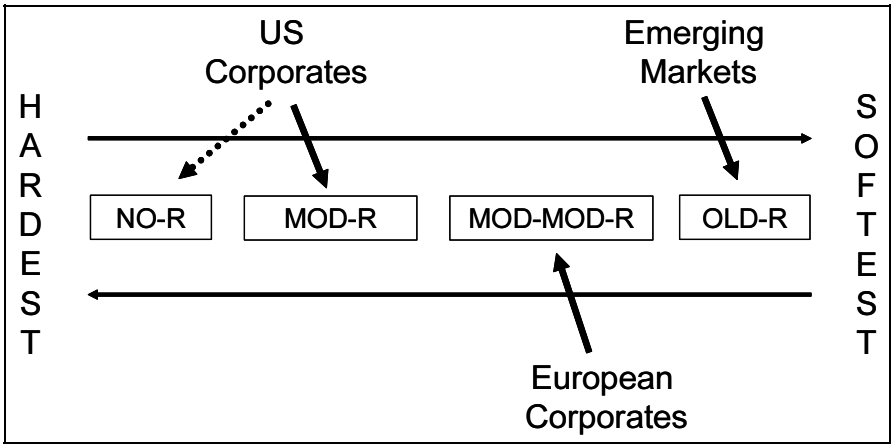


Source: Merrill Lynch

The impact of restructurings can range in expected severity as shown in Chart 73. In "hard" restructuring situations, it is likely that for a given seniority, the debt of an issuer will trade at a similar cash price irrespective of maturity or currency. In a "soft" scenario though, debt may still trade on a yield basis and cash prices may not converge. The protection Buyer's "Cheapest-to-Deliver" option is therefore typically of greater value in "soft" restructuring scenarios.

Conseco – The best known case study on restructuring has been Conseco. In October 2000, the company and its bankers agreed to a restructuring of its loans, which included an extension of maturity. In the bank loan market this was not seen particularly as a credit negative as it headed off a potential liquidity crisis. However, some bankers who had bought protection on Conseco gave notice of restructuring and then delivered long-dated bonds, which were trading significantly lower than the restructured bank loans. This outcome was viewed negatively by protection Sellers who were not expecting to suffer an economic loss on a "soft" Credit Event that was a result of credit deterioration but fell short of a full default or bankruptcy.

Chart 74: Restructuring Credit Event Options



Source: Merrill Lynch.

Modified Restructuring

Mod R focused on limiting the Cheapest-To-Deliver option

In May 2001, ISDA issued its Restructuring Supplement ("Modified Restructuring" or "Mod-R") to the 1999 Definitions. This Supplement, which has now been consolidated into the 2003 Definitions, was used extensively in US markets but very little in Europe. However, following the introduction of Mod-R a significant amount of business was transacted subject to this supplement before it became apparent that the new standard was failing to achieve widespread adoption in Europe. When adopted, Mod-R contains a variety of restructuring related provisions including the following:

Multiple Holder Obligations

Bilateral loans are not Obligations under Mod-R

Modified Restructuring contracts are subject to the Multiple Holder Obligation restriction. This was extended to all forms of Restructuring in the 2003 Definitions. This requires that the Restructuring Credit Event can occur only with respect to an obligation that has *at least four holders* and that requires at least two thirds of holders to agree to the restructuring. Thus a restructuring of a bilateral loan would not be a Restructuring Credit Event.

2003 Definitions – Under the new definitions, the Multiple Holder Obligation requirement applies to old-R, Mod-Mod-R as well as Mod-R.[14]

[14] The Multiple Holder Obligation can be disapplied if specified in the contract.

Refer to important disclosures on page 118.

The two-thirds agreement requirement could be problematic in Europe in particular since amendments to bond indentures typically require a quorum of 75% of bondholders and then 75% of the quorum to vote in favour of alterations. Thus restructurings could potentially be voted through by as few as 56% of bondholders.

For bonds documented under New York law, 100% approval is typically needed for fundamental restructuring changes such as reductions or postponements in interest or interest payments. Less clear to us is whether other Restructuring triggers such as subordination or currency will always require a 66 2/3% majority.

Restructuring Maturity Limitation

Complex provisions for determining what is and is not deliverable

These provisions set strict restrictions on Deliverable Obligations when Mod-R applies and a Restructuring Credit Event has occurred. In particular, Mod-R limits the ability of the protection Buyer to deliver long-dated instruments in settlement of the swap. Maturity of Deliverable Obligations is capped at:

- The earlier of A) 30 months following the Restructuring Date and B) the latest final maturity date of any restructured bond or loan, subject to the following limitation:
- The Restructuring Maturity Limitation Date can never be earlier than the Scheduled Termination Date of the credit default swap contract or later than 30 months after such date.

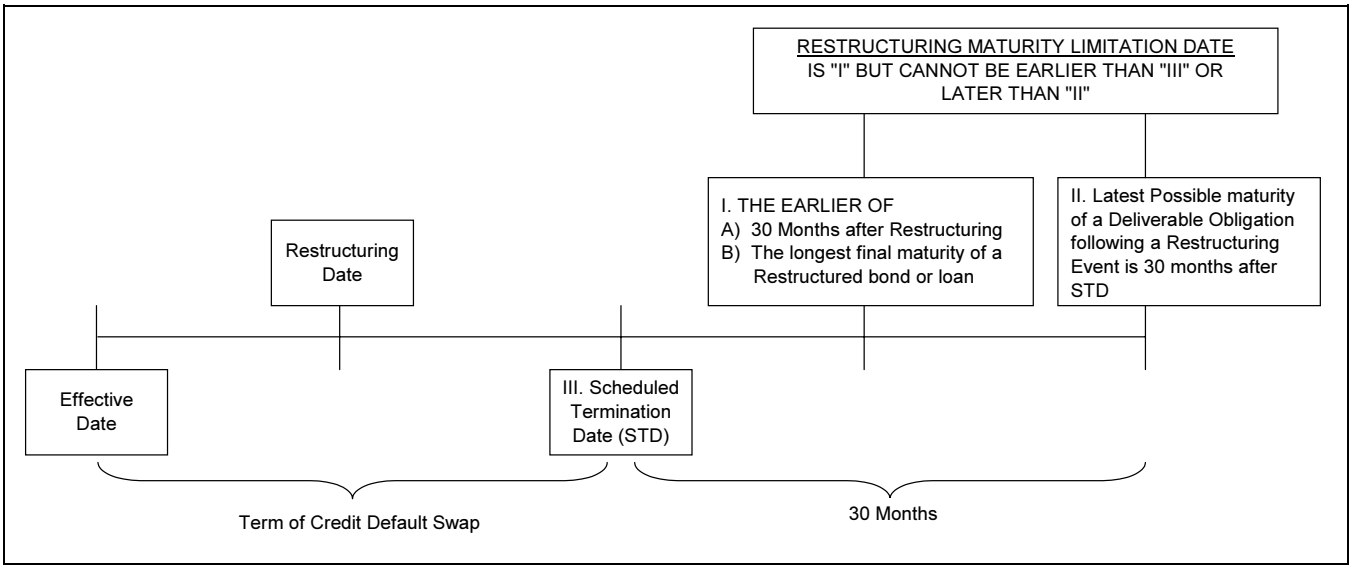
The conditionality of this definition can be quite tricky. The determination of such date is summarised in Chart 75.

Fully Transferable Obligation

A further provision of this clause is that following such event, *only Fully Transferable Obligations are deliverable*. Thus, loans that require the consent of the borrower for transfer to an Eligible Transferee are not deliverable. **Eligible Transferees** are defined to be those on a list of institution types, notably, banks, insurance companies, mutual funds and brokers, in each case subject to a minimum balance sheet size.

Additionally, Restructuring Maturity Limitation provisions apply only if the contract is triggered by the protection Buyer and not the protection Seller.

Chart 75: Summary of Restructuring Maturity Limitation Date under mod-R



Source: Merrill Lynch

Mod-Mod-R

As mentioned above, Mod-R never took hold in European markets. We think this was for a variety of reasons, including:

- The dominance of major banks in protection buying. As a coordinated force, this group favors protection-Buyer friendly and BIS friendly documentation.
- The maturity limitation requirement is viewed as too restrictive for many European coporates which are relatively new issuers in the young regional bond market. Protection Buyers worried that there may be a high chance that no bond would be deliverable following restructuring.
- Many European syndicated bank loans require borrower consent prior to being transferable to a new holder, thereby being ineligible as Fully Transferable Obligations.

Mod-Mod-R has been crafted to address at least the last two of these factors.

Modified Restructuring Maturity Limitation

This clause differs from Mod-R in that it potentially allows obligations, which mature up to 60 months (in respect of the restructured obligation, and 30 months in respect of all other obligations) after the Restructuring date to be delivered. More precisely Deliverable Obligations cannot mature after the later of:

- The Scheduled Termination Date of the contract, and
- In the case of the restructured obligation, 60 months after the Restructuring Date and 30 months in the case of other Deliverable Obligations.

Conditionally Transferable Obligation

These provisions have been added to be less restrictive than the Fully Transferable deliverable obligation requirement.

- Consent required obligations can be considered Conditionally Transferable Obligations if such consent for novation, assignment or transfer cannot be unreasonably withheld or delayed.
- Under Mod-Mod-R the definition of Modified Eligible Transferee is narrower than the definition (under Mod-R) of Eligible Transferee, which should make qualification easier.

No Restructuring

Mod-R acts to limit the classes of Deliverable Obligations . . .

One problem with Mod-R and Mod-Mod-R is that they do not address directly the "soft" features at the heart of the of the Credit Event itself (such as maturity extension). Rather they act to:

- Limit the classes of Obligations on which the event can be triggered; and
- Endeavour to reduce the value of the "cheapest-to-deliver option" following a Restructuring Credit Event.

. . . but Xerox restructuring showed Mod-R wasn't sufficient

Xerox – Mod-R worked pretty well in the US but came under pressure when, in summer 2002, Xerox extended maturities of a syndicated bank loan. In this case the maturity limitation requirements of Mod-R did not really insulate Sellers of protection from the "cheapest-to-deliver" risk since, although not long dated, Xerox's yen bonds were trading about 15-20 points lower than where the dollar bank loans were quoted.

It is now viewed as a risk that all forms of the Restructuring Credit Event could create a conflict of interest for bank lenders who are also long protection. For this reason parts of the U.S. market have been strongly advocating scrapping the Restructuring Credit Event completely.

Insurance companies, which have evolved as key protection sellers in the credit default swap market, have been particularly active in the Restructuring debate.

Refer to important disclosures on page 118.

J.P. Morgan, when acting in its capacity as an end user, decided to drop the Restructuring Credit Event from its standard contracts (non-sovereign) used to hedge its own loan portfolio. In our opinion, about 15% to 20% of the single-name CDS in U.S. markets are no-R contracts. In addition, the CDX index market in the U.S. is also a no-R contract.

Given the dominance of banks as protection Buyers in Europe, a key factor in the wholesale adoption of no-R would be an ability to get capital relief on credit investments that have been hedged in the credit default swap market. In October 2002, BIS issued technical guidance clarifying that the Restructuring Credit Event is required for capital relief.

Table 22 summarizes the typical market conventions for CDS contracts in different geographical markets.

Table 22: Market Conventions (Usual)

	EUROPEAN	US	EMERGING MARKETS			
CREDIT EVENTS	CORPORATES	CORPORATES	EMEA	ASIA	LATAM	CORPORATES
Bankruptcy	√	√	X	X	X	√
Obligation Acceleration	X	X	√	√	√	√
Failure to Pay	√	√	√	√	√	√
Repudiation Moratorium	X	X	√	√	√	√
Restructuring	MM	M/X	√	√	√	√
OBLIGATIONS	BM	BM	B	B&L	B	B&L
DELIVERABLE OBLIGATIONS	B&L	B&L	B	B&L	B	B&L

MM = mod-mod-R; M = mod-R; X = No-R; BM = Borrowed Money; B = Bond; B&L = Bond & Loan
Source: Merrill Lynch

Case Studies: CDS and Acquisitions

Whether or not a reference obligation remains outstanding following an LBO is a crucial question for CDS investors. Investors generally stand to benefit from buying default protection or shorting the bonds of LBO candidates. If reference obligations have change of control provisions, protection buyers still stand to benefit, if new lower rated debt is issued by the reference entity.

While U.S. acquisitions (including LBOs) are structured with the ultimate merger of the acquirer and the target, thereby pushing acquisition debt down to the target, European law generally prohibits companies from giving financial assistance for the acquisition of their shares. Therefore, European acquisition financing initially remains the obligation of the acquirer, without being pushed down or fully guaranteed by the target. (European companies can generally guarantee acquisition debt to the extent of their distributable reserves.) Also, law and public perceptions relating to mergers and corporate combinations differ considerably between U.S. and European jurisdictions, also impacting transaction structures. To reduce structural subordination of acquisition financing at the acquirer level, lenders and sponsors may tender for outstanding debt of the reference entity target even though there are no change of control provisions therein forcing redemption.

ProSieben – In August 2005, AxelSpringer announced an acquisition of ProSieben and at the same time a tender for its bonds. Since the redemption of the reference obligations occurred before a planned merger between ProSieben and Axel Springer, no debt was to be assumed as a result of this transaction. Also, prohibition of financial assistance in European law prevented ProSieben from guaranteeing AxelSpringer's acquisition debt, significantly reducing the value of ProSieben protection. When the transaction was abandoned in February 2006, ProSieben CDS widened back to pre-announcement levels.

ISS – In April 2005, ISS was acquired by a consortium of private equity firms, which announced that they would not be redeeming the company's existing debt, leaving the reference obligations outstanding. Threats of bondholders' lawsuits followed. When the ultimate financing structure was announced, the existing ISS bonds were subordinated to some of the new acquisition bank financing, which was guaranteed by ISS' subsidiaries, permitted to the amount of available distributable reserves of the company, leaving the value of protection intact.

TDC – In November 2005, TDC was also acquired by a consortium of private equity firms, which simultaneously with the offer announced a tender for TDC's existing bonds, producing a scenario in between ProSieben and ISS. However, since TDC is anticipated to become a guarantor under the bank facility, guarantee which can be identified as an SRO, protection retained significant value.

Since European acquirers are generally prevented from obtaining target subsidiary guarantees of its acquisition debt, the value of default protection should rise on companies on the continent which tend to debt-fund their acquisitions.

Protection buyer stands to benefit if Reference Obligations remain outstanding . . .

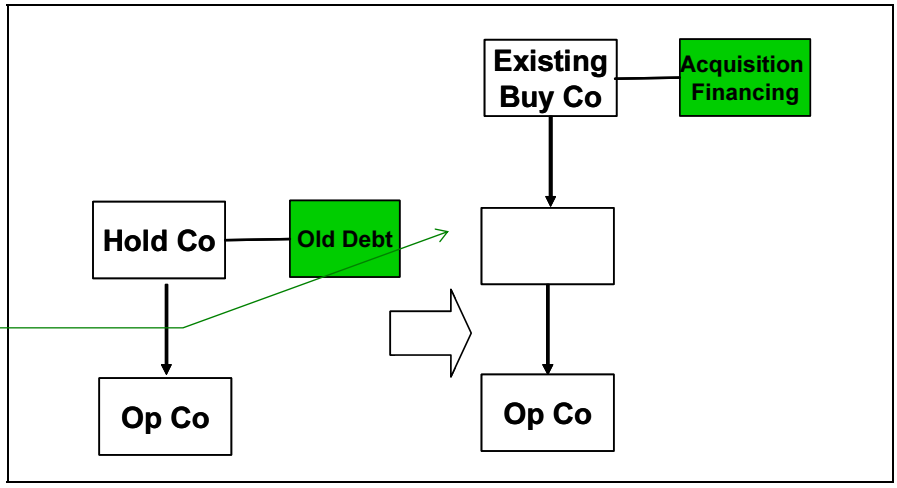
Where Reference Obligations remain outstanding, a "Successor" is determined if one entity directly **succeeds** to 75% or more of the relevant obligations as a result of a "Succession Event," according to the 2003 Definitions. In the Definitions, "Succession Event" is defined as merger, consolidation, amalgamation, transfer of asset or liabilities, de-merger, spin-off or similar when one entity assumes the obligations of another. The acquisition of share capital (or change of control of reference entity) is not defined as a Succession Event.

. . . but either protection buyer or seller could benefit if Reference Obligations redeemed

Where Reference Obligations are redeemed, e.g., through a tender, before a Reference Entity is merged with an acquirer, no debt is assumed as a result of the Succession Event so the new merged entity will not become a Successor (Chart 76). If a Reference Obligation is redeemed or aggregate amounts there under have been reduced, the Calculation Agent (typically the protection seller, unless otherwise specified) identifies one or more Substitute Reference Obligation (SRO), as described above. That SRO could be identified as a guarantee by the Reference Entity of an acquisition financing facility (Chart 77).

Protection Sellers stand to benefit if Reference Obligations are tendered for before a takeover, leaving the Reference Entity debt-free..

Chart 76: Acquisition Structure Favoring Protection Seller



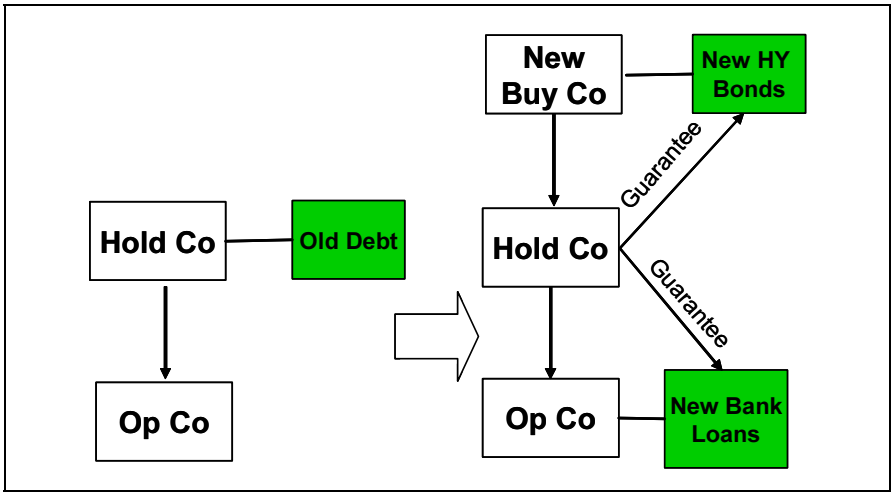
In some circumstances, the Reference Entity becomes "an empty shell" following a takeover

Source: Merrill Lynch

Refer to important disclosures on page 118.

..but Protection Buyers should benefit, if Reference Entity becomes a guarantor of new bank or bond financing

Chart 77: Acquisition Structure Favoring Protection Buyers



Source: Merrill Lynch.

Table 23: Summary Impact of Corporate Actions on Value of Protection

Corporate Action	Region	Impact	Notes
Leveraged Re-Capitalization	U.S. & Europe	Positive	Value of protection should always increase. Still mostly a U.S., rather than a European phenomenon.
LBOs	U.S.	Positive	Reference obligations typically remain outstanding. If they are redeemed due to change of control, however, merger with acquisition vehicle results in a push-down of the LBO financing, leaving value of protection (in a more levered entity) intact.
LBOs	Europe	Uncertain	If reference obligations remain outstanding, value should increase. If reference obligations are redeemed, together with other debt, due to change of control, or to reduce structural subordination of acquisition debt, protection value will either (a) increase if target is a guarantor of a debt of a more leveraged entity or (b) decrease if no such substitute reference obligations can be identified.
Mergers, Acquisitions & Spin-Offs	U.S. & Europe	Uncertain	If a new entity assumes debt of the reference entity as a result of a Succession Event, protection value will depend on credit quality of such successor. If debt is tendered for before spin-off, acquisition or merger, there is no Succession Event (since no entity succeeds to debt of reference entity) and protection value should decrease, since reference entity remains debt-free. Note, acquisition of share capital may constitute change of control, but does not constitute a "Succession Event".

Source: Merrill Lynch.

CDS Physical Settlement

■ Basic Mechanics under 2003 Definitions

What happens once a Credit Event comes to light?

Event Determination Date

Once a Credit Event has occurred the first key milestone is the **Event Determination Date**. On this date the settlement clock starts ticking. Under current market conventions, this occurs when both **the Credit Event Notice** and the **Notice of Publicly Available Information** have been served.

Credit Event Notice ("CEN")

This is an irrevocable notice of a Credit Event that has occurred between the Effective Date and Scheduled Termination Date of the contract.

This notice contains a description in reasonable detail of the facts relevant to the determination that the Credit Event has occurred. This Credit Event need not be continuing on the date that the CEN becomes effective.

The CEN can be served up to 14 calendar days after the CDS Scheduled Termination Date so long as the Credit Event itself occurred during the life of the contract.

The CEN will usually be served by the buyer. However, it is standard market practice to allow it also to be served by the seller. This allows dealers with offsetting positions to manage their risk.

Notice of Publicly Available Information

It is market convention to require that the CEN is supplemented with a Notice of Publicly Available Information. This irrevocable notice from the party who served the CEN must cite Publicly Available Information that confirms the occurrence of the Credit Event.

Publicly Available Information ("PAI") must reasonably confirm the facts relevant to the determination of the Credit Event and can be sourced from a variety of international news media such as Bloomberg, Dow Jones, Reuters and several major international financial newspapers. The PAI can also take other forms such as releases by the Reference Entity, Trustee or bankruptcy filings.

Current market convention requires two sources of PAI (if press reports are used).

■ Physical Settlement of the CDS

Notice of Physical Settlement

How and when to settle

Within 30 calendar days of the Event Determination Date, the buyer must serve a **Notice of Physical Settlement** ("NoPS") to the seller.

The NoPS replaced the Notice of Intended Physical Settlement (NIPS) from the 1999 Definitions.

The NoPS is an "irrevocable" confirmation of the buyer's delivery plans in settlement of the CDS including a detailed description of the Deliverable Obligations.

Although the NoPS is irrevocable, the buyer can, on or prior to the Physical Settlement Date, notify the seller that it will change the bonds or loans to be delivered. Additionally, after this date, the buyer can correct errors and inconsistencies in the description of the Deliverable Obligations.

Physical Settlement Period

The Physical Settlement Period is the timeframe within which Deliverable Obligations must be delivered following the issuance of the NoPS

For investment grade contracts in Europe, Asia, Japan and Australasia it is market convention for the Physical Settlement Period to be set at 30 business days. The US contracts are worded slightly differently specifying it as the longest number of business days for settlement in accordance with the then market practice of such Deliverable Obligation subject to a maximum of 30 business days.

The **Physical Settlement Date** is the last day of the Physical Settlement Period or the date on which all Deliverable Obligations have been delivered (if earlier).

Buy-In of Undelivered Bonds

Buyer and seller play 5-day ping pong

Under the 2003 Definitions, if the buyer has not delivered the bonds specified in the NoPS five business days after the Physical Settlement Date, the seller has the right to close out some or all of the transaction through a buy-in of relevant bonds.

The seller must provide the buyer with at least two business day's notice of the buy-in specifying 1) the bonds to be bought-in 2) principal amount of bonds to be bought-in and 3) date of buy-in.

In the 1999 Definitions there was no provision for buy-in of bonds after the Physical Settlement Date

The seller has five business days to execute this buy-in by attempting to get quotes from five dealers and take the lowest price.

If the buy-in is not completed in five business days, the buyer's right to deliver the bonds is reinstated for a further five business days.

Under the 2003 Definitions this process continues indefinitely until the contract is settled. This system has been adopted as market convention for contracts with North American Reference Entities.

Refer to important disclosures on page 118.

Can't obtain borrower's consent

Seller can source and select the instrument to be delivered

Alternative Settlement Procedure Relating to Loans not Delivered

If loans specified in the NoPS have not been delivered five business days after the Physical Settlement Date, Alternative Procedures begin. At this initial stage, provisions are made for the delivery of alternative bonds or loans in cases where the failure to deliver was a result of a failure to obtain requisite consents from the borrower.

At any time later than 20 business days after the Physical Settlement Date, if loans have not been delivered, the seller can require the buyer to deliver a particular bond (transferable and not bearer) or loan (assignable) provided it complies with Deliverable Obligation Characteristics. The seller can select which bond or loan is to be delivered so long as it can identify a willing seller of the instrument.

There is no time cap placed on these Alternative Procedures.

Table 24: Regional Settlement Convention Summary

Reference Entity Location	Physical Settlement Period	60 Business Day Cap on Settlement
Europe	30 business days	Applicable
Japan	30 business days	Applicable
Non-Japan Asia	30 business days	Applicable
Australia & NZ	30 business days	Applicable
North America	As defined in S8.6 of Definitions, but max 30 business days	Not Applicable

Source: Merrill Lynch. Refers to investment grade corporate transactions

■ European and Asian Market Practice

Problems for CLNs

In Europe and Asia, credit linked notes are a popular investment vehicle as they offer a funded indirect means of 1) exploiting pricing anomalies between cash and CDS markets 2) achieving investment flexibility to tailor-make features such as maturity and 3) accessing names who have not issued bonds. In the US where the corporate bond market is much broader and deeper, CLNs are not a major product area.

The bond buy-in procedures outlined above pose great challenges for CLN structures as they put no final date on the settlement process, making it very difficult for the structurer/buyer to manage its risks given that the CLN itself has a finite life.

The 60-Day Cut Off

For this reason it is market convention in Europe and Asia to specify a 60 business day cap on settlement. Thus if the alternating 5 day buy-in procedure cannot achieve full settlement in 60 business days (after the Physical Settlement Date) the contract then terminates. The part of the contract not settled by that time would effectively then expire worthless even though a Credit Event has occurred. In North America by contrast, the settlement cycle would continue indefinitely until settlement is completed (if ever).

The wording of CLN issues has now adapted to this new system by using "Hedge Adjustment Event" language. These clauses allow the deferment of settlement of the CDS imbedded in the CLN if the structurer/counterparty has not received settlement from hedges of, or offsetting trading positions related to its counterparty obligations to the CLN.

■ Certain Other Issues

"Clean" Delivery

Exclude Accrued Interest

In settlement, the buyer must deliver bonds or loans with an outstanding principal balance equal to the notional amount of the CDS. It is market convention for accrued but unpaid interest to be excluded from this calculation.

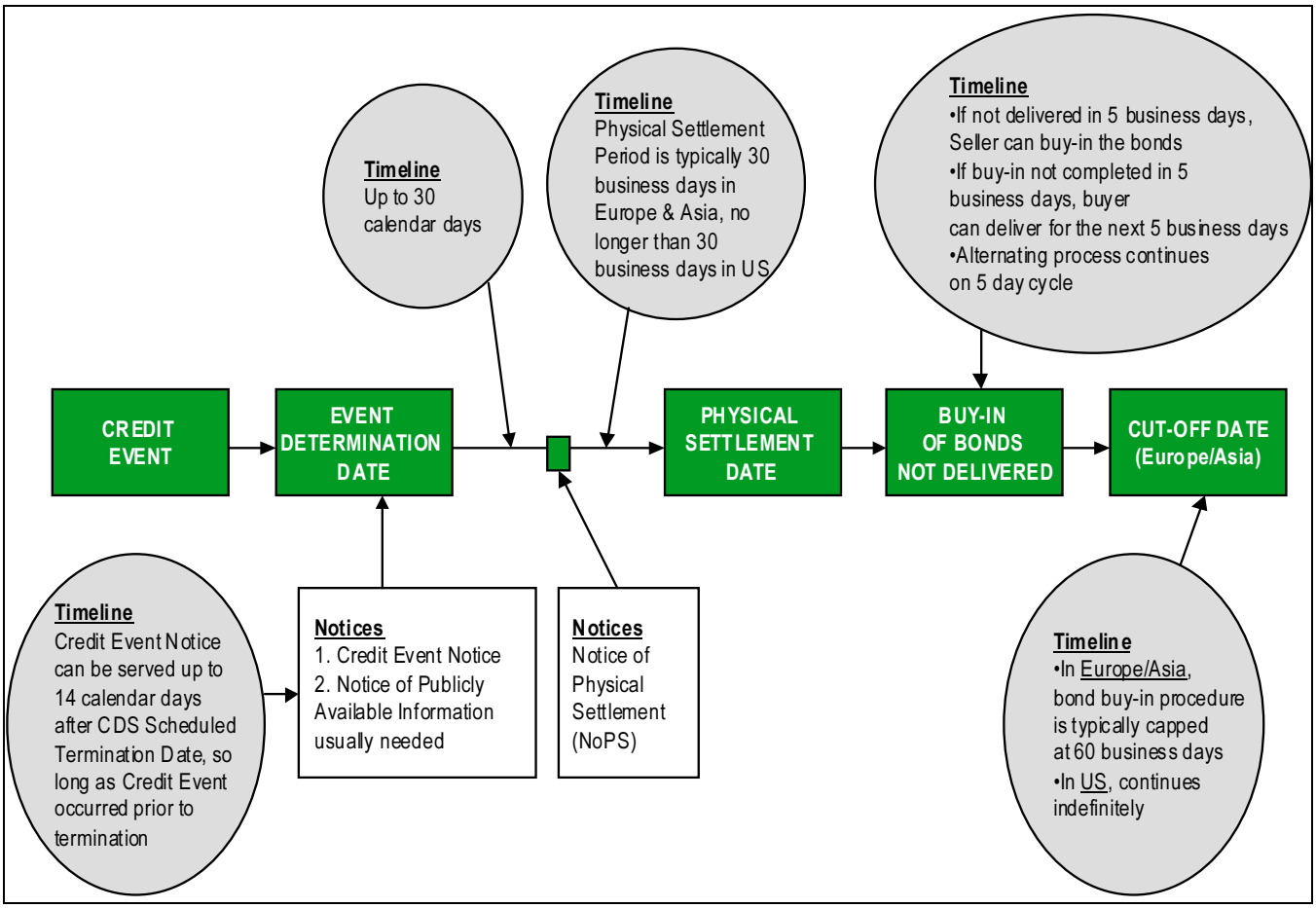
Standard Specified Currencies

Contracts can be settled in other currencies

It is market convention to allow delivery of bonds or loans denominated in Standard Specified Currencies. These are the currencies (or successor currencies) of Canada, Japan, Switzerland, UK and USA together with the euro. Thus a $10mn CDS contract could be settled with yen bonds provided the outstanding principal balance was equivalent to $10mn at the time of delivery.

It has been argued that the potential for altering the bond to be delivered post issuance of the NoPS gives the buyer a degree of currency optionality.

Chart 78: Summary of CDS Settlement Timeline



Source: Merrill Lynch

Refer to important disclosures on page 118.

8. CDS Indices

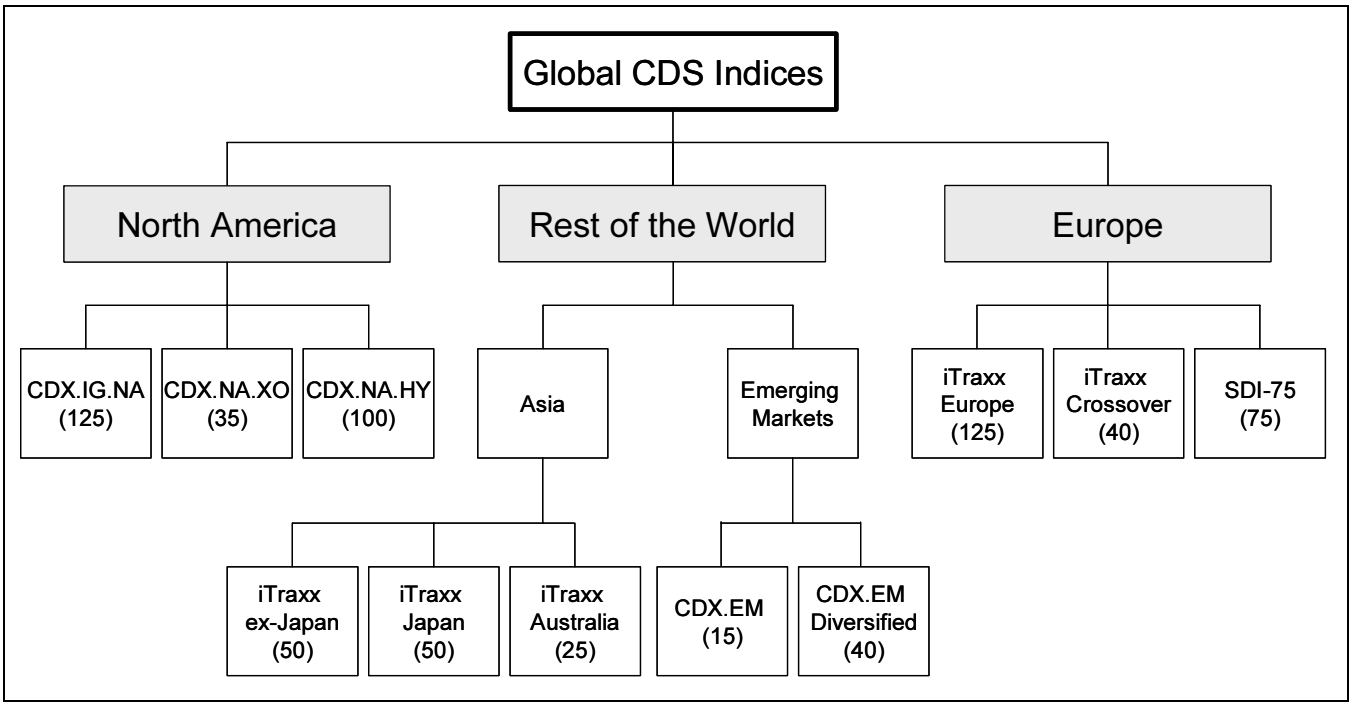
The introduction of CDS indices, such as the iTraxx in Europe and Asia, and CDX in North America and Emerging Markets, have revolutionized the trading of credit risk due to their liquidity, flexibility and standardization. In this chapter, we will discuss the indices in general and the two major index groups, iTraxx European and CDX North America, in particular.

Overview

CDS indices have now been developed globally under the CDX (North America and Emerging Markets) and iTraxx (Europe and Asia) banners. They were formed in 2004 with the merger of two competing indices, Trac-X and iBoxx. The CDX and iTraxx indices now encompass all the major corporate bond markets in the world:

- **73** Indices, Classified by Region, Maturity, Spread, Sector, and Rating
- More than **500** Members, Drawn from 6 Continents

Chart 79: The Major Global CDS Indices



Source: Merrill Lynch. Number of index members in ().

Each of the indices above comprise of sub-indices, based on spread range, sectors, geography and rating (Table 25, Table 26). They also trade in different maturities, with the 5Y contract the most liquid. Members of the indices are selected based on rating criteria and liquidity in the CDS market. The indices "roll" every six months, or around 20 March and 20 September each year, a mechanism by which new members are selected and new on-the-run indices launched. For example, the last roll on 20 September 2005 saw the launch of the fifth series of CDX.IG.NA index and the fourth series of the iTraxx Europe. While the indices are most actively traded in unfunded form, select indices have also been traded in funded form as notes, most notably the CDX.NA.HY index. That is also the only index traditionally quoted based on price, rather than spread.

The CDX index brand is used in North America and Emerging Markets

The main indices trade in maturities between 1Y and 10Y, with 5Y being the most liquid

Sub indices are based on spread range (Hi Vol or Hi Beta) or sectors

Main indices can comprise up to 22 indices and can have between 15 and 40 members

Tranches and options have also been developed on some of the major indices

Table 25: CDX Indices (North America and Emerging Markets)

	North America			Emerging Markets	
	CDX.NA.IG	**CDX.NA.XO**	**CDX.NA.HY**	**CDX.EM**	**CDX.EM.Diversified**
Main Indices					
	1Y				
	2Y				
	3Y	3Y	3Y		
	5Y	5Y	**5Y**	5Y	5Y
	7Y	7Y	7Y		
	10Y	10Y	10Y	10Y	
Sub-Indices					
	Hi Vol		**Hi Beta**		
	Financials		BB Rated		
	TMT		B Rated		
	Industrials				
	Consumer				
	Energy				
	125 Members	35 Members	100 Members*	15 Members	40 Members
	22 Indices	4 Indices	7 Indices	2 Indices	1 Index
Other Products					
	Tranches		Tranches		Tranches
	Options	Options	Options		

Source: Bloomberg, Merrill Lynch. Maturity of Hi Vol and High Beta Indices in bold, maturity of other Sub-Indices in box. *Currently there are 98 members in the CDX.NA.HY series 5 index and 97 members in the CDX.NA.HY series 4.

The iTraxx index brand is used for CDS indices in Europe, Asia (including Japan) and Australia

Sub indices are based on spread range (Hi Vol or Hi Beta), sector or geography.

Table 26: iTraxx Indices (Europe, Asia and Australia)

	European			Rest of the World		
	iTraxx Europe	**iTraxx Crossover**	**SDI-75***	**iTraxx Asia ex-Japan**	**iTraxx Japan**	**iTraxx Australia**
Main Indices						
	3Y					
	5Y	5Y		5Y	**5Y**	5Y
	7Y					
	10Y	10Y	10Y		**10Y**	
Sub Indices						
	Hi Vol				**Hi Vol**	
	Financials*			Greater China	Financials	
	TMT			Korea	Technology	
	Industrials			Rest of Asia	Capital Goods	
	Consumer					
	Energy					
	Autos					
	Non-Financials					
	125 Members	40 Members	75 Members	50 Members	50 Members	25 Members
	24 Indices	2 Indices	1 Index	4 Indices	10 Indices	1 Index
Other Products						
	Tranches			Tranches	Tranches	
	Options	Options				

Source: Bloomberg, Merrill Lynch. Maturity of Hi Vol Indices in bold, maturity of other Sub-Indices in box. * Unlike the other indices, a specific index for subordinated financial default swaps is available for iTraxx Europe. *CDS index based on Sterling corporate bond issuers.

Refer to important disclosures on page 118.

North American Indices

■ High Grade (CDX.NA.IG)

125-name equally weighted investment grade names

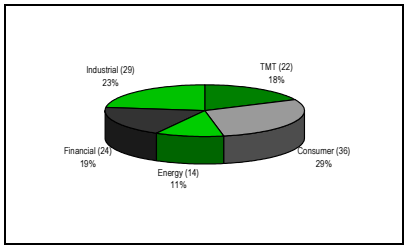
Description

CDX.NA.IG.5 comprises default swaps on 125 equally weighted North American investment grade-rated issuers. The main index is divided into five sector indices: Consumer, Energy, Financials, Industrials and Telecom, Media & Technology (TMT). In addition, the master benchmark index offers a high-beta index of 30 issuers with above average volatility called the "high vol" index or HVOL. All members of the HVOL are also members of the IG index.

The IG and the HVOL indices have six maturities: 1y, 2y, 3y, 5y, 7y and 10y. The maturity date is 20th December for each year – for example, the 5y matures on 20th December 2010. The sector indices, however, trade only in 5y and 10y maturities.

All indices trade No-Restructuring, i.e. Bankruptcy and Failure to Pay are the only two credit events. They are also physically settled. However, following a recent credit event at CKC (a member of the CDX HY4 index), the market agreed to a cash settlement mechanism which we expect to be a blueprint for future settlement of credit events that affect CDX indices.

Chart 80: Sector Breakdown for CDX.NA.IG Index



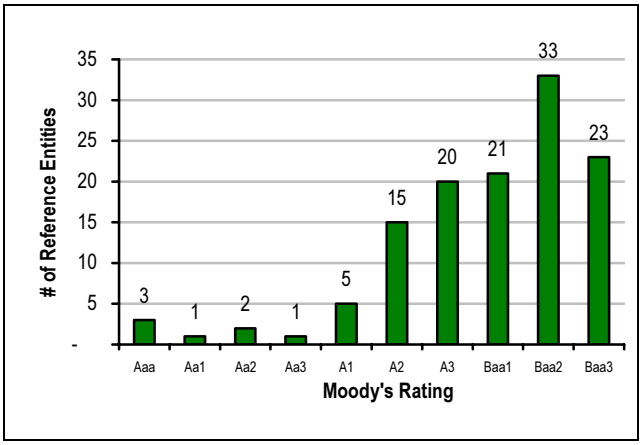
Source: Merrill Lynch. Number of members in ().

Ratings are concentrated in the mid-to-low investment grade categories

Credit Ratings

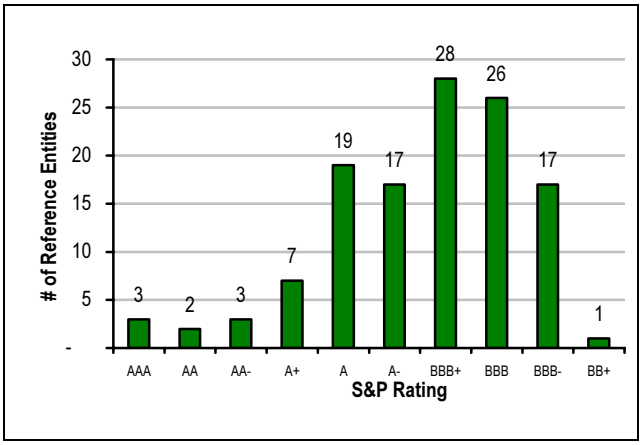
The credit ratings of reference entities in CDX.NA.IG.5 span the entire investment grade spectrum. Reflecting rating patterns in the corporate bond market, however, the ratings are concentrated in the mid-to-low investment grade rating categories. Of the 125 reference entities, most are rated Baa2 (33 entities or 26%) by Moody's and BBB+ (28 or 22%) by Standard & Poor's.

Chart 81: CDX.NA.IG.5 Entities by Moody's Rating



Source: Bloomberg; As of 21-Sep-05.

Chart 82: CDX.NA.IG.5 Entities by S&P Rating



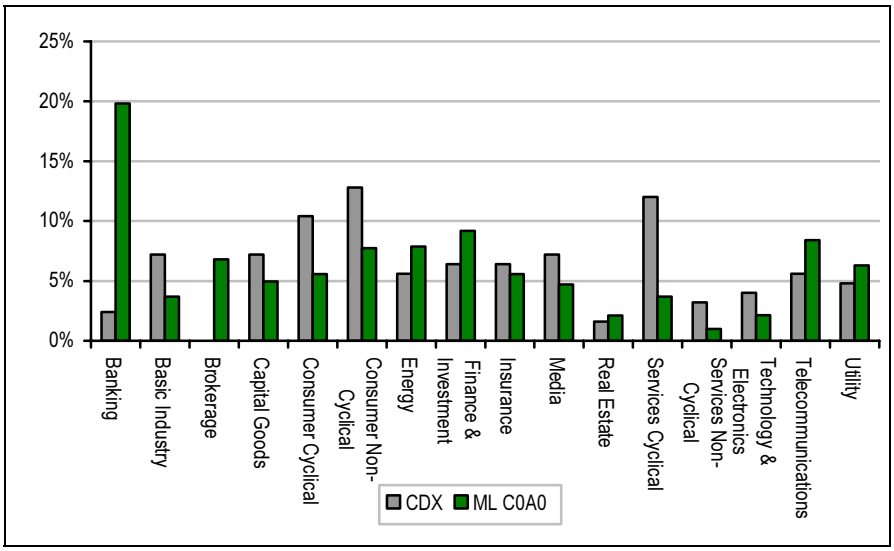
Source: Bloomberg; As of 21-Sep-05.

CDX IG5 represents about 37% of ML's C0A0

Comparison vs. US Corporate Bond Index

CDX.NA.IG.5 is a benchmark North American index that has some overlap with other bond indices, such as the Merrill Lynch U.S. Corporate Master (C0A0) Index. As of 20th September 2005, the 125 members of the CDX.NA.IG 5 index represent 36.7%% of the market value of C0A0 (702 issuers). Also 97% of the credits of IG5 are included in C0A0. Chart 83 compares sectors for CDX.NA.IG.5 vs. C0A0 using the Merrill Lynch Index sector classification system.

Chart 83: CDX.NA.IG.5 vs. ML C0A0 Sectors Representation



Source: Merrill Lynch

Crossover (CDX.NA.XO)

Description

35 equally-weighted credits

The migration of several large cap investment grade names such as GMAC and FMCC into high yield territory has led to the creation a new Crossover (or XO) index. XO consists of 35 equally-weighted names and includes seven of the nine names that have dropped out of IG4. This index, in our opinion, should be relatively popular given that its constituents are relatively widely held in the credit markets.

The XO5 is available in four maturities: 3y, 5y, 7y and 10y. These indices trade at relatively meaty spreads compared to similar maturity HVOL5 indices (Table 27). As search for yield continues, this index should be relatively liquid. The volatile nature of the underlying names should also make options on this index popular. While tranching this 35-name index is unlikely, we believe some combination with the IG5 and/or HVOL5 indices would create a portfolio which is relatively representative of bespoke portfolios that are traded in the market. These portfolios are typically characterized by a mix of IG and Crossover/HY names.

Table 27: Fixed Coupons

Maturity	HVOL5	XO5
1y	25	-
2y	40	-
3y	55	150
5y	85	200
7y	105	220
10y	120	240

Source: Merrill Lynch

Credit Ratings

Ratings are concentrated in the mid-to-low investment grade

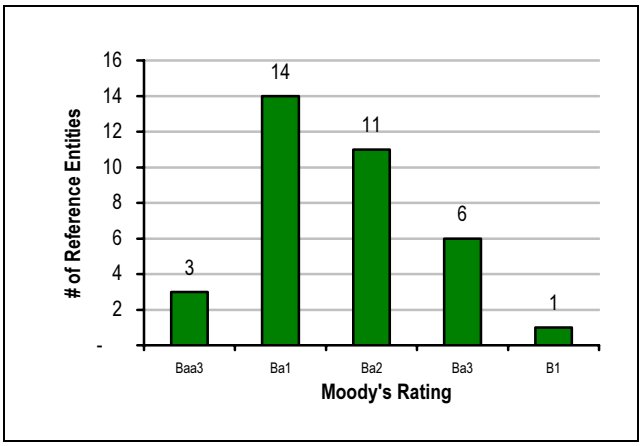
The ratings required for inclusion into the Crossover index are either:

- a crossover (5B) rating (i.e. a rating in the BBB/Baa category by one of S&P and Moody's and in the BB/Ba rating category by the other);
- a 4B rating (i.e. a rating in the BB/Ba category by both S&P and Moody's.
- a rating in the BB/Ba category by one of S&P and Moody's and no rating by the other.

The credit ratings of reference entities in CDX.NA.XO.5 are mostly clustered around the BB/Ba area. Of the 35 reference entities, most are rated Ba (31 entities or 88%) by Moody's and BB (30 entities or 85%) by Standard & Poor's.

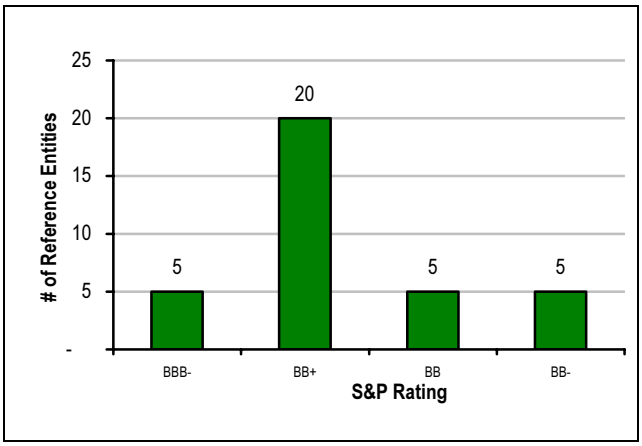
Refer to important disclosures on page 118.

Chart 84: CDX.NA.XO.5 Entities by Moody's Rating



Source: Bloomberg; As of 21-Sep-05.

Chart 85: CDX.NA.XO.5 Entities by S&P Rating



Source: Bloomberg; As of 21-Sep-05.

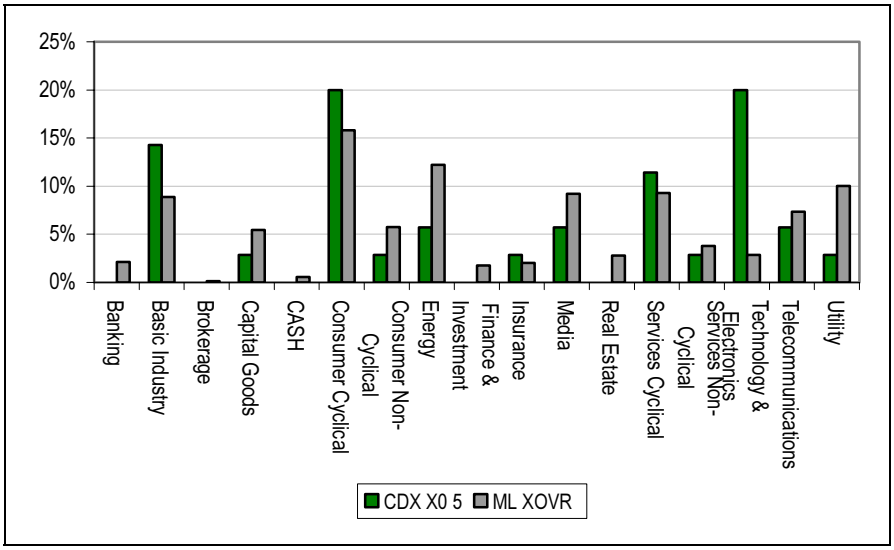
The index represents about 25% of the ML U.S. Crossover Index

Comparison vs. US Crossover Bond Index

CDX.NA.XO.5 is a benchmark North American index that has some overlap with other bond market indices, such as the Merrill Lynch U.S. Crossover Index (XOVR). As of 20th September 2005, the 35 members of XO5 index represent 24.7% of the market value of XOVR (618 issuers). Also 99% of the credits in the XO5 are included in the ML's XOVR index.

Chart 86 summarizes and compares the sector representation of CDX.NA.XO.5 vs. XOVR using the Merrill Lynch Index sector classification system.

Chart 86: CDX.NA.XO.5 vs. ML XOVR Sectors Representation



Source: Merrill Lynch

■ High Yield (CDX.NA.HY)

CDX.NA.HY is also available in funded form

Index Description

CDX.NA.HY.5 is a 5y benchmark index for North American high yield issuers, containing 100 equally weighted reference entities. The major reference entities are then classified by rating into two sub-indices, the BB index and the B index. Unlike the IG family, the HY indices are also available in funded form. The funded indices trade like bonds, i.e. the investor pays a cash price and receives a fixed coupon. In addition, Series 5 also has multiple maturities for the unfunded HY index: 3y, 5y, 7y & 10y.

No-Restructuring

All indices trade No-Restructuring, i.e. Bankruptcy and Failure to Pay are the only two credit events. They are physically settled. However, following a credit event at CKC (a member of the CDX HY4 index) in May, the market agreed to a cash settlement mechanism which we expect to be a blueprint for future settlement of credit events that affect CDX indices. Recent credit events at Delta and Northwest were also settled in a similar auction on 11th Oct. DPH, a Series 5 member, immediately filed for Chapter 11 on 8th October. An auction on 4th November was used to determine a DPH cash settlement price of 63.375% for all index and tranche trades. The index and tranche market now trades ex DPH. A later section explains CDX HY5 tranche trading ex DPH. For each maturity, the HY indices mature on 20th December. Table 28 highlights the fixed spreads for both unfunded and funded indices.

Table 28: Fixed Spreads for CDX.NA.HY.5 Indices

Index	Spread	Maturity
Unfunded 5y		
CDX.NA.HY.5	395	20-Dec-10
CDX.NA.HY.5 BB	250	20-Dec-10
CDX.NA.HY.5 B	340	20-Dec-10
Funded	**Coupon**	**Maturity**
DJ CDX HY S5 T1	8.75%	29-Dec-10
DJ CDX HY S5 T2	7.25%	29-Dec-10
DJ CDX HY S5 T3	8.25%	29-Dec-10

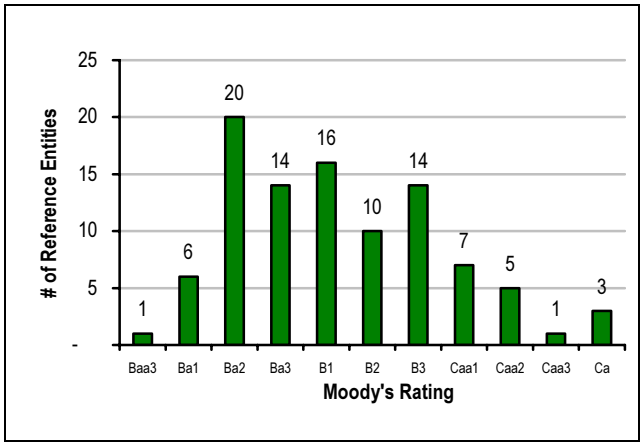
Source: Merrill Lynch.

Rating Breakdown

Of the 100 reference entities in CDX.NA.HY.5:

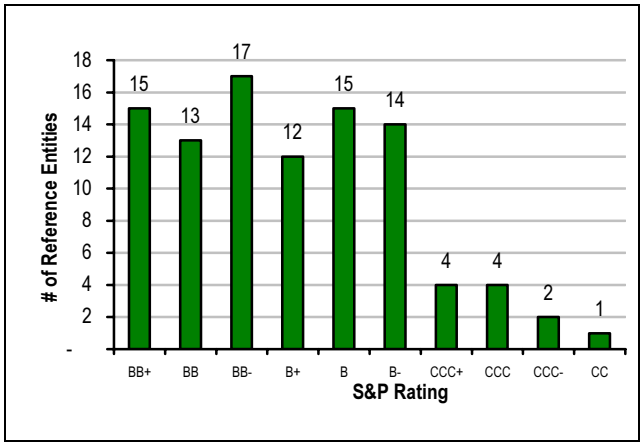
- Moody's rates 40% Ba and 40% B.
- S&P rates 45% BB and 41% B.

Chart 87: CDX.NA.HY.5 Entities by Moody's Rating



Source: Bloomberg. As of 7-Nov-05.

Chart 88: CDX.NA.HY.5 Entities by S&P Rating



Source: Bloomberg. As of 7-Nov-05.

Comparison vs. US Corporate Bond Index

CDX HY5 represents about 42% of ML's HUC0 index

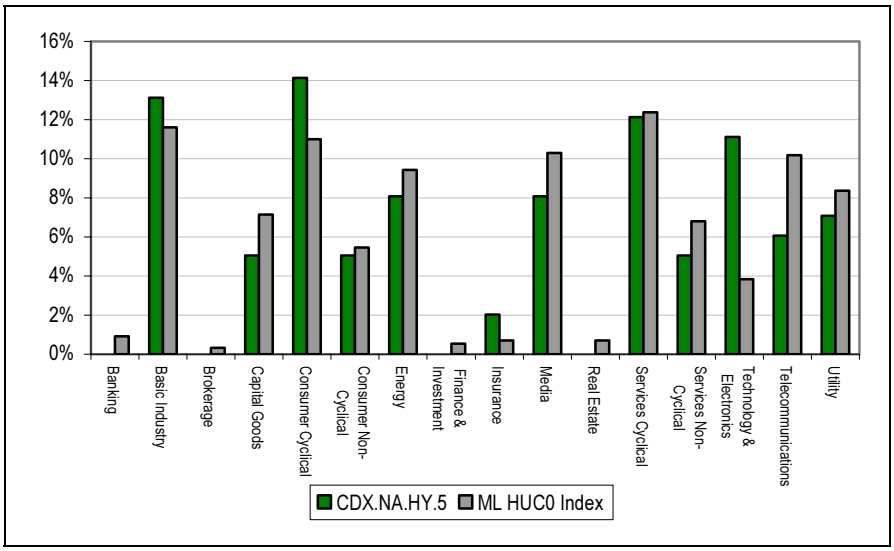
CDX.NA.HY.5 is a benchmark for the North American high yield credit derivative market and therefore overlaps with other bond market indices such as the Merrill Lynch U.S. High Yield Master II Constrained Index (HUC0). In particular, based on the weightings at November 7, 2005, the 99 members of the CDX HY5 (ex DPH) represent about 42% of the market value of the HUC0 index (917 issuers) as of 7-Nov -05. Of the 99 names in CDX HY5, 96 are included in the HUC0 index.

Significant sector overlap between HUC0 and CDX HY5

Chart 89 summarizes and compares the sector representation of CDX.NA.HY.5 versus HUC0 using the Merrill Lynch Index sector classification system.

Refer to important disclosures on page 118.

Chart 89: CDX.NA.HY.5 vs. ML HUCO Sectors Representation



Source: Merrill Lynch; As of 7-Nov-05

European Indices

■ High Grade (iTraxx Europe)

Description

The iTraxx Europe is segmented into sector indices

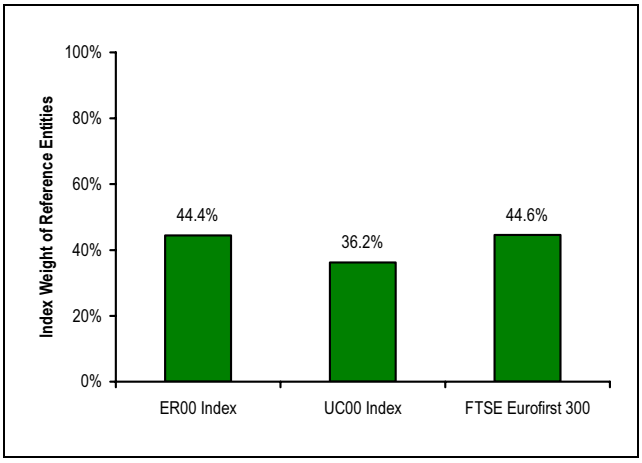
The iTraxx Europe Index is the benchmark CDS index for the European investment grade market, comprising **125 equally-weighted** default swaps on **European investment grade reference entities**. The index is traded in four benchmark maturities: 3-year, 5-year, 7-year and 10-year. Reference entities are selected based on traded CDS volume over the prior six months, reported by market makers of the index. Similar to other index benchmarks, the iTraxx Europe is further segmented into sub-indices, defined by industry groups (Sector Baskets) and trading levels (Hi Vol Index). The index trades with three credit events (Failure to Pay, Bankruptcy and Modified-Modified Restructuring).

The iTraxx Europe has a large overlap with the bond and stock markets

Members in the iTraxx Europe account for **44.4%** of the market value of the Merrill Lynch EMU Corporate Master (ER00) Index, **36.2%** of the market value of the Sterling Corporate Master (UC00) Index[15] and **44.6%** of the market value of the FTSE Eurofirst 300 (E300) Index. Out of the 125 reference entities in the index, 110 are members of the ER00 Index, 66 of the UC00 Index, but 108 of the E300 Index.

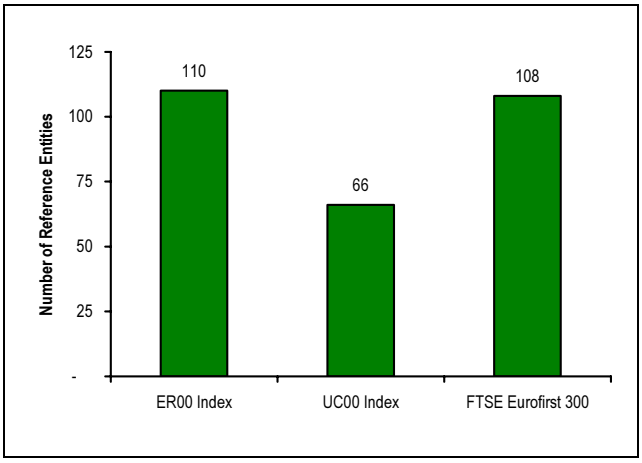
[15] Market-weights adjusted to exclude asset-backed issues (which are in the UC00 index, but not the ER00 index).

Chart 90: iTraxx Europe Index Reference Entities in European Bond & Stock Indices



Source: Merrill Lynch, Indexco, Bloomberg. The market weights would equal 100%, if each respective index would only comprise of reference entities in the iTraxx Europe Index. At 31 August 2005.

Chart 91: European Bond & Stock Index Members in the iTraxx Europe Index



Source: Merrill Lynch, Indexco, Bloomberg. The number of reference entities in the bond and stock indices would equal 125, if each of the reference entities in the iTraxx Europe would be a member of the respective indices. At 31 August 2005.

Consumer Cyclical and Utility are the largest iTraxx Europe sectors, but Banking and Telecom the largest ER00 Index sectors

The average rating for iTraxx Europe is also lower

Rating, Sector & Country Breakdown

The sector composition differs between the iTraxx Europe and ER00 indices (correlation of 0.54). The most significant difference between the ER00 and iTraxx Europe indices is the large weight of the banking sector in the former and consumer (cyclical and non-cyclical) sectors of the latter (Table 29). Also, Media issuers have a comparatively large weight in the iTraxx Europe. The Insurance, Energy, Telecom and Utility sectors have all similar weights in each index. However, no issuers from the Brokerage, Finance & Investment and Real Estate sectors are members of the iTraxx Europe.

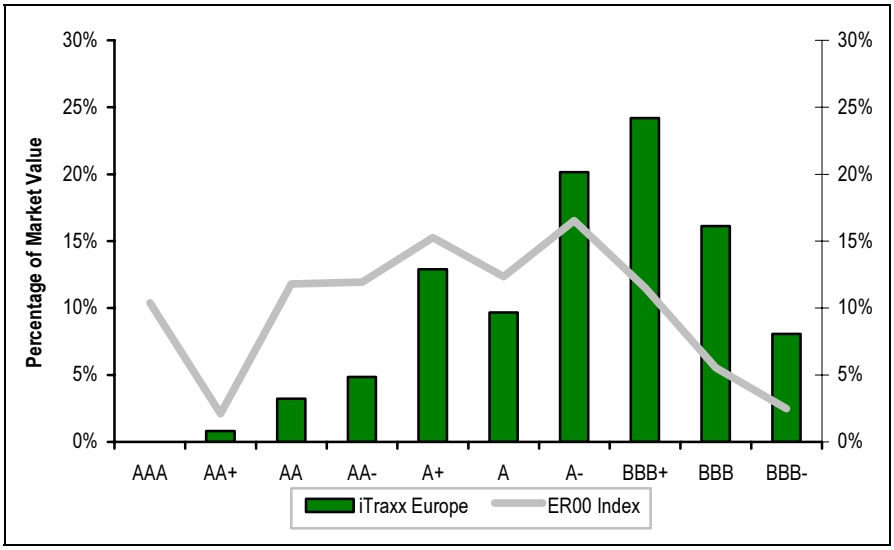
The average rating of the iTraxx Europe is A-, compared to A+ for the ER00 index. The rating distribution for the iTraxx Europe is in fact skewed towards low-A, high-BBB rated credits. The ER00 index has instead a higher percentage of credits rated between A- and AAA.

Table 29: Sector Comparison

Bond Index Sector	ER00 Index	iTraxx Europe
Banking	**38.9%**	12.8%
Basic Industry	3.7%	7.2%
Brokerage	1.9%	0.0%
Capital Goods	3.1%	6.4%
Consumer Cyclical	6.5%	**13.6%**
Consumer Non-Cyclical	4.5%	12.0%
Energy	2.5%	2.4%
Finance & Investment	4.8%	0.0%
Insurance	6.9%	7.2%
Media	0.9%	6.4%
Real Estate	0.9%	0.0%
Services Cyclical	3.5%	6.4%
Services Non-Cyclical	0.1%	0.8%
Technology & Electronics	0.5%	3.2%
Telecommunications	**11.3%**	8.0%
Utility	9.9%	**13.6%**
Total	100.0%	100.0%

Source: Merrill Lynch. Largest sector weights in bold.

Chart 92: Ratings Breakdown

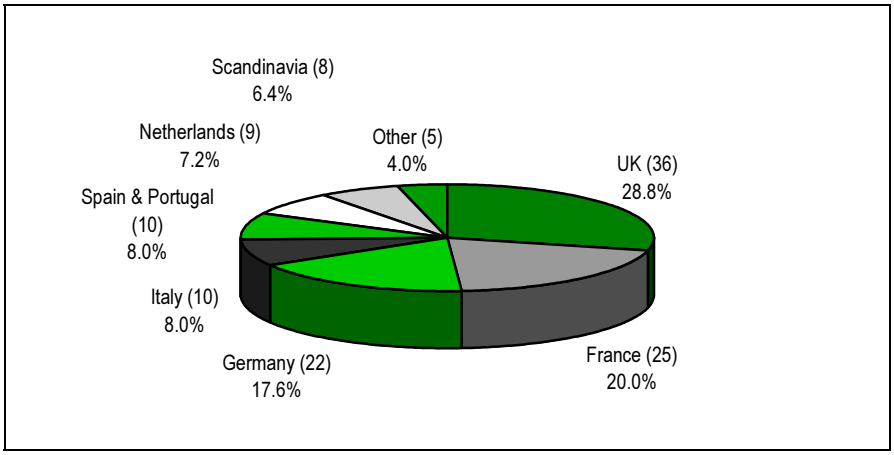


Source: Merrill Lynch, Bloomberg.

Refer to important disclosures on page 118.

Most iTraxx issuers are from the UK (36, or 28.8% of index members), followed by France (25, or 20.0%), Germany (22, or 17.6%) and Italy (10, or 8.0%)

Chart 93: iTraxx Europe Country Breakdown



Source: Merrill Lynch.

Crossover (iTraxx Crossover)

Description

Comprised of 40 crossover names trading

The iTraxx Crossover Index comprises of default swaps on 40 equally-referenced European "cross-over" credits. The maturity of the default swaps is both five and ten years. Reference entities in the iTraxx Crossover are selected by a poll of market makers. The default swaps on eligible reference entities are those that which (i) have a rating of no higher than Baa3/BBB- on negative watch and (ii) trade at spread ranging between twice the spread on the iTraxx Europe Non-Financial Basket and 1,250 bps (or 35% upfront). The index is not divided into any sub indices.

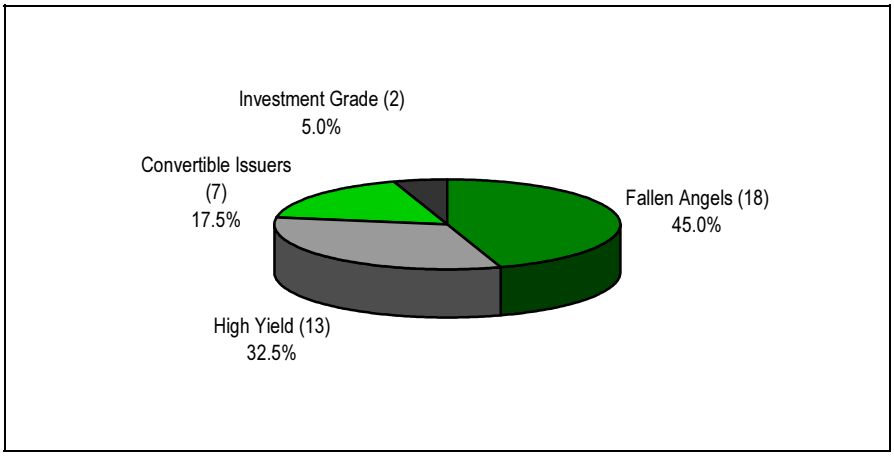
The iTraxx Crossover has the largest overlap with high yield indices

Members of the iTraxx Crossover have the largest overlap with issuers in the Merrill Lynch European Currency High Yield (HP00) Index. Specifically, the iTraxx Crossover accounts for **38.5%** of the market value of the HP00 Index and **29** of its members are also members of the HP00 Index. GM, the largest member of the HP00 Index (19.0% of market value), does not qualify for inclusion.

Index expansion has brought in more original high yield than fallen angel credits

The first series of the iTraxx Crossover index initially comprised of only 25 issuers (mostly fallen angels), but subsequent series have more original high yield issuers, as the index expanded to 40 members. Fallen Angels, however, still comprise the largest market segment of the index (45.0%), followed by High Yield, Convertible and Investment Grade credits (Chart 94).

Chart 94: iTraxx Crossover Index Members by Market Segment



Source: Merrill Lynch. Number of index members in brackets

Capital Goods and Media are the largest iTraxx Crossover sectors

Rating, Sector & Country Breakdown

We compare the iTraxx Crossover to the European Currency High Yield Index, or HP00. The Crossover overweights Basic Industry, TMT, Services Cyclical and strongly underweights Consumer Cyclical and Energy credits. Overall the breakdown of the two indices is correlated by a low 36.5%.

The average rating of the iTraxx Crossover is B+, one notch lower than the HP00 index. The Crossover also has 6 (15%) non-rated members.

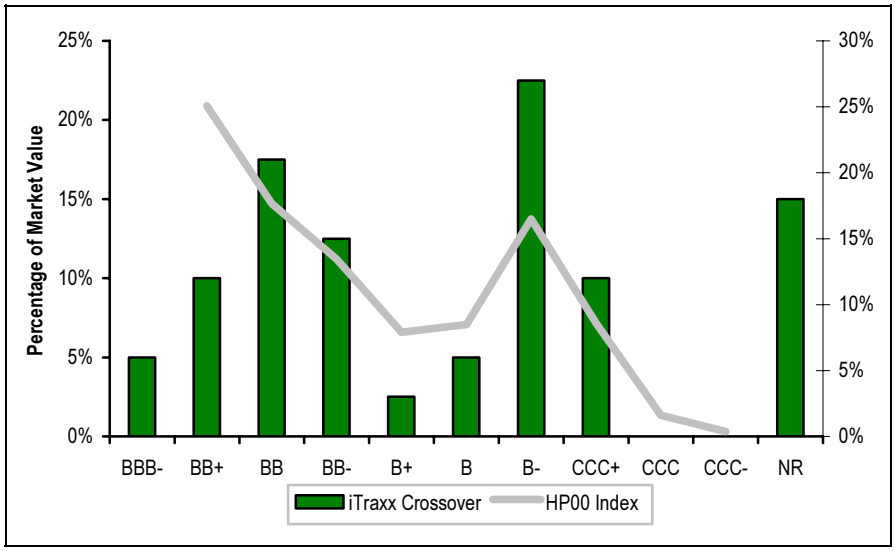
The breakdown by country is similar to the one of the iTraxx Europe, with slightly more weight in UK and Scandinavia and less in French credits.

Table 30: Sector Comparison

Bond Sector	HP00 Index	iTraxx Crossover
Banking	0.3%	0.0%
Basic Industry	10.1%	15.0%
Brokerage	0.3%	0.0%
Capital Goods	**15.4%**	**17.5%**
Consumer Cyclical	**27.6%**	2.5%
Consumer Non-Cyclical	10.2%	10.0%
Energy	4.7%	0.0%
Media	9.6%	**17.5%**
Real Estate	0.2%	0.0%
Services Cyclical	5.9%	15.0%
Services Non-Cyclical	2.8%	2.5%
Technology & Electronics	5.9%	10.0%
Telecommunications	5.0%	7.5%
Utility	2.0%	2.5%
Total	100.0%	100.0%

Source: Merrill Lynch. Largest sector weights in bold.

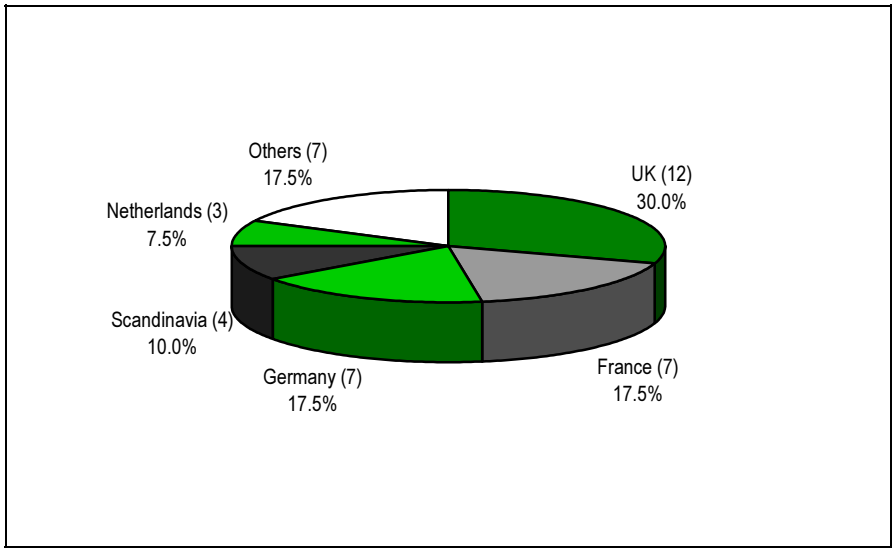
Chart 95: iTraxx Crossover Index Ratings Breakdown vs. HP00 Index



Source: Merrill Lynch.

Similar to the iTraxx Europe, the iTraxx Crossover index is dominated by UK, French and German credits

Chart 96: iTraxx Crossover Country Breakdown



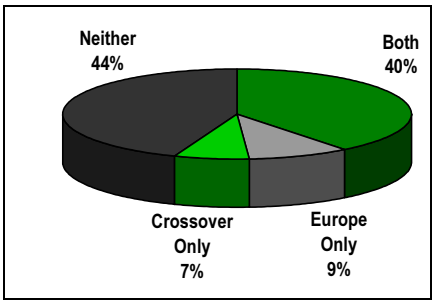
Source: Merrill Lynch.

Refer to important disclosures on page 118.

Who Uses the Indices? How? Why?

In August 2005, we surveyed European credit investors on their views on the iTraxx indices. The results are summarized below.

Chart 97: Do You Currently Use the iTraxx Europe or iTraxx Crossover Indices?

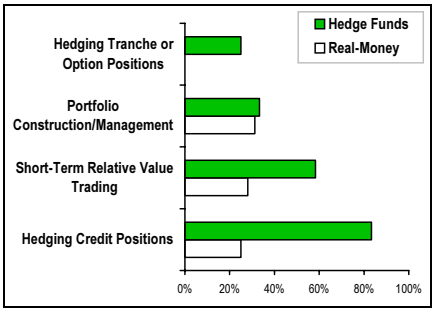


Source: Merrill Lynch. All respondents.

Do You Currently Use the iTraxx Europe or iTraxx Crossover Indices?

- In total, 56% of respondents currently use the iTraxx indices.
- By investor type, over 90% of hedge funds use the indices, but only 40% of real money investors currently use them.
- 70% of index users currently use both indices.
- About 25% of hedge funds use only the iTraxx Crossover index.

Chart 98: If so, Please Indicate for What Purposes

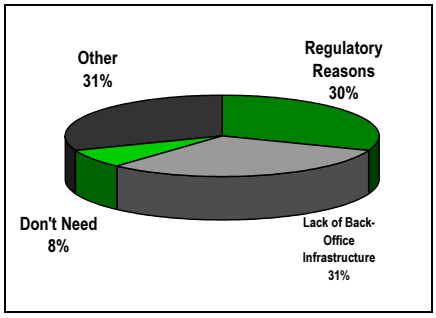


Source: Merrill Lynch.

If So, Please Indicate for What Purposes

- The most popular use of the indices is to hedge credit positions, followed by short-term relative value trading and then portfolio construction/management.
- However, there are large differences between how the two broad investor groups use the indices. Hedge funds mostly use the indices to hedge credit positions. Real money investors tend to use them to construct or manage portfolios.
- Only hedge funds & prop desks use the indices to hedge credit options or CDO tranches.

Chart 99: If not, Please Indicate the main constraints



Source: Merrill Lynch. All respondents.

If Not, Please Indicate the Main Constraints. Do You Also Plan to Use the iTraxx Indices in the Near Future?

- Lack of back-office infrastructure and regulatory hurdles are primary reasons for not using the indices currently.
- About 50% of investors who do not use the iTraxx indices currently plan to begin using them in within the next 12 months.
- A significant majority of participating pension funds indicated they planned to use the indices in the next twelve months.

What Is Your Net iTraxx Index Position?

- Index users are net protection buyers. The ratios between net protection buyers and net protection sellers (roughly 2:1) are similar for both the iTraxx Europe and iTraxx Crossover indices.
- Hedge funds & prop desks are the largest protection buyers.

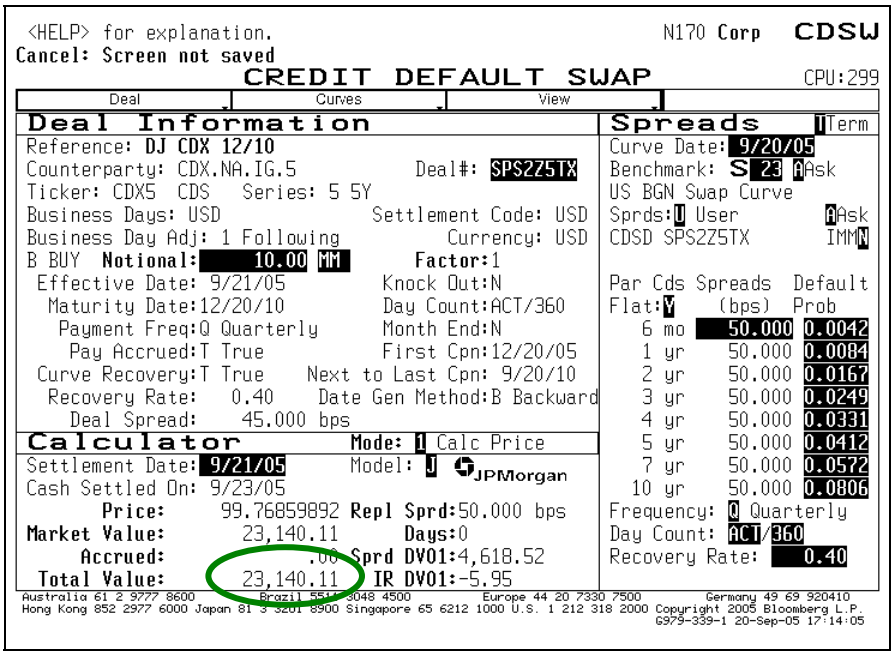
Pricing Convention

Investor pays/receives fixed spread and upfront

Each of the indices described above has a fixed spread or coupon. For example, the coupon of the 5y CDX.NA.IG.5 is 45bps. This coupon approximates the average spread of all the reference entities in the index (or sub-index) at the time of its launch (20th September for this roll). Each reference entity enters the index at this fixed spread, which typically differs from its actual spread. This implies an upfront payment/receipt associated with each reference entity. These upfront values are aggregated for all reference entities to generate the initial upfront.

Post launch, a protection seller of 5y CDX.NA.IG.5 (trading at, say, 50bps) would receive a premium equal to the fixed spread (45bps) similar to a bond coupon as well as an upfront payment equal to the difference between 50bps and 45bps. This difference can be calculated via Bloomberg as shown in Chart 100.

Chart 100: MTM for CDX.NA.IG.5 on Bloomberg (CDSI<GO>; Choose Index; CDSW<GO>)



Source: Bloomberg

CDX HY indices trade on a price basis

Unlike CDX IG, CDX HY trades on a price basis. For example, CDX HY5 99 (without DPH) has a bid/offer of 100-1/4 / 100-1/2 as of 4th November. This implies that an investor can:

- sell protection at a contractual spread of 395bps and pay an upfront of 1/2% of the notional; or
- buy protection at a contractual spread of 395bps and receive an upfront of 1/4% of the notional.

Table 31: CDX.NA.HY.5 Bid/Offer

Index	Contractual Spread	Maturity	Bid/Offer	Risky BPV
CDX.NA.HY 99	395 bps	20-Dec-10	100-1/4 / 100-1/2	3.99
CDX.NA.HY BB	250 bps	20-Dec-10	99-3/8 / 99-5/8	4.12
CDX.NA.HY B	340 bps	20-Dec-10	99-1/2 / 99-3/4	3.98

Source: Merrill Lynch. Prices and Risky BPVs as of 4-Nov-05.

Once the contractual spread and risky BPV of the index are known, it is possible to compute the **equivalent implied spread** through a simple iterative procedure:

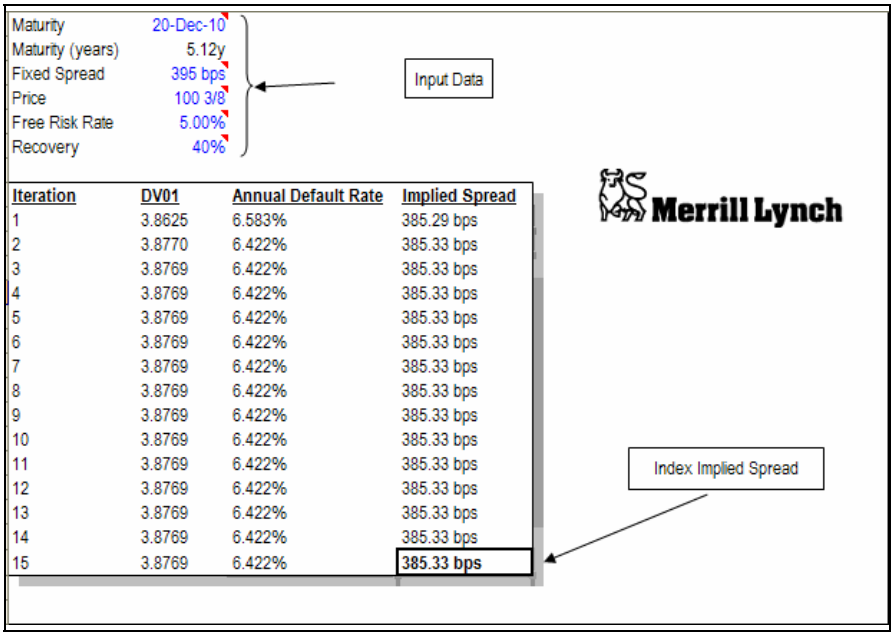
1) Compute the difference between the traded index level and par value (for the CDX.NA.HY index the difference for the mid is 100.375 - 100=0.375)
2) Compute the initial estimate of the risky BPV of the index using the contractual coupon of the index as the input for constructing the survival curve (Risky BPV=3.86 for CDX.NA.HY, contractual spread of 395bps).
3) Find index spread that corresponds to the price (for the CDX.NA.HY this is approximately equal to 395bps - (0.375)/3.86 = 385bps)
4) Using the spread found in step 3, i.e. 385bps,
   a) construct a new survival curve;
   b) recompute the index risky BPV (Risky BPV=3.88 for CDX.NA.HY);
   c) recompute the implied spread (for the CDX.NA.HY this is approximately equal to 395bps - (0.375)/3.88 = 385bps).

Refer to important disclosures on page 118.

5) Repeat step 4 until the difference in spread between two subsequent iterations is negligible (i.e. the spread converges).

Merrill Lynch Credit Derivatives Research has built a simple Excel-based calculator to compute the implied spread for CDX HY indices (Chart 101).

Chart 101: Calculation of Implied Spread for CDX HY5 Indices



Iteration	DV01	Annual Default Rate	Implied Spread
1	3.8625	6.583%	385.29 bps
2	3.8770	6.422%	385.33 bps
3	3.8769	6.422%	385.33 bps
4	3.8769	6.422%	385.33 bps
5	3.8769	6.422%	385.33 bps
6	3.8769	6.422%	385.33 bps
7	3.8769	6.422%	385.33 bps
8	3.8769	6.422%	385.33 bps
9	3.8769	6.422%	385.33 bps
10	3.8769	6.422%	385.33 bps
11	3.8769	6.422%	385.33 bps
12	3.8769	6.422%	385.33 bps
13	3.8769	6.422%	385.33 bps
14	3.8769	6.422%	385.33 bps
15	3.8769	6.422%	385.33 bps

Source: Merrill Lynch

Fair Value and the Index Skew

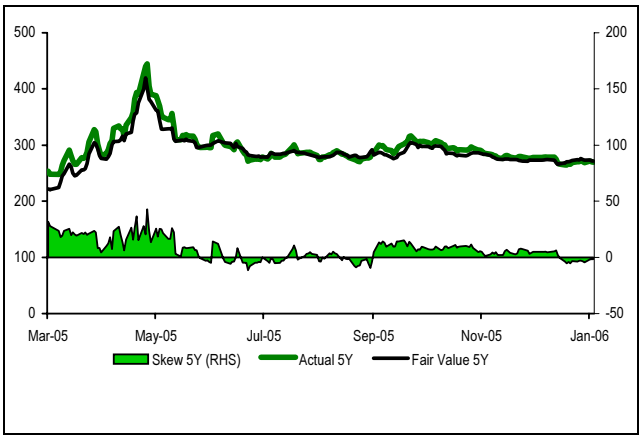
The actual index premium should equal the fair value index premium in frictionless markets. In reality, however, any CDS index may trade at different spreads than its fair value. That difference has been termed as the "Index Skew":

Index Skew = Actual Index Spread – Fair Value Index Spread

In reality, there are several reasons why actual spread may differ from fair value, e.g., lower liquidity in single name spreads, differences in maturity between on-the-run single name and index contracts, and general credit market demand for protection selling and buying, among other.

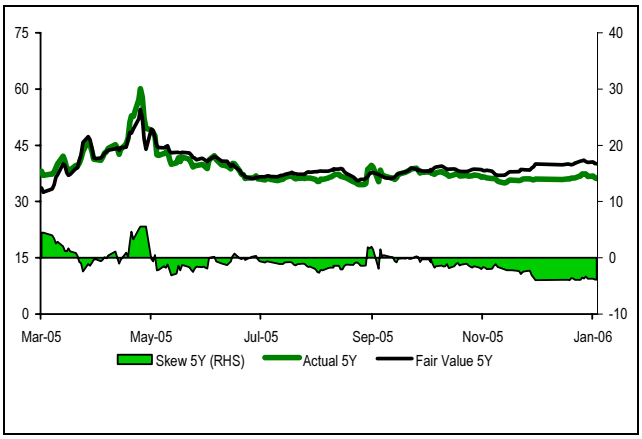
- A positive index skew is a bearish credit indicator, suggesting that index protection buyers outweigh sellers of single name protection.
- A negative index skew is a bullish credit indicator, suggesting that there are more sellers of index protection, than buyers of single name protection.

Chart 102: iTraxx Europe Crossover Index Skew



Source: Merrill Lynch.

Chart 103: iTraxx Europe Index Skew



Source: Merrill Lynch.

Case Study: Trading CDX HY5 Indices ex DPH

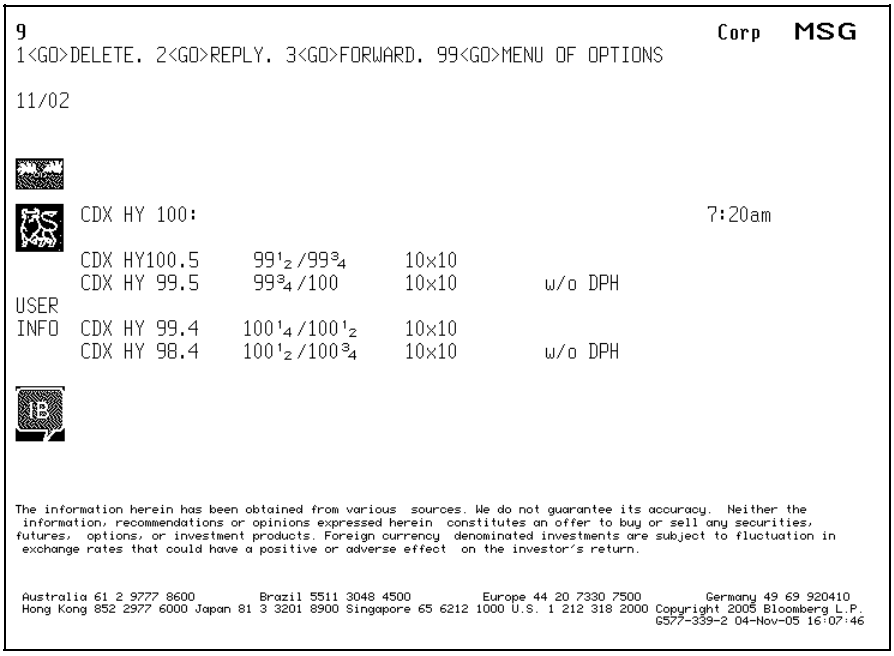
CDX HY5 is now a 99-name index (and CDX HY4 is a 98-name index)

The DPH cash settlement applies to all the series of the CDX HY family as well as the prior iBoxx and Trac-X that include DPH. Post Chapter-11 filing on 8th October, CDX HY5 and HY4 have been trading (a) with DPH and (b) without DPH. Chart 104 shows recent quotes for both indices. CDX HY4 has experienced two defaults: CKC and DPH.

Expect cash settlement for future credit events

Though contractually the index is physically settled, we believe any credit event will lead to a cash settlement due to the extremely high trading volumes of the CDX index. In our opinion, the cash settlement mechanism following the recent credit events (CKC, DPH, etc.) is an example of the blueprint that the market is likely to adopt going forward.

Chart 104: On-the-Run CDX HY Quotes (Series 4 & 5) With and Without DPH



Source: Merrill Lynch; Bloomberg

Refer to important disclosures on page 118.

Quoted notional is adjusted by 0.99 factor

CDX HY5 99 corresponds to the CDX HY Series 5 index without DPH. The index trades with the same fixed coupon of +395bps. However, the index has a **notional factor of 0.99**. As a result, we observe the following for CDX HY5 99 (using the quotes in Chart 104):

- A **market** quote of $10mn notional for CDX HY5 99 corresponds to an **actual** notional of $9.9mn (= $10mn*0.99).
- The running spread on a $10mn notional (quoted) is therefore 395bps * $9.9mn = $391,050.
- A seller of protection would receive the above running spread with no upfront payment (price = 100).
- A buyer of protection would pay the above running spread as well as an upfront payment of $^1/_4$ (= 100 – 99$^3/_4$) on the actual notional of $9.9mn, i.e. $24,750 upfront.

Following the auction, dealers are expected to trade only this 99-name index for HY5, i.e. an existing 100-name index with a notional of $10mn will now trade as a 99-name index with a notional of $9.9mn.

The new 99-name index is represented as **CDX.NA.HY.5*** on Bloomberg. Since DPH was not a member of the BB or B indices, these indices are unchanged. This Bloomberg screen can be accessed directly by typing: **CDX5 CDS Corp <GO>**.

9. CDS Investment Strategies

CDS investment strategies are significantly broader than those for cash credit instruments. Investors can take either long or short credit positions, use funded structures such as CLNs, combine CDS and bonds in basis trades and construct curve trades (both in different maturities and ranking). CDS technology has also introduced more advanced risk and sensitivity measures of credit investment strategies.

Cheap Longs/Shorts

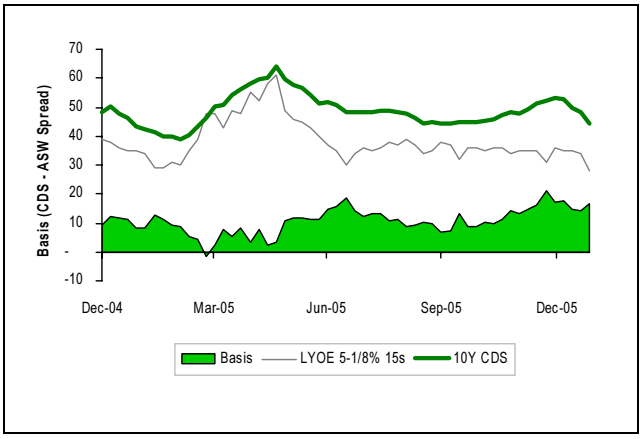
The most basic strategy is to invest via credit derivatives when a higher yield is available . . .

In Volume 1, Chapter 6 we explained the different factors that give rise to a difference between the protection and the comparable asset swap spread. The most simple strategy to exploit anomalies that emerge is the **cheap long.** This is a situation in which it is more advantageous to take exposure to a credit via a CDS than through the cash market. Such opportunities occur when the basis between the CDS and the asset swapped spread is positive, i.e. the income generated by selling protection is greater than yield generated by buying a similar maturity asset swap. However, a positive basis alone, is not sufficient for qualification as a "cheap long" since there may be a fundamentally good reason why the CDS trades wider. However, if the basis is positive and has recently widened for technical reasons, it probably represents a "cheap long" opportunity.

. . . or to buy protection as a cost effective credit short

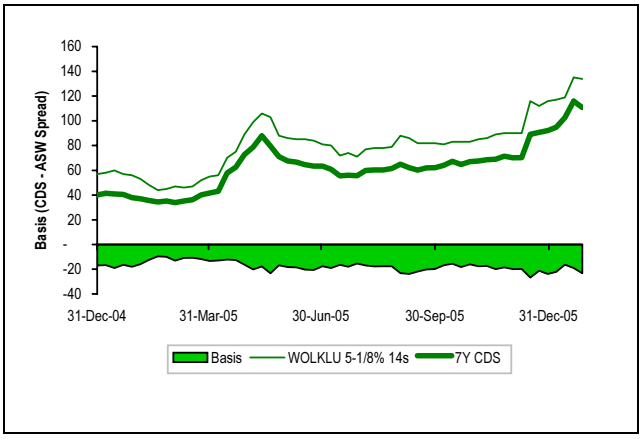
A **cheap short**, on the other hand, refers to a situation where the CDS market can be used to take a "low cost" bearish view on a credit or the market. Most obviously "cheap short" opportunities occur when the basis is negative, i.e. the protection is trading tighter than the asset swapped spread. However, given the difficulty in locking in term borrowing of corporate bonds for selling short, CDS "cheap short" opportunities can be attractive even where the basis is positive but the cash market trades tight and there is scope for fundamental volatility.

Chart 105: "Cheap Long" – LYOE 10Y CDS



Source: Merrill Lynch

Chart 106: "Cheap Short" – WOLKLU 7Y CDS

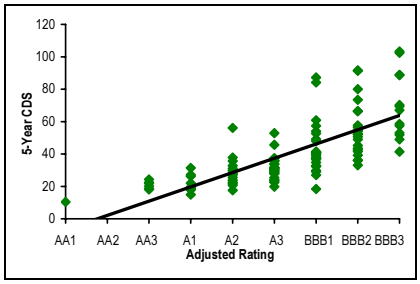


Source: Merrill Lynch

In Chart 105 we illustrate the case of Suez (LYOE) which has typically traded at a wider level in the CDS market than in the cash market (10y maturity) and might be considered a "cheap long" opportunity by investors. By contrast, Wolters Kluwer (WOLKLU) in Chart 106 may be considered a cheap short since its CDS more often than not trades through its asset swap (7Y maturity).

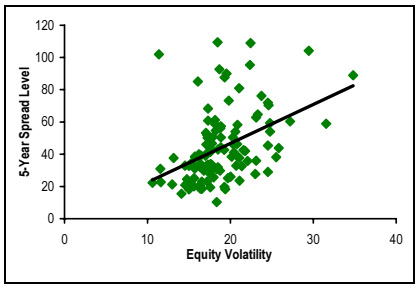
Refer to important disclosures on page 118.

Chart 107: Spreads vs Adjusted Rating



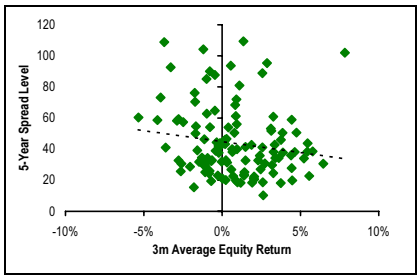
Source: Merrill Lynch

Chart 108: Spreads vs Equity Volatility



Source: Merrill Lynch

Chart 109: Spreads vs Equity Returns



Source: Merrill Lynch

Identifying Cheap Long & Shorts: The Market Cut

Modeling Single Name CDS Spreads

In the absence of arbitrage-based pricing models, such as Merton, or off-shoots thereof, the most rigorous method of identifying relative value in single name CDS is to relate CDS premiums to observable firm-specific risk factors, such as ratings and implied equity volatility. Specifically, regression analysis, based on liquid 5Y CDS, using these risk factors as input can produce fair value CDS premiums, which then can be compared to actual CDS premiums to determine if actual spreads are too low or too high, given underlying risks.

Model Risk Factors: Linking Spreads to Market-Observable Risks

Our model estimates an issuer's fair-value 5yr CDS spread based on the market's relationship with three separate risk factors:

1. **Adjusted Rating**. We convert each rating to a number, scaled based on default rates, and adjust both Moody's and S&P's rating for outlook. For a positive outlook, we move the rating up 1 notch. Vice-versa for a Underweight outlook. We then take the composite rating. A lower rating corresponds to a higher spread and vice-versa (**Chart 107**).
2. **Equity Volatility**. We use 3m equity implied put volatility of an issuer's shares. Higher equity volatility corresponds to a higher spread and vice-versa (**Chart 108**).
3. **Equity Returns**. We use 3m equity price returns of an issuer's shares. Lower equity return corresponds to a higher spread and vice-versa (**Chart 109**).

We choose these variables because they are a proxy of leverage, asset returns and asset volatility, which are key inputs in a firm-value model. The model can also be used as an overlay to fundamental analyst credit convictions about an issuer.

Applying Model to Single Names

Below we present illustrative results for the model. The tight (-) and wide (+) indicator for each issuer is shown in the second column, based on how tight or wide actual CDS is from model-implied CDS spreads.

- A positive number indicates that an issuer's 5yr CDS is too wide relative to underlying risks factors and therefore **attractive to protection sellers**.
- A negative number indicates that an issuer's 5yr CDS is tight relative to underlying risk factors and therefore **attractive to protection buyers**.

Table 32: Selected Model-Implied Credit Longs (Protection Selling Attractive) – CDS Wider than Fair Value Estimates

			Risk Factors		
Issuer	Wide (+) / Tight (-) to the Market	5yr CDS	Adjusted Rating	Equity Volatility	3m Avg. Equity Returns
CCMLN	**+43**	114	BBB2	29.4%	1.4%
DCX	**+42**	78	BBB1	17.5%	4.1%
DB (Sub)	**+16**	30	A1	16.4%	2.1%

Source: Merrill Lynch

Table 33: Selected Model-Implied Credit Shorts (Protection Buying Attractive) – CDS Tighter than Fair Value Estimates

			Risk Factors		
Issuer	Wide (+) / Tight (-) to the Market	5yr CDS	Adjusted Rating	Equity Volatility	3m Avg. Equity Returns
SBRY	**-25**	76	BB1	19.7%	0.3%
GLHLN	**-24**	47	BBB3	18.8%	-0.1%
RTRGRP	**-17**	27	A3	26.2%	2.4%

Source: Merrill Lynch

Credit Linked Notes (CLNs)

Structure

CLNs are fully funded balance sheet instruments . . .

CLNs are fully funded balance sheet instruments that offer the holder synthetic credit exposure to a reference entity (or multiple reference entities) in a structure resembling a synthetic corporate bond or loan. Credit risk can be transferred in return for payment of interest and repayment of par. CLN issuance can either be direct issuance by financial institutions, for instance, or issuance by a Special Purpose Vehicle that holds collateral securities financed through the issuance proceeds. In this section, we concentrate on the latter form of CLN structure.

. . . with embedded CDS

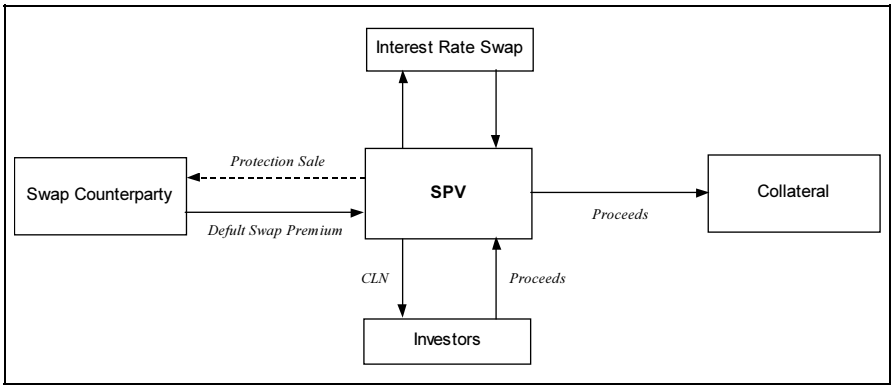
CLNs are created by embedding credit derivatives in new issues from an SPV. Thus the CLN investor achieves synthetic exposure to a CDS in a funded security form. The SPV does the following:

- The issuance proceeds from the CLN are used by the SPV to purchase pre-agreed collateral to fund the CDS.
- SPV simultaneously enters into a CDS with a highly rated swap counterparty (such as a dealer) whereby it sells credit protection in return for an ongoing premium.
- SPV grants a security interest in the collateral against the SPV's future performance under the above default swap.

Three CLN components: SPV, collateral and CDS

As shown in Chart 110, the CLN can be deconstructed into its three main components: the SPV, the collateral, and the credit default swap. The SPV may also need to enter into an interest rate swap (or a cross-currency swap) to reduce interest rate risk and to tailor the required cashflows of the note. For instance, a swap component may be necessary if the collateral cashflows are fixed-rate but CLN cashflows are required in floating-rate form. At inception, any swap would be on-market but as markets move, the swap may move in or out-of-the-money.

Chart 110: Structure of a Typical CLN



Source: Merrill Lynch

Enhanced Coupon

Enhanced Coupon

The performance of the CLN is linked to the performance of the reference entity. The CLN coupon, which can be fixed or floating, is the sum of the funding element from the collateral and the default swap premium received from the swap counterparty. The CLN investor receives this enhanced coupon and par redemption provided there has been no credit event on the reference entity or the collateral has not defaulted.

Credit Event

Following a credit event, the note accelerates

If a credit event occurs to the reference entity during the life of the CLN, then assuming physical delivery, the swap counterparty delivers a qualifying obligation

Refer to important disclosures on page 118.

to the SPV of equal notional amount to the CLN. In turn, the SPV delivers this obligation to the investor in lieu of any future coupons or principal redemption. The collateral is sold to form the par payment made by the SPV to the swap counterparty under the terms of the default swap. The CLN is redeemed by the issuer at zero percent. Any accrued interest from the collateral or default swap premium forms an accrued CLN coupon, which the investor receives.

Collateral risk

If the collateral has a market value in excess of 100% at the time of a credit event, the investor further receives this excess as the default swap counterparty is entitled to only 100% of the notional amount. Similarly, if the market value of the collateral is less than 100%, then the default swap counterparty reduces the amount of defaultable obligations it delivers, with this reduction having the same economic value as the shortfall. In instances where the market value of the collateral has deteriorated significantly, such that the withheld obligations become greater than the obligations to be delivered, the investor receives nothing and the default swap counterparty suffers a loss under the contract. The investor is exposed to only the notional value of the CLN and cannot lose more.

Credit Exposure of the Investor

Exposure of investor

An investor in a CLN has exposure to the credit risk of the reference entity, credit risk associated with the collateral securities and counterparty risk associated with the protection buyer. However, to the extent that the pre-agreed collateral is highly rated and also that the swap counterparty is highly rated, most of the emphasis is on the credit risk of the reference entity. Where the SPV has entered into an interest rate/currency swap, there may also be a potential exposure to these swap counterparties.

What Are the Advantages of CLNs?

- Relative Value – CLNs give investors the opportunity to exploit anomalies in pricing between cash and protection markets. In particular where the default swap basis widens and the credit story remains acceptable to the investor, significant yield enhancement can be achieved.
- Tailored Exposure – CLNs can be used to gain exposures to reference entities in a variety of currencies, maturities and coupon structures that may not be available in the cash market. They may also be used to gain greater leverage to credit risk.
- Maturity – as the protection period is not tied to any particular issue, it is possible to synthetically create a maturity that is different from existing debt issues by the reference entity. In particular, this means that investors who have lines for the credit which are shorter than outstanding issues can use CLNs to shorten the maturity.
- Non-issuers – similarly, CLNs can be created by referencing credits which have not yet issued in the bond market. This can help with portfolio construction and diversification.
- No Direct Derivatives Contract – whilst the CLN contains embedded interest rate and credit default swaps, there is no need for the investor itself to enter into either contract.
- Counterparty Risk/Credit Line Usage – investing in a CLN does not use up counterparty credit limits relating to the sale of protection or the interest rate swap. This feature is relevant for lower-rated investors, but also for those who are highly correlated to the reference credit. Protection buyers are exposed to the credit risk of the SPV collateral and not the CLN investor.
- Infrastructure – Selling protection via a funded purchase of a CLN will bypass the need for infrastructure and pricing systems necessary for default swap trading.
- Listed – CLNs can be listed and are transferable in the same way as other bond issues.

What Are the Disadvantages of CLNs?

- Liquidity – CLN issues are usually much smaller than corporate bond issues and do not have plain vanilla credit structures – thus whilst freely transferable they will not typically be liquid. Shorter maturities as discussed above can to a certain extent mitigate this.
- Cheapest to Deliver – If a credit event does occur to the reference entity, physical settlement of the default swap will likely consist of the lowest priced bond ranking pari-passu with the reference obligation.
- Medium Term View – There are fixed costs (legal costs) associated with the creation of the SPV and the various aspects of the CLN. These fixed costs are irrespective of notional size or maturity, and will be reflected in the pricing of the issue. Thus we think CLNs make more sense for a medium-term investment horizon rather than for short-term trading purposes.

Choice of CLN Collateral

CLN collateral should be acceptable to both issuer and CDS counterparty

The collateral serves two purposes: 1) it provides a base return to the CLN investor and 2) it acts as collateral for the default swap counterparty. As a result, the chosen collateral must be acceptable to both parties. Typical collateral may be obligations issued by the swap counterparty or asset-backed AAA paper (GIC-backed, for example). Asset-backed paper typically trades at a positive spread over LIBOR (whereas AAA government debt trades at a spread through LIBOR). Using ABS paper minimises the negative carry to a non-AAA investor of funding a AAA rated security. The choice of collateral should be such as to minimise the risk of joint probability of default of the reference entity and the collateral.

Special Purpose Vehicles

Benefits of SPV

An SPV is an independent company (in the US it is a trust) primarily designed to enter into certain limited transactions to enable it to issue debt customised to a specific payout profile or suitable to investors. Each SPV issue is collateralised separately and has recourse only to a defined pool of assets. So while the same SPV can issue any number of notes, no two issues will impact each other. An appointed and independent trustee ensures that the interests of all parties to the SPV – the default swap counterparty and the CLN investor – are considered and preserved. The SPV can be situated in a number of jurisdictions, providing tax benefits, and the issued CLN can be rated and/or listed as required.

Curve Trades

CDS Curve Trading Comes of Age

Curve trading gaining popularity

In tight and range bound spread markets, sourcing alpha from directional credit plays has become tougher. However, as the term structure of CDS has become more liquid between 1yr and 10yrs, interest has grown in trading any irregularities in the shape of CDS curves.

- For credit curves that are viewed as too steep, *selling* longer-dated protection and *buying* shorter-dated protection makes sense.
- For credit curves that are viewed as too flat, *buying* longer-dated protection and *selling* shorter-dated protection is the trade of choice.

These trades have been most active in the 3yr, 5yr, 7yr and 10yr parts of the credit curve where liquidity is better.

As curve trading has increased, the market has begun to quote specific curve trades as individual CDS 'contracts'.

Refer to important disclosures on page 118.

Curve trades morph into separately traded CDS contracts, thereby reducing transaction costs

For example, **a 5s/10s curve trade quoted as +60/70** means:

- An investor would receive 60bps running to sell 10yr protection and buy 5yr protection (i.e. investor buys the 'flattener').
- An investor would pay 70bps running to buy 10yr protection and sell 5yr protection. (i.e. investor buys the 'steepener').

When the curve is quoted in this way, transaction costs will typically be lower and economics more attractive.

Flatteners

Overview

As their name suggests, flatteners are curve trades premised on the flattening of a credit curve in a certain maturity band, whereby on the same underlying credit (single default swap or an index) investors:

- buy short-dated (e.g., 5Y) protection and
- sell long-dated (e.g., 10Y) protection.

Structuring Curve Trades

Flatteners can be structured with (1) Equal Notional, (2) DV01-Hedged or (3) Flat Carry notional amounts

Curve flatteners, where investors sell 10-year protection and buy 5-year protection, can be structured in three ways. (These structures apply equally to curve steepeners, whereby investors buy 10-year protection and sell 5-year protection in anticipation of curve steepening.) These structures are:

- **Equal Notional,**
- **DV01-Hedged,** or
- **Flat Carry**

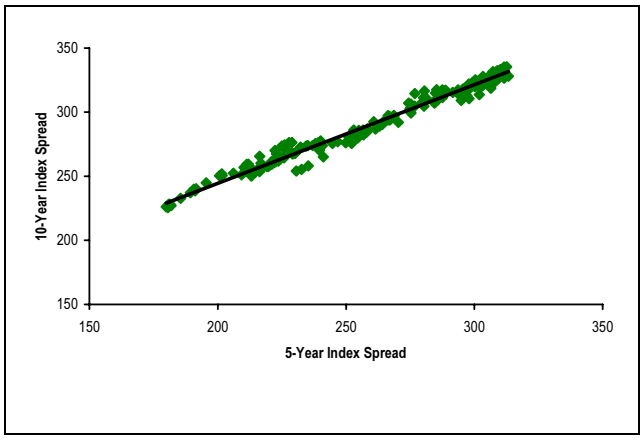
Curve trades, however, are also sensitive to spread changes

In these structures, investors can remain neutral with respect to credit events (**Equal Notional),** parallel curve shift **(DV01-Hedged)** or running costs (**Flat Carry**). These flatteners have **considerably different risk profiles**, since curve trades are both sensitive to spread and slope changes. For example, curves tend to flatten when spreads widen and vice versa.

Curves tend to steepen when spreads tighten

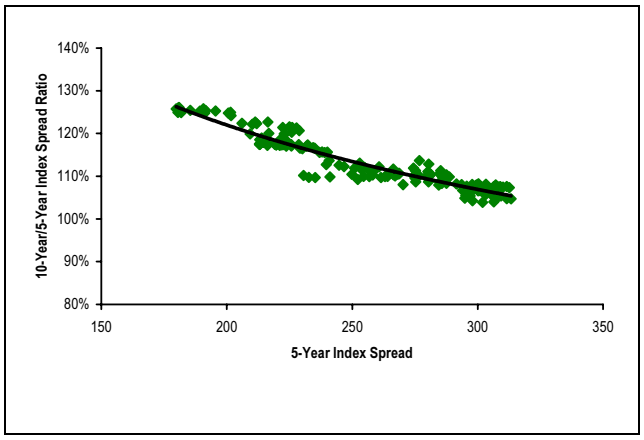
In the case of the iTraxx Crossover index, for example, the spread on the **10-year** index has changed about **0.77 bps** for each **1 bps** change in the **5-year** index, using linear approximation (Chart 111). Therefore **the curve has steepened as spreads have tightened**. Viewing 10-year spreads as a ratio of 5-year, however, the relationship is more non-linear (Chart 112).

Chart 111: iTraxx Crossover Index 10-Year Curve Difference



Source: Merrill Lynch. **10-Year Spread = 0.77 * (5-Year Spread) + 91 bps**. (R^2=0.98).

Chart 112: iTraxx Crossover Index 10-Year Curve Ratio



Source: Merrill Lynch. **10-Year Spread = 6.83*(5-Year Spread)$^{0.67}$** (R^2=0.91).

Table 34: Summary of Curve Flatteners for iTraxx Crossover Index

	DV01 Hedged	Equal Notional	Flat Carry
Structure			
Sell 10-Year Protection	N	N	N
Buy 5-Year Protection	$(DV01_{10\text{-}Yr}/DV01_{5\text{-}Yr})*N$	N	$(Spread_{10\text{-}Yr}/Spread_{5\text{-}Yr})*N$
Ratio	1 to 1.7x	1 to 1x	1 to 1.3x
3 Month Carry	Negative (-17 bps)	Positive (12 bps)	Flat (0 bps)
Valuation Parameters			
Hedging with Respect to	Parallel Curve Shifts	Credit Events	Running Costs
Relative Credit View	Most Bearish	Most Bullish	Moderately Bullish
MTM Volatility	Low	High	Average
MTM due to Credit Event *	Very Positive	None	Positive

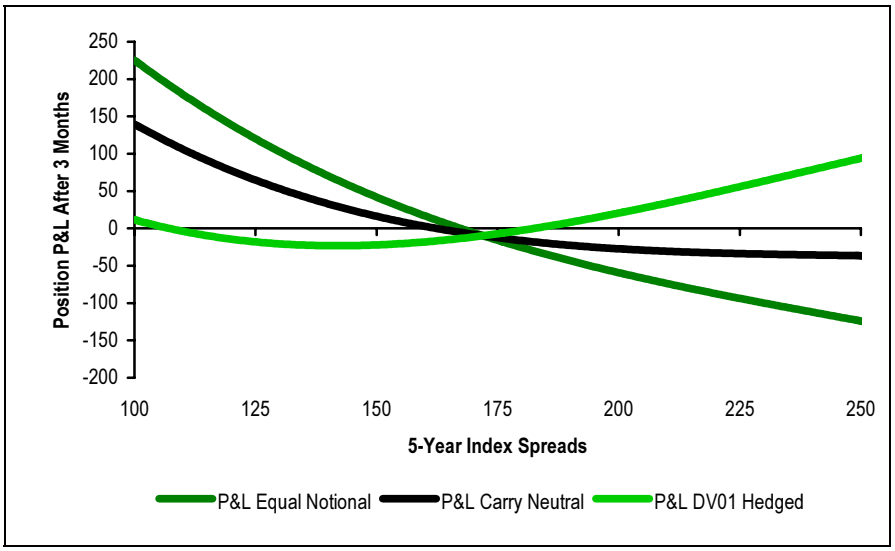
Source: Merrill Lynch. * In the first five years.

Assuming spread and curve history repeats itself, a return profile for flatteners can be constructed using the inverse relationship between spreads and curves

Return Profile

The expected returns for a flattener can be sketched out, using the historically observed inverse relationship between the 5-to-10-year curve slope and the absolute 5-year spread level. **Assuming that the inverse relationship will continue to hold**, we can construct a hypothetical return profile of each structure, linking the return to the combined effect of spread and curve changes (see also Chart 112), i.e., tighter spreads, steeper curves, and vice versa.

Chart 113: Illustrative 3-Month P&L Profile of Position



Source: Merrill Lynch. Excludes carry. Approximation based on third-order polynomial of the 10-year spread as a ratio of the 5-year spread.

The P&L for DV01-Hedged Flattener is not sensitive to changes in absolute spreads, but only changes in the slope. The DV01-Hedged Flattener, however, under-performs in a spread-tightening environment, solely due to the negative relationship between curves and spreads.

On the other side, an Equal Notional trade will capture both the movements in the slope and the absolute changes in the 10-year and 5-year spread. In a tightening environment, the positive MTM due to the decrease in spreads would offset the negative MTM due to the associated steepening in the slope, generating a profit.

Finally, a Carry-Neutral Flattener would have a P&L profile in the middle of the two.

Refer to important disclosures on page 118.

Steepeners

The opposite of flatteners, steepeners are premised on steepening of a credit curve

Steepeners are curve trades premised on the steepening of a credit curve, whereby on the same underlying credit (single default swap or an index) investors:

- buy long-dated (e.g., 10Y) protection and
- sell short-dated (e.g., 5Y) protection.

Butterflies

Butterflies are combinations of steepeners and flatteners

Tight spreads make it tough to generate returns without also taking significant spread and default risk. We advocate CDS butterflies on crossover names to use curve views rather than outright credit longs to generate carry. One such butterfly is:

Table 35: Illustrative Butterfly Structure

	Position		
	Long	Short	Long
Ratio	2x	3x	1x
CDS Maturity	3Y	5Y	10Y

Source: Merrill Lynch.

For credit curves which kink at the five year point, this trade can offer attractive positive carry, default neutrality (both long and short 3 "contracts") and a duration which is close to neutral.

Butterflies and Crossover Credits: A Powerful combination

Kinked curves in Crossover credit provide opportunities for investors to simultaneously position for 1) a flattening in the short-end of the credit curve and 2) a steepening in the longer-end of the credit curve, and generate a healthy positive carry. We recommend investors consider default neutral butterfly trades to profit from a curve normalisation.

A butterfly CDS trade consists of simultaneously:

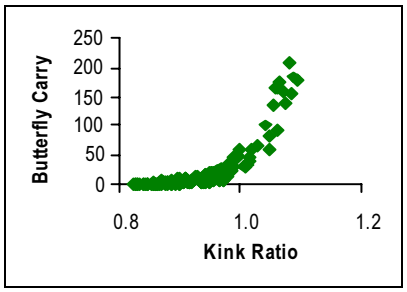
- Buying 3yr protection on **2x notional**
- Selling 5yr protection on **3x notional**
- Buying 10yr protection on **1x notional**

Trade Characteristics

Butterfly trades characteristics:

- By leveraging the relatively wide CDS spread in the 5yr part of the curve, compared to the 3yr and 10yr part of the curve ('wings'), the investor has a **generous positive carry**. The more kinked the credit curve, the greater the carry from the butterfly trade, relative to the 5yr CDS level (Chart 5).
- The net notional of the position is zero and so the investor **has no exposure following a credit event**.
- **The position is almost DV01 neutral,** so the investor makes just a small P&L following a **parallel shift** tighter in the CDS curve. Conversely, the investor loses a small P&L following a **parallel shift** wider in the CDS curve.
- The investor makes a **positive P&L** if the curve flattens between 3yrs and 5yrs and steepens between 5yrs and 10yrs.
- The **worst case scenario** for an investor is if the curve steepens further between 3yrs and 5yrs and flattens further (or even inverts) between 5yrs and 10yrs. Realistically, the most likely immediate driver of this would be a technical tightening at the long end if there was to be growth in protection selling on mezzanine tranches of the 10-year crossover index.

Chart 114: Kink vs Butterfly Carry (bps)



Source: Merrill Lynch. CDS Mid Points. Kink Ratio = 5yr CDS spread / (3yr + 10yr) / 2.

Negative Basis Trades

What is a Negative Basis Trade?

Basis = CDS Premium – Bond Spread

A basis trade involves an investor buying a bond (typically asset swapped to floating) and simultaneously buying credit protection on the same credit to maturity. Such structures are typically (but not exclusively) purchased when the CDS is offered at a tighter spread than the offer on the bond asset swap spread. This combination is referred to as a **negative basis trade**.

Positive Carry

No cost of carry for LIBOR funders

The most obvious attraction of negative basis trades is **positive carry** on a reference entity against which default risk is hedged. For investors who can fund at LIBOR, such packages are self-funding for the life of the transaction. This carry in itself is, however, often not wide enough to entice investors to buy these packages since funding costs are more typically above LIBOR. There may also be other capital and administrative costs to consider.

Volatility

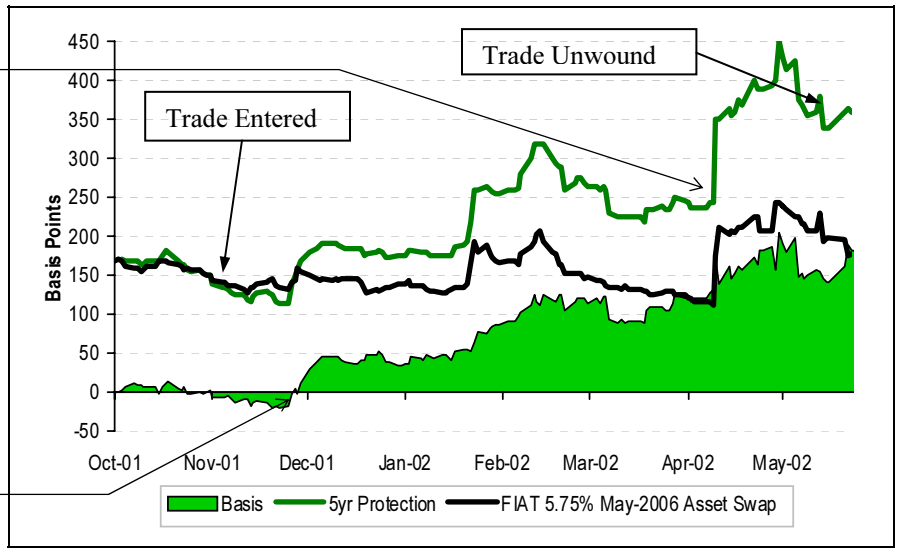
Put on when negative, unwind when positive

A key attraction of protected packages is prospect of "free" exposure to market volatility with limited credit downside. As the cash bond market and the default markets are driven by different buying and selling flows, day by day and month by month, the basis can be highly variable. This volatility may reflect technically driven market movements (such as convertible bonds issuance, synthetic CDO hedging) or fundamental credit developments (such as banks buying protection against worrying loan exposures).

With a negative basis trade, the investor can often take advantage of this volatility by unwinding both legs of the trade at a profit if the basis swings from negative to significantly positive. Negative basis opportunities are most frequently available on high quality credit situations where the bonds are trading at relatively tight spreads in the credit market. Indeed as spreads get wider, the basis also tends to get more strongly positive. Small positive basis packages that have exhibited high historical basis volatility can also be attractive candidates if investors believe that the high historical volatility is a good indication of the range in which the basis might be expected to trade in the future.

Chart 115: FIAT Basis Trend November 2001 to June 2002

Further credit deterioration as S&P announces Fiat's short-term A-3 ratings may be cut



Announcement of $2.2bn exchangeable

Source: Merrill Lynch

Fiat CDS in 2002: A case study for negative basis trades

In Chart 115 we illustrate the market trends for FIAT asset swap and default. This represented a successful basis trade between November 2001 and May 2002. As can be seen, the basis widened sharply following issuance of a $2.2bn

Refer to important disclosures on page 118.

exchangeable and then later further still on the back of sustained bearish credit sentiment.

In Table 36, we examine how a zero basis trade would have performed based on being unwound six months later.

Table 36: Illustration of P&L for a FIAT Flat Basis Trade

	Buy Package	Sell Package
Notional	€ 10,000,000	
Funding	3mo €LIBOR	
Bond Details	FIAT 5.75% 25-May-2006	
Trade Date	26-Nov-2001	28-May-2002
Bond Price (plus Accrued)	103.5	96.0
LIBOR Spread	140 bps	220 bps
Matched to Maturity CDS	140 bps	380 bps
Basis	0 bps	+160 bps
Profit & Loss on Trading Strategy		
Profit (Loss) on Bond Sale (net of Funding)	€ (289,000)	
Profit (Loss) on CDS Unwind (40% Recovery)	€ 856,000	
Net Profit (Loss)	**€ 567,000**	

Source: Merrill Lynch

Typically Moderately Bearish

Tends to benefit with credit deterioration

Although the holder of the package is essentially credit hedged, the structure could be expected to be most profitable in bearish scenarios.

- The basis tends to be most positive when spreads are wide or widening. Moreover, when credits deteriorate significantly, bids for bonds typically remain but liquidity in protection offers can dry up. Being long protection can therefore be a highly advantageous position.
- Credit events tend to be broader than events of default, which will generally favor protection buyers.
- The protection holder is the beneficiary of the "cheapest-to-deliver" (CTD) option in the settlement of default swaps.

Cheapest to Deliver Optionality

Bond documentation, e.g. ratings language

The CTD option will be more valuable if the bond has underlying documentary features which suggest that the bond will not be the CTD following a credit event. Differing covenant language between individual bond issues is a factor which can drive divergence of price performance following credit deterioration or corporate restructuring. Thus being long the issue with the strongest covenants together with protection can be advantageous.

Documentary protection may also take the form of ratings-triggered coupon step-up language. Negative basis strategies can be interesting for bonds with ratings driven coupon-step language – since a credit ratings deterioration could trigger an improvement in the carry on the transaction. Against this, however, many issues also have coupon step down language following upgrades, which can reverse the above impact. Such language is, therefore, most attractive on credits which have a negative trend or are trading at their coupon floors.

Unwind Profits or Losses

Long Gamma and Risky BPV

The profit and loss impact of a given change in the yield on the default swap will not necessarily be the same as for the swapped cash bond. In fact, for an *equal* spread widening in a long 5yr asset-swap and equivalent long 5yr protection position, the loss on the asset-swap will be greater than the gain on the CDS position. This is because buying protection is a long gamma position. This is due to the *survivability* of the annuity stream, which was bought at a lower cost and sold at a higher cost. While the investor has a positive annuity for the remaining

life of the trade, the probability of a credit event (and thus elimination of the annuity) is greater at the higher cost than at the lower cost.

Recovery assumption determines P&L on CDS position

The protection unwind also assumes a below par recovery value. Typically a 35% recovery is assumed for senior unsecured obligations. For recovery assumptions greater than 35%, the P&L on the CDS unwind would be lower and vice-versa. As a result, it is not possible to calculate the present value of a negative basis trade by simply discounting the positive carry over the transaction lifetime.

■ Capital at Risk Hedge Ratio: When Bond Trades Away from Par

A 1x credit hedge is the most simple basis trade structure and is often appropriate when bonds trade around par since the CDS is essentially a par product. When the market prices of bonds diverge significantly from par, however, this structure can lead to a highly imperfect credit hedge if default subsequently occurs.

Credit Risks in Bonds & CDS

Investors who take on credit risk are essentially exposed to its two components:

1. **Default risk**: as implied by the probability of default of the instrument.
2. **Recovery risk**: as implied by the expected loss of the instrument given default.

Default risks are the same for bond and CDS . . .

Bond spreads lump both these risks together into a combined credit spread which has always been difficult to decompose. However, the introduction of the CDS instrument and the mechanism of unwinding it forces the market to decompose the spreads providing a more appropriate method of determining relative value between the bond and CDS.

As the CDS and the bond reference the same credit, we can assume that the default risk of each is the same[16]. **Thus any difference in spread should then reflect only the recovery risk or the expected severity of loss given default.**

Unlike a bond which can be "unwound" by simply selling it at the market price, a CDS is unwound at the market spread using a specific recovery rate assumption following a default. This recovery rate information from the CDS market enables us to establish the recovery risk of the bond as implied by the CDS market.

The recovery risk or expected loss given default is the difference between:

1. **entry-price** exposure to the credit (which reflects the capital-at risk), and
2. **expected recovery** following default (assume same for both bond and CDS).

. . . but recovery risks can differ

If a bond is trading above par, its expected loss given default is higher than that of the CDS which is essentially a par product. Similarly, the expected loss given default for a bond trading below-par is lower than that of the CDS.

For example given a bond purchase price of $112 and a recovery of $40, the loss given default on the bond will be $40-$112=-$74 whereas, on the CDS leg the payoff would be equal to $100-$40=$60. This would imply a loss of $14 for the protected (as it seems wrongly at the trade inception) bond package holder.

Above-Par or Below-Par?

Spread differential should reflect capital at risk between bond and CDS

To understand the relative value between bond and CDS as a function of recovery rate assumption, consider a company which has two bonds outstanding which rank equally and have the same maturity. Due to their different coupons, however, the bonds trade at different cash prices as follows:

1. Above-par bond trading at 110.
2. Below-par bond trading at 90.

[16] Readers could argue that the probability of a CDS credit event could be different from that of a bond defaulting especially if there is a high probability of a soft restructuring i.e. the CDS would have a credit event without a default by the bond. We ignore this for the purpose of our analysis.

Refer to important disclosures on page 118.

Table 37: Loss Given Default for Bonds Relative to CDS

Recovery	Loss Given Default: Below-par 90	CDS 100	Above-par 110
20	70	80	90
70	20	30	40

Source: Merrill Lynch

Table 37 highlights the loss given default for high asnd low recovery rate scenarios. For a given price and recovery rate assumption, we expect the following:

- **Above-par bond**: the bond spread should be higher than the CDS spread to reflect the greater expected loss given default i.e. the basis should be negative. As the recovery expectation increases, the attractiveness of the bond decreases relative to the CDS and basis should be more negative.
- **Below-par bond**: the bond spread should be lower than the CDS spread to reflect the smaller expected loss given default i.e. basis should be positive. As the recovery expectation increases, the bond becomes relatively more attractive than the CDS and the basis should be more positive.

CDS Equivalent Spread

Adjust the bond spreads by the bond price and recovery rate

In order to compare the bonds and CDS, we adjust the bond spreads by the bond price and the expected recovery rate to determine a CDS equivalent spread. Since the probability of default of the CDS-equivalent bond is unchanged, we derive the CDS-equivalent spread by equating the spread ratio to the ratio of the expected loss given default[17].

$$\text{CDS Equivalent Spread} = \text{Bond Spread} \cdot \left(\frac{100 - \text{Rec}}{\text{Bond Price} - \text{Rec}} \right)$$

We then **compare the CDS-equivalent spreads to the CDS premium** to evaluate relative value either between the two instruments or between different bonds using the underlying CDS curve as a given.

Capital at Risk Hedge

Setting the hedge such that expected loss on default is zero

A capital at risk hedge is simply a reworking of the above equation in such a way that the expected loss following default is zero.

$$\text{Capital at Risk Hedge} = \text{Bond Notional x} \left(\frac{\text{Bond Price} - \text{Rec}}{100 - \text{Rec}} \right)$$

Where the underlying bond is trading below par, the ratio will be lower than 1x and above 1x for bonds trading at a premium. The lighter hedge on the lower cash-price bond has the effect of improving the carry on the basis trade.

■ DV01 Neutral Hedge Ratio

Defaults are rare, but spread changes are constant

Profitability of trades more likely to be driven by mark to market than default…

Capital-at-risk analysis and CDS equivalent spreads are extremely useful in guarding against and valuing the expected impact of default. In reality, however, most issuers do not default and the P&L on a basis trade will be determined by the market movements of each instrument rather than realised recovery rates.

Thus, where the capital-at-risk hedge significantly diverges from 1x, it is likely that mark-to-market impact of spread movements will be different for each leg of the trade. Where the hedge ratio is lower than 1x, a matched maturity basis trade will tend to be DV01 positive and will therefore benefit from parallel spread tightening. Hedge ratios of above 1x will by contrast tend to be bearishly positioned with regards to spreads.

…so an alternative strategy is to use duration weighted hedges

An alternative approach to hedging credits, which are not expected to default is therefore to set the hedge ratio such that the DV01s of each leg exactly offset each other. With this approach the expected P&L impact of a small parallel change in spreads on both instruments will be zero.

$$\text{DV01 Hedge} = \text{Bond Notional x} \left(\frac{\text{Bond DV01}}{\text{CDS DV01}} \right)$$

[17] Spread / Adjusted Spread = (Bond Price - R) / (100 - R); given bond price, spread and recovery rate, we can solve for CDS equivalent or adjusted spread.

Also gives the opportunity to build in curve views

Allows hedging with CDS of different maturity

One of the advantages of this approach is that it enables investors to select the sections of the CDS and bond curves which offer the best value even when these are at different maturity points simply by adjusting the hedge ratio.

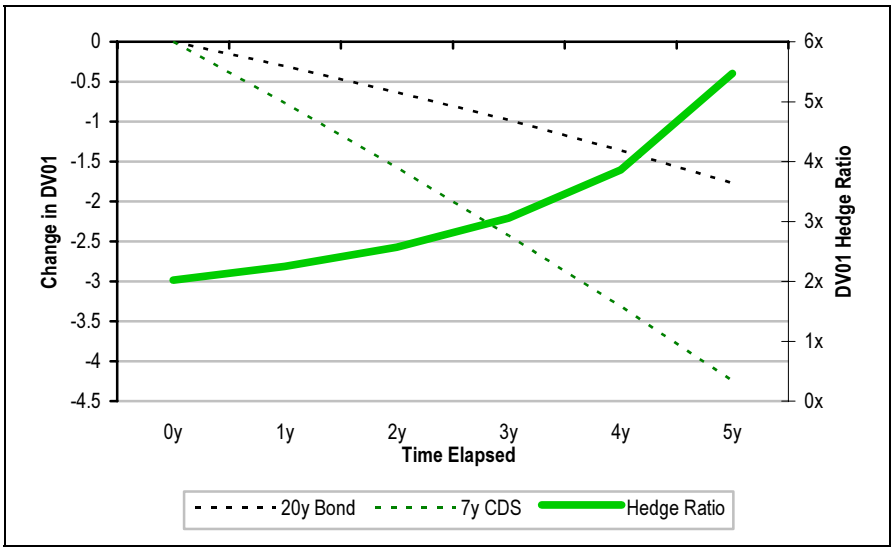
Whilst hedging duration this way with hedge ratios significantly away from 1x, the investor is implicitly taking a view on the credit curve shape and will either have a positive or negative recovery exposure if a default occurs.

Hedging with the DV01 ratio: risk and reward

Especially in the case of substantial mismatch between the bond and the CDS maturities, the frequency at which the hedge needs to be rebalanced assumes particular relevance[18].

To this end, let us consider a protected bond package structured with a 20y bond against a 7y CDS. As clear from Chart 116, the speed of decay of the short dated CDS is more pronounced than the bond one. This in turn implies that the hedge ratio will significantly increase as time passes.

Chart 116: DV01 Hedge Ratio vs. Time



Source: Merrill Lynch

Protected Bond Packages

■ Extension of Negative Basis Trade

Protected bond packages represent an extension of the basis trade strategy. In these structures, an investor buys a bond and protection in the same credit, but could accept a small positive basis (i.e., negative carry). The investor expresses a moderately bearish view as well and has very similar risk considerations as in the negative basis trade, i.e., carry, volatility, bond price and documentation risks.

■ Case Study: Peugot '33 Protected Bond Package

Assume that Peugot 6% Sep-2033 is trading at a price of 119 (Z spread = 93bps) and 10Y CDS at 53 bps.

[18] In addition, we remark that duration based hedge strategies only work as long as spread movement are parallel in nature (i.e. all the points of the issuer credit curve move by the same absolute amount) and small in magnitude.

Refer to important disclosures on page 118.

Table 38: Peugot '33 Protected Bond Package

Bond Price		Bond Z Spread	Bond DV01
	119	93bps	14.4
CDS Spread		**CDS DV01**	**Assumed Recovery**
	53bps	8.4	40%

Source: Merrill Lynch

Given the price (119) and the maturity ('33) of the bond, we can compute the corresponding CDS hedges by applying one of the three formulas developed earlier:

DV01 Hedge =

Bond DV01 / CDS DV01 = 17.3/8.4=2.07x

Table 39: Hedge Strategies

	1:1 Hedge	DV01 Hedge	Capital at Risk Hedge
Bond	€ 10	€ 10	€ 10
CDS	€ 10	€ 20.7	€ 13.2

Source: Merrill Lynch

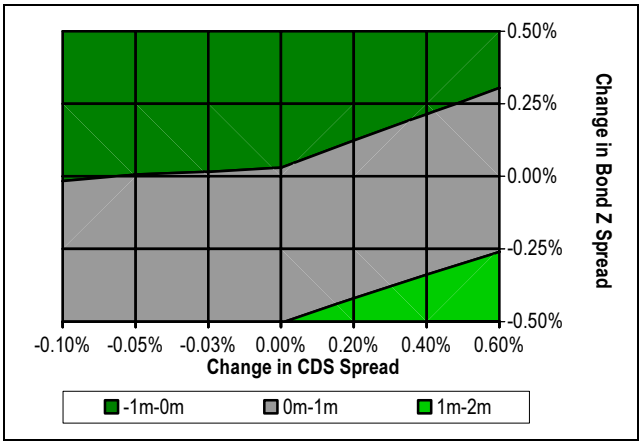
Capital at Risk Hedge =

(119-40)/(100-40)=1.32x

With respect to the example depicted above, choosing the appropriate hedging amount assumes particular relevance as the CDS notional to buy varies significantly for the three strategies. Let us first compare the P&L profile of the 1:1 hedge against the Capital at Risk (CaR) hedge.

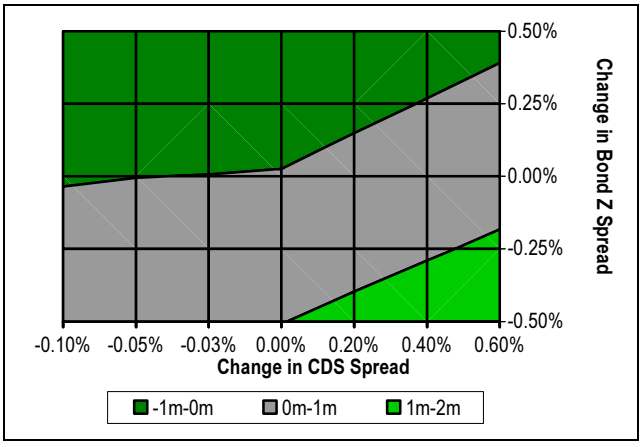
As shown in Chart 117 and Chart 118, the CaR hedge, when compared to the 1:1 hedge, is a slight more bearish strategy, since it enhances the P&L profile when spreads widen. On the other hand the negative CDS/Bond basis narrows from 40bps (1:1 hedge) to 23bps (CaR hedge). In terms of cash outflows upon default, the strategy offers full protection only if the realized recovery is significantly close to the assumed one (40%). Recovery values **above** the assumed will jeopardize the performance of the trade.

Chart 117: 1:1 Hedge



Source: Merrill Lynch. Assume a 3m holding period.

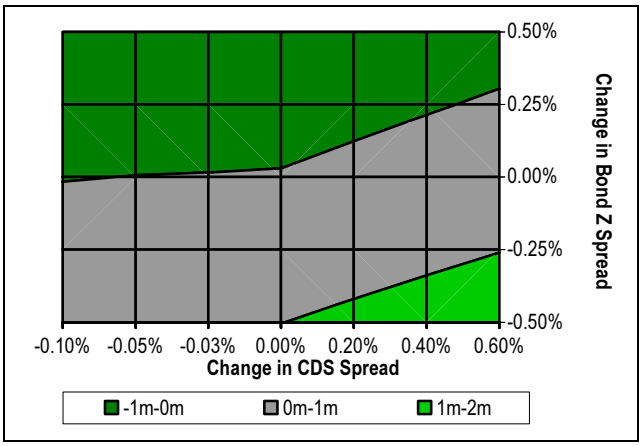
Chart 118: Capital at Risk Hedge



Source: Merrill Lynch. Assume a 3m holding period.

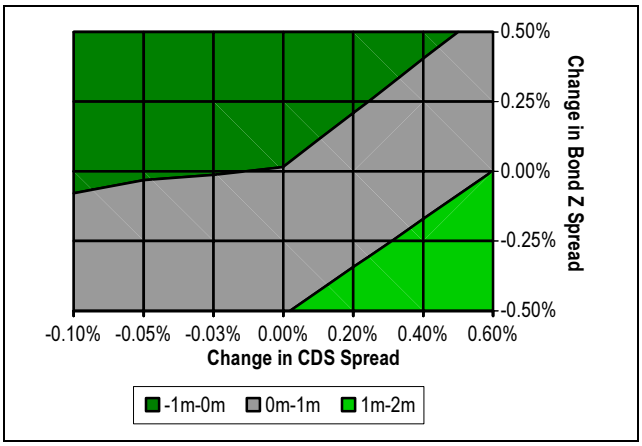
With respect to the second strategy, as shown in Chart 119 and Chart 120, the DV01 hedge, when compared to the 1:1 hedge, is definitely a more bearish strategy, since it enhances the P&L profile when spreads widen. On the other hand the negative CDS/Bond basis narrows from 40bps (1:1 hedge) to -17bps (DV01 hedge).The strategy offers a higher degree of protection in case of spread widening due to the larger CDS notional bought. In terms of cash outflows upon default, the strategy offers full protection up to a breakeven rate of 82. Recovery values **below** the breakeven will provide substantial gain for the package holder.

Chart 119: 1:1 Hedge



Source: Merrill Lynch

Chart 120: DV01 Hedge



Source: Merrill Lynch

Sub-Versus-Senior CDS Strategies

■ Protection Levels and Recovery Expectations

Default spreads tell us about relative recovery assumptions . . .

Across all instruments, subordinated debt trades wider than senior, although differentials in this yield vary considerably. In the cash market, such spread variations may reflect differing evaluations of default risk or expected recovery following default.

In the credit default swap market however, the credit event probability of senior and subordinated contracts should be identical since a common definition of "obligations" applies to all contracts unless otherwise specified. It is market convention to define the obligations on which a credit event can occur as "borrowed money" – which makes no distinction based on seniority of claim.

Thus the sub-to-senior spread differential in default swap contracts is driven fundamentally by expected recovery values. If subordinated spreads are double those of senior, then the expected subordinated loss following default is double that of senior. Thus a 80% senior recovery (20% loss) would imply a 60% subordinated recovery (40% loss) whilst a 50% senior recovery (50% loss) would imply a 0% subordinated recovery (100% loss).

. . . and changing sub-to-senior relationships imply changing recovery assumptions

Further, although protection spreads may move frequently as expectations of default risk shift, any change in the sub-to-senior default premium ratio implies changing relative recovery value assumptions.

For example, if the senior-to-sub spread ratio dropped from 2.0x to 1.5x this implies that expectations of relative recoveries for subordinated have improved. An 80% senior recovery (20% loss) expectation implies a 70% subordinated recovery (30% loss) expectation. And subordinated recovery would not hit 0% until expected senior recovery fell to 33% (67% loss).

■ European Banks and Insurance Companies

The most liquid markets in subordinated and senior CDS is in European financials.

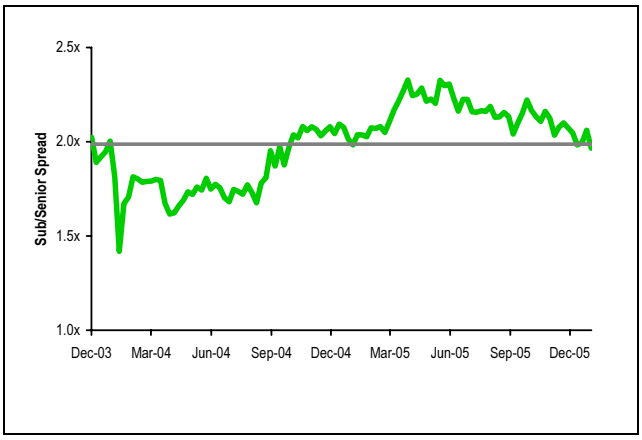
The most liquid markets in subordinated and senior CDS is in European financials. For major **European banks**, there is an active credit derivative market on both a senior and subordinated level. For **European insurers**, the market has also evolved, but with most of the activity in subordinated CDS in 10Y, rather than 5Y. Below, we have charted historical 5Y sub-to-senior ratios.

Refer to important disclosures on page 118.

Chart 121: DRSDNR Sub-Senior 5Y Spread Ratio vs. Average

Source: Merrill Lynch.

Chart 122: HANRUE Sub-Senior 5Y Spread Ratio vs. Average



Source: Merrill Lynch

Identifying Relative Value

We suggest a comparison of current spread ratio to historical average and peers

It is difficult to ascertain whether the sub-senior CDS ratio should be different for banks and insurers. Demand for protection selling and buying could be a factor. To identify candidates for sub-senior trades, we suggest two methods, each based on the comparison of current sub-senior spread ratio to:

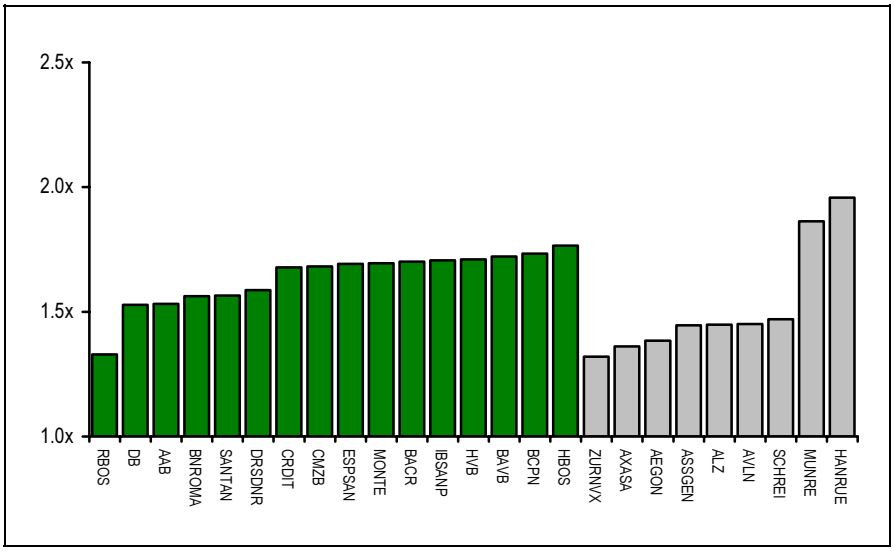
a) historical average (Chart 121, Chart 122), and

b) current spread ratio of peers (Chart 123)

For instance, the ratio of sub-to-senior spread for DRSDNR is below its historical average (Chart 121), and among the lowest for banks in the iTraxx Financials Index peers (Chart 123), suggesting it more attractive to sell senior and buy subordinated protection.

In the case of HANRUE, however, the ratio is both above its historical average (Chart 122) and the highest for the iTraxx Financials Index (Chart 123). One possible explanation could be demand for protection buyers putting on insurance sub basis trades in the credit.

Chart 123:Sub-Senior Spread Ratios (5Y) for iTraxx Financials Index (Banks & Insuers)



Source: Merrill Lynch. At 1 February 2006.

Convertible Bond Hedging with CDS

This section was written by Jeremy Wyett

Hedging is the technique of managing, or trying to eliminate, specific "unwanted" risks, whilst retaining "wanted" risks. Convertible bonds can incorporate equity, volatility, interest rate, issuer credit and currency risks, therefore skilful convertible hedging is the most useful way to isolate only the type of exposure the investor feels comfortable with. The transferring – or hedging – of any one of these risks can make the difference between a profit and a loss. The presence of hedgers impacts all investors as their positions affect valuations and market dynamics for all convertibles. The development of the CDS market has had a beneficial effect for convertible hedge investors.

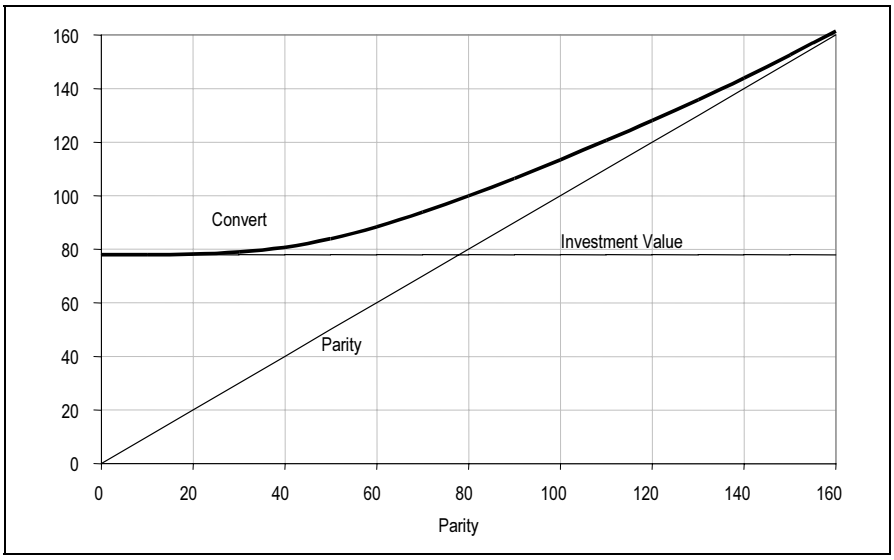
Return Profile

Before we explain why convertible hedgers use the CDS market, firstly we should explain expected convertible bond price behaviour plus the concept of delta hedging as this is the basic form of convertible hedging.

Chart 124 below gives an example of convertible bond behaviour, this is for a normal, plain vanilla convertible that redeems in cash at maturity i.e. not mandatory or of an exotic nature. As the share price (and parity) declines, fixed income characteristics of the instrument will override equity market valuations. At this point, the price of the instrument will be primarily supported by the investment value (bond floor) of the bond – i.e. what the issue should be worth without equity optionality. Note that the chart is a simplification, as in reality as the shares approach zero the bond floor is unlikely to hold. Similarly, when the share price rises, the convertible will become more equity sensitive.

As parity declines the convertible is supported by the investment value while on the upside the convertible is lifted by gains in parity

Chart 124: Convertible Price vs Parity



Source: Merrill Lynch

Parity is the value of the convertible upon immediate conversion. This is also known as the intrinsic value or conversion value. Parity is expressed in the same terms as the convertible.

$$Parity = Current\ Stock\ Price \times Conversion\ Ratio \times Current\ FX\ Rate$$

For issues that are traded in percent then this is expressed as a percentage of Nominal value as the equation reads:

$$Parity = 100 \times \frac{Current\ Stock\ Price \times Conversion\ Ratio \times Current\ FX\ Rate}{Nominal\ Value}$$

Note: When the shares and Bond are denominated in the same currency then the FX rate is 1. Most normally the nominal value is 1000 for convertibles traded in percent.

Refer to important disclosures on page 118.

Delta Hedging

The simplest and most common form of convertible hedging is Delta hedging. Here the goal is to neutralise the equity market risk. Most hedged investors wish to take a view on, say, richening of valuations without any exposure to the stock price. Delta hedging would be the primary way of isolating this type of exposure. Contrary to popular opinion hedgers generally do not care whether the underlying shares in a hedge go up or down – the hedger only cares that they move in some direction.

Here the hedger will borrow shares and carry out a short sale of equity against the long convertible position. The number of shares to be sold short will be calculated by multiplying the conversion ratio of the bond by the number of bonds held and then by Parity Delta.

Parity Delta is defined as the points change in theoretical value for a one unit move in parity, it can also be expressed as a percentage. The convertible hedger will have a model that will produce this figure. The conversion ratio is the number of shares into which each bond may be converted.

So, for example, if a bond has a conversion ratio of 100 shares and a parity delta of 30%, for each bond held on a Neutral Hedge, the hedger will borrow and short sell 30 shares. Now, if a hedger has a particular view about the future performance of the underlying shares or considers that the actual parity delta differs is some way from that produced by the model they may decide to sell more shares short, known as a "Heavy" hedge, or less shares, known as a "Light" hedge.

This position will be managed by the hedger according to movements in parity delta and any views on heavy or light hedges. This will be done by either borrowing more shares to sell short if the parity delta increases or a view for a heavier hedge is taken, or buying shares back if parity delta reduces or a view for a lighter hedge is taken.

Credit Hedging Using CDS

The convertible hedger may also look to hedge credit risk where possible and desirable. By desirable, we mean that if a convertible is trading far in the money (equity price far above conversion price – far right of Chart 124), it is unlikely that a hedger will be so concerned about hedging the credit risk. Of course, the opposite is true as well in that as the convertible moves closer to investment value, so finding a way to hedge the credit risk becomes far more important.

With the growth in the credit default market, many convertible hedgers have focussed their credit hedging activities towards the credit default swap market.

Establishing the Credit Hedge

For the purposes of this example we shall assume that the convertible hedger has a position in a convertible with the following terms:

Table 40: Example Convertible Bond Hedge

Characteristic	Example
Nominal Size:	€1000
Price:	105%
Coupon:	2%pa
Maturity:	In 3 years with cash redemption at 100%
Conversion Ratio:	25 shares per bond
Parity Delta:	30%
Credit Sensitivity:	-0.25 points for 10bps move in the credit spread
Position Size:	€10mn nominal or 10,000 bonds

Source: Merrill Lynch

We should point at this stage that there is not necessarily just one method for a hedger to determine the level of credit protection to be purchased and the example that follows is just one of the possible ways to approach the calculation.

The hedger decides to buy credit default swap protection against the nominal value of the position, €10mn. The current price of the CDS is 120bps. In terms of the contract it is also likely that the hedger will either settle for 5 year protection or get the maturity date in three years matched.

We should explain at this point that it is very likely that the convertible hedger will have a convertible model which calculates parity delta and the credit sensitivity based on various inputs. In this example the model is saying that for a 10bps widening in the credit spread the theoretical value of the convertible is expected to decline by 0.25 points.

The hedger needs to find out what they would expect to pay for an additional 10bps protection over the next 3 years (assuming protection to maturity). This we can work out by assuming, for example, an interest rate of 3% and then working out the net present value of 10bps per year which works out at 28.3bps.

For a 10bps widening of the credit spread on the nominal value of the convertible bond position, the hedger expects a loss of 0.25 points. The hedger has also worked out that the net present value of the additional 10 basis points in protection over the next three years is circa 28.3bps. So, for a neutral credit hedge protecting the Eur10mn nominal position, the value of credit default swap protection that needs to be purchased is:

€10mn × 0.0025/0.00283 = €8,833,922 (probably rounded to €9mn).

Some Other Points to be considered are:

1. At the same time as the purchase of the credit default protection is taking place, the hedger will be borrowing 75,000 shares (10,000 bonds with a conversion ratio of 25 shares per bond on a 30% parity delta) for short sale (assuming a neutral hedge).
2. If the convertible has a put date, the protection would normally be to the put date and not maturity.
3. CDS protection for convertibles is normally limited to convertible bonds, in other words where the convertible redeems in cash, is not a mandatory issue or one where the issuer has the choice of delivering a share equivalent at maturity.

In a similar way to 'Heavy' and 'Light' hedging for the equity short sale, so a hedger may develop a view on the credit risk or direction and therefore decide to buy more or less credit protection than the amount indicated in the example.

Debt-Equity Trades

■ Wings Trades

Definition

Stock + Default Protection = Wings Trade

A "Wings Trade" encompasses a simultaneous purchase of shares and default protection. The combination is designed to produce very positive returns in the case of extreme changes ("doubling of the shares" or "default") in the company's enterprise value over the investment horizon period. Since the default protection is funded by the (anticipated) dividend income from the stock, Wings Trades are only feasible for issuers that trade at high dividend yields relative to their CDS Premium. The "Wings Ratio" is the ratio of (a) the notional amount of default protection to (b) the notional amount of stock purchased.[19] Because Wings Trades are usually structured to have a "zero carry", the Wings Ratio is frequently determined by the ratio of (1) dividend yield to (2) CDS premium. Since Wings Trades are premised upon financing the credit default swap purchase with a dividend-paying underlying stock, they would only be suitable on issuers whose dividends are considered to be "secure" and not at a risk of being cut.

[19] Even though a Wings Trade is not structured like a hedge, the Wings Ratio is sometimes referred to as the Hedge Ratio.

Refer to important disclosures on page 118.

Wings Trades are particularly intriguing on companies with

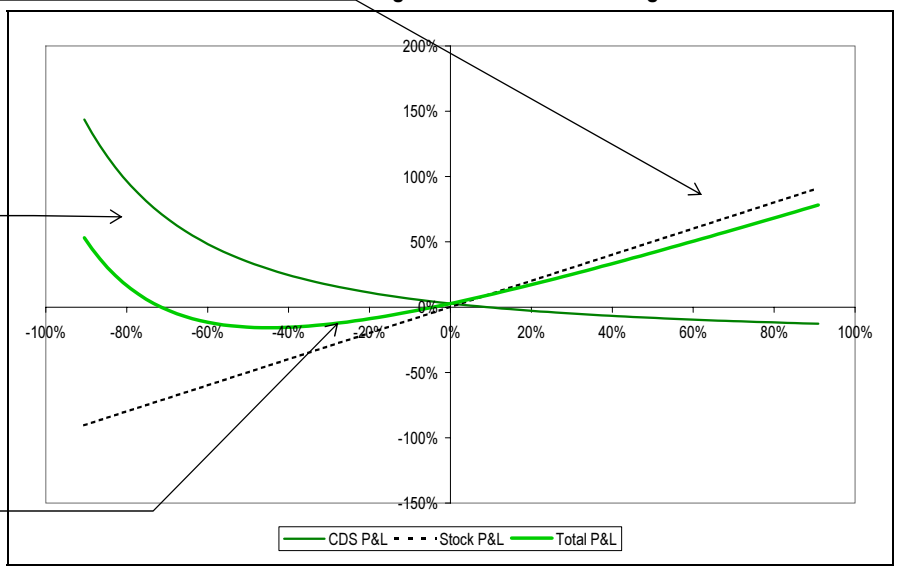
- Large litigation risks (tobacco, asbestos, other), or
- LBO risks

Stock P&L: *Will dominate positive pay-offs should stock price rise sharply*

CDS P&L: *Because the notional amount of CDS is a multiple of the stock investment, losses from significant share price declines should be offset by CDS gains from the resulting deterioration in the credit profile of the company*

Total P&L: *Because the trade is structured for a zero-carry, there is 0 P&L in a status quo scenario. In between the two "Wings", however, small declines in the share price, that do not trigger a sharp spread widening, produce a negative Total P&L*

Chart 125: Illustrative Profit & Loss Diagram of a Theoretical Wings Trade



Source: Merrill Lynch

Identifying Prospects

(1) High Wings Ratio, (2) Secure Dividend Income and (3) Buy Recommendation on Stock are overriding considerations

To identify prospective candidates for a Wings Trade investors should focus on those companies that have a:

1. High Wings Ratio (determined by the ratio of Dividend Yield to CDS Premium).
2. "Secure" Dividend Income, and
3. "Buy" Recommendation on Underlying Stock.

Using equity derivatives markets

If an investor wishes to lock in current dividend expectations, he/she can do so by synthesizing the long equity position in the derivative market. For example, the price of a futures contract is based on the market expectations of dividend pay-out during the life of the contract. If an investor buys the contract today, any dividend cut at a later date would be compensated for by a corresponding increase in the price of that contract. (Therefore, the market-implied dividend yield rate is at all times priced into stock futures contracts. It is captured, or effectively locked in, at the time the contract is purchased.) The theoretical pay-off for a Wings Trade can therefore also be effected by the purchase of a futures contract (rather than the stock) and a CDS. In the absence of a futures contract, the position can also be replicated in the options market through a purchase of an at-the-money (ATM) call and a simultaneous sale of an ATM put.

Other considerations include (a) recent stock declines, (b), high asset volatility, (c) "binary outcomes" issuers and (d) LBO candidates

Other considerations include: (a) "bombed-out" equities[20], (b) high asset volatility, (c) binary outcome issuers, and (d) potential leveraged buy-out (LBO) candidates. Asset volatility can be indicated by the Merrill Lynch volatility rating on the stock or implied equity volatility on its options. Issuers facing binary outcomes ("boom" or "bust") could include companies facing litigation exposure (asbestos, tobacco or other severe product liability), companies whose capital structure recommendations are binary (Buy recommendation on stock, Underweight recommendation on the credit) due to volatility. LBO candidates offer the prospects of profits on both the CDS (deteriorating credit) and the stock leg

[20] These would only include companies whose shares may have fallen by more than one-half, but credit ratings and spreads still in the investment grade range.

(takeover premium) of a Wings Trade. By the same token, companies whose deteriorating credit profile could result in a rights issue for re-capitalization, would produce losses on both legs.

For trades premised on LBO candidates specifically, we have identified three screening methods. These would be companies trading at:

- Low EV/EBITDA Multiples and Low CDS Premiums,
- High Dividend Yield vs. Marginal After-Tax Cost of Debt, or
- Low EV/EBITDA Multiples vs. Average Leverage Multiples (Debt/EBITDA) for Their Sector.

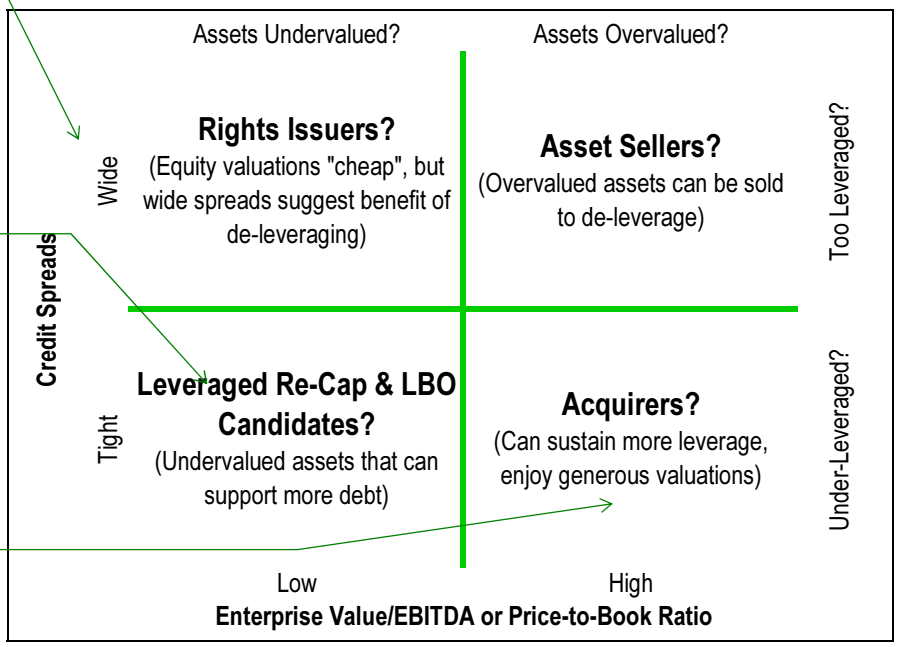
In particular, our **wealth-transfer risk screen** below (Chart 126) may help investors both identify LBO candidates and avoid rights issue candidates:

If equity or assets appear undervalued, high credit spreads could point to financial distress and the need for a rights issue to rescue the balance sheet, rather than outright value in the shares.

***Leveraged Re-Cap** and **LBO Candidates** trade at **both** low EV (or Equity) multiples **and** low credit spreads. Assets appear undervalued and credit market seems comfortable with risks, suggesting these companies can shoulder more leverage.*

Least risky from a value transfer point-of-view, but companies with generous equity and credit market valuations can embark on acquisitions and fund them by cash (debt) and/or shares.

Chart 126: Assessing Wealth Transfer & Event Risks with Credit & Equity Market Valuations



Source: Merrill Lynch

Input Analysis

For a "zero carry", investors can purchase default protection on a notional amount equal to 3.4x, or the dividend yield (4.8%) divided by default protection (1.4%)

The Actual Hedge Ratio may differ from the zero carry ratio

The number of shares that have to be purchased (at the current price) for the notional amount

Table 41: Illustrative Inputs for Wings Trade for Company XYZ

Inputs	
Current Dividend Yield	4.80%
Current Credit Default Swap Premium	1.40%
Implied Wings Ratio	3.4x
Actual Hedge Ratio	4.0x
Credit Default Swap Notional Amount	10,000,000
Stock Notional Amount	2,500,000
Current Share Price	25.00
Number of Shares	100,000

Source: Merrill Lynch. Amounts in euros, except Number of Shares.

Outputs & Scenario Analysis

Although the term of the underlying Credit Default Swap is normally five years, the profitability and loss (P&L) of a Wings Trade is typically assessed over a one-year or a six-month period. The P&L of a Wings Trade for a company is typically developed for at least three types of scenarios:

Refer to important disclosures on page 118.

The P&L of a Wings Trade is assessed for at least three different scenarios, typically over a one-year or a six-month period

1. a sharp increase in its share price;
2. a credit event (such as default); and
3. a significant decline in the share price (without a corresponding deterioration in credit fundamentals).

The first two scenarios should produce positive returns, but the last one negative. A particularly useful sensitivity analysis could assume the recovery of the company's share price to a 52-Week-High or collapse to a 52-Week-Low (unless, of course, it as at either extremes currently) over the one-year investment horizon of the Wings Trade. Unless the credit risk of the company is anticipated to change over the investment horizon, we believe it is reasonable to assume that the price of the Credit Default Swap would react correspondingly, given the high correlation between equity and credit markets. We believe it is reasonable (as a first step at least) to assume a total loss (99.9%) of equity value following a Credit Event. (Of course, there are possibilities that a Credit Event could occur, even though shares have not collapsed). **We note, however, that the P&L analysis of a CDS position around a "less than a significant change" (such as ± one standard deviation) in the stock price is highly subjective.**

We assume that the CDS premium follows the share price and that shares suffer total loss upon a Credit Event

Recovery Rate assumptions

Any decreases in the share prices will generally produce losses, unless a Credit Event occurs

Should no Credit Event occur, the CDS can be unwound at a profit or loss

Table 42: Illustrative Wings Trade Scenario Analysis for Company XYZ

Assumptions	52-Week High	52-Week Low	Credit Event
Stock Increase (Decrease)	100.0%	-24.0%	-99.9%
Stock Price	€ 50.0	€ 18.0	€ 0.0
Default Bid	40bps	250bps	
Invested Amount	2,500,000	2,500,000	2,500,000
Recovery Rate			40.0%
Break-Even Recovery Rate			74.8%
Profit (Loss) from Stock	2,500,000	(700,000)	(2,497,500)
Profit (Loss) from Default Swap	(371,195)	408,315	6,000,000
Net Carry	(20,000)	(20,000)	(20,000)
Total Profit (Loss)	2,108,805	(311,685)	3,482,500

Source: Merrill Lynch

Put vs. Put Trades

This section was written by Heiko Ebens

As made evident by Chart 127 and Chart 128, the cost of 'Credit Protection' (measured by the pricing of Credit Default Swaps) correlates with the cost of 'Equity Protection' (measured by equity option implied volatilities), on the aggregate over time as well as cross-sectionally at one point in time. However neither relationship is perfect and credit and equity may be mis-priced relative to each other. Here we introduce a model that allows us to identify the relative value of credit and equity risk at the stock level using liquid equity and credit derivatives instruments.

Chart 127: 5-Year CDX.NA.IG and 1-Year S&P 500 ATM Implied Volatility (Weekly Data from Sep 7, 01 through Jan 4, 06)

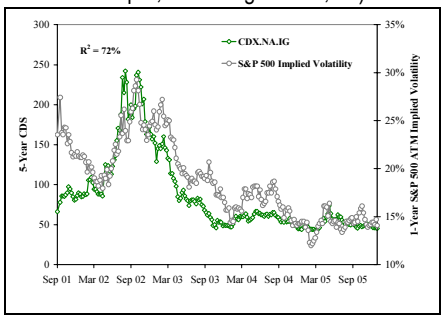
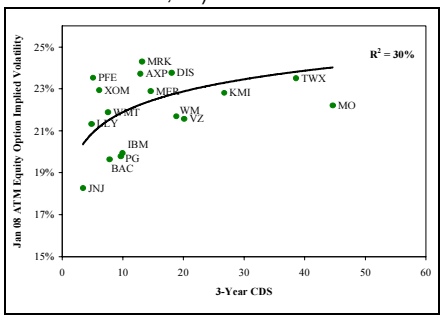


Chart 128: Jun 08 Equity Option Implied Volatility versus 3-Year CDS Pricing (Select cases as of Jan 4, 06)



Source: Merrill Lynch Equity Derivatives Strategy.

A tradable relative value approach to capital structure arbitrage. At the forefront of understanding the linkages between credit and equity valuations are structural models, such as KMV and CreditGrades, which are based on the academic work of Merton, Black and Scholes of the early 70's on evaluating corporate liabilities. These models use inputs from the equity market to evaluate credit instruments, however they do not seek to identify trade opportunities that capitalize on the potential mis-pricing of credit and equity risk.

Our approach exploits the link that the risk of debt holders not receiving their claims is the risk of equity prices falling to zero as credit is the more senior corporate liability. Both credit and equity risk are directly tradable with derivatives in the marketplace. Credit Default Swaps (CDS) provide a pay-off under the occurrence of 'credit events' and equity put options can be used to hedge against falling equity prices. To identify cases where credit risk is expensive vis-à-vis equity risk, we follow the following steps:

- Calculate the present value of CDS premium over the duration of the put option contract.
- Determine the potential CDS liability, i.e. (1 - Recovery) x CDS Notional. It is common to assume a 40% Recovery, i.e. that the value of the cheapest-to-deliver CDS obligation has market value of $40 at the time of default.
- Make an assumption on what the stock price will be should debt default occur.
- Determine the number of puts necessary to hedge the estimated credit loss, i.e. CDS Liability / (Put Strike - Assumed Stock Price if Default).
- Determine the cost of the equity put credit hedge, i.e. Number of Puts x Put Ask Price.

Our decision variables become: (1) Given a recovery assumption, does the present value of CDS premia over the life of the equity option pay for the put hedge? (2) What recovery value equates the cost of the put hedge to the PV of CDS premia?

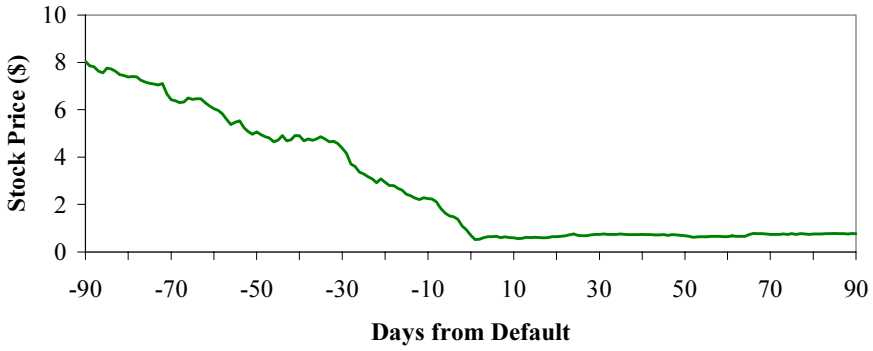
Behavior of the equity price the time bankruptcy is declared. Our approach crucially depends on the behavior of the stock price at the time of default as a high stock price would reduce the pay-off from our long equity put hedge. To determine empirsically the 'stock default' price, Chart 129 lists all names within the S&P500 that defaulted since Dec 31, 97 (no names defaulted between Dec 31, 1997 and Jun 9, 00 when the market was increasing strongly). The average stock price at the time of the bankruptcy filing was $0.73. Chart 130 plots the average price of these stocks 90 days before and after the filing of bankruptcy.

Chart 129: S&P500 Companies that defaulted
(Data from Dec 31, 97 to Jan 4, 06)

Name	Ticker	Bankruptcy Filing Date	Closing Price on the Filing Date
Safety-Kleen	SKLNQ	Jun 09, 00	0.07
Owens Corning	OWENQ	Oct 05, 00	2.20
Armstrong Hldgs	ACKHQ	Dec 06, 00	0.94
Polaroid	PRDCQ	Oct 12, 01	0.28
Bethlehem Steel	BHMSQ	Oct 15, 01	1.20
Enron	ENRNQ	Dec 02, 01	0.26
Kmart	KMRTQ	Jan 22, 02	0.69
Global Crossing	GBLXQ	Jan 27, 02	0.51
Worldcom	WCOEQ	Jul 21, 02	0.10
UAL	UALAQ	Dec 08, 02	0.93
Conseco	CNC	Dec 18, 02	0.06
Fleming Cos	FLMIQ	Apr 01, 03	0.67
Mirant	MIRKQ	Jul 14, 03	0.39
Win-Dixie	WNDXQ	Feb 21, 05	0.75
Delta Airlines	DALRQ	Sep 14, 05	0.75
Delphi	DPHIQ	Oct 08, 05	2.35
Calpine	CPNLQ	Dec 20, 05	0.23
		Average	0.73

Source: Merrill Lynch Equity Derivatives Strategy

Chart 130: Average Stock Prices of S&P 500 Companies near Default (As of Jan 4, 06)



Source: Merrill Lynch Equity Derivatives Strategy

Refer to important disclosures on page 118.

Selected short CDS / long equity put candidates[21]. Chart 131 highlights positions where a 3-year equity put 'credit' hedge is inexpensive relative to the discounted value of CDS premium over the duration of the equity put options:

Chart 131: Short CDS / Long Equity Put Candidates; per $100 credit notional; Select Cases as of Jan 9, 06

			3-Year Put Hedge			3-Year CDS premium			Put vs CDS		
					assumed	est. bid		pv of	by recovery assumption		
ticker	name	stock price	strike price	ask price	stock price if default	price (bp)	assumed recovery	premium through option expiration.	cost of put hedge	pv cds - put hedge	break-even recovery
DISH	EchoStar	28.81	10.0	0.35	0.75	125	40%	3.41	2.27	1.14	9%
AMR	AMR	22.79	10.0	2.75	0.75	1010	40%	22.44	17.84	4.61	21%
CAL	Continental Airlines	22.00	10.0	3.20	0.75	1061	40%	23.31	20.76	2.55	31%
LEA	Lear	29.54	10.0	2.00	0.75	574	40%	14.08	12.97	1.10	35%

Source: Merrill Lynch Equity Derivatives Strategy, Market-it, and Bloomberg.

The above examples are based on $100 credit risk notional and we consider 3-year equity puts and CDSs. We assume that at the time of default the stock price falls to $0.75 and that the cheapest-to-deliver bond obligation has market value of $40, i.e. the recovery is 40%. For AMR, for instance, the CDS present value equals $22.44 for every $100 of credit risk. Based on our 40% recovery value, our CDS liability at the time of default equals $60. We purchase 6.49 =$60 / ($10 – $0.75) puts, which at an ask price of $2.75 lead to a put hedge cost total of $17.85 (6.49 x $2.75). Thus the carry of the trade is $4.61 = $22.44 – $17.85. A recovery value of 21% equates the CDS present value to our put hedge cost.

The biggest trade opportunity is that the equity put is expected to overhedge the short CDS position. It is much more likely for the put to be in the money than for a credit event to occur. Hence the holder of the short CDS / long put position could potentially obtain a put pay-off without being liable on the CDS. Therefore, investors that are bearish on the stock, but believe that default is unlikely may want to consider puts with higher strike price to maximize the chance that the stock price falls below it. This typically increases the cost of the put hedge and lowers the expected carry.

Main Trade Risks: There are a number of risks inherent in this trade and we here present a few examples. Firstly, the recovery and 'default' stock price assumption may be different than assumed, i.e. in the default scenario, the cheapest to deliver CDS obligation may have a lower than expected market value and the stock price might not fall to $0.75. However, one would expect a positive correlation between the stock price at the time of default and the cheapest to deliver bond obligation. If the recovery expectation is high, the bond is expected to trade at a high value as well as the stock. The latter becomes essentially a call option that the recovery value is greater than 100%, i.e. the company has equity value after the credit holders are paid. Secondly, the CDS PV is only an expected value, but not necessary a realized outcome. In practice, however, CDSs may trade on an up-front and/or running basis. Thirdly, corporate actions, such as spin-offs and private equity buyouts, could force an early settlement of the equity puts, leaving investors with un-hedged short CDS positions.

[21] At 10 January 2006.

10. Counterparty Risk

Counterparty risk is a key feature of OTC contracts

Credit default swaps are over-the-counter (OTC) contracts between buyers and sellers of protection. Among other risks, both parties to the contract are exposed to the credit risk of the counterparty (or "counterparty risk"). This risk reflects the potential failure by the counterparty to make a payment when it is due. The extent of counterparty risk in a CDS depends on whether the investor is a protection seller or a protection buyer.

Protection Seller

Non-payment by protection buyer . . .

The only risk faced by the protection seller is that the protection buyer fails to pay the premium for whatever reason. Unlike buying a bond, selling CDS protection is an unfunded investment. Whilst the par amount (or notional amount) is exposed to a default by the reference entity, it is not at risk from a counterparty default.

Following the protection buyer's failure to make a premium payment, the seller can terminate the provision of protection and sell protection on the same credit to another counterparty. This could **expose the seller to the mark-to-market** (MTM) movement of the default swap premium. If the CDS with the original counterparty is documented under the ISDA Master Agreement, any difference between the related MTM is accounted for in the termination payment. However, the original counterparty may also fail to pay any termination payments required to be made by it under the ISDA.

. . . could expose protection seller to MTM risk

The MTM may be substantial if the default premium has tightened significantly since the seller sold the initial CDS. However, the MTM is limited by the fact that CDS premiums can never be negative. MTM risk for the protection seller would also be relatively small for low premium default swaps.

Table 43: Protection Seller's Counterparty Risk

Protection Seller	Cash Flows
Sell 5y protection	+150bps
Protection buyer defaults within 5 years	
Default premium (bid) at time of buyer's default	+100bps
MTM loss annuity (bps)	50bps
Notional amount	€10mn
PV01 (€) (1)	€3,000
MTM loss (€) (2)	€150,000

(1) This is an assumption. PV01(€) = (Notional Amount/10K) × Σ (Survival Probability × Risk-free Discount Factor)
(2) MTM Loss (€) = Loss annuity (bps) × PV01(€)
Source: Merrill Lynch

Protection Buyer

Timing of default by protection seller could leave buyer with . . .

The protection buyer faces **two** key risks:

1. The reference entity defaults *and* the protection seller is unable to pay the notional amount due to the protection buyer on delivery of the appropriate obligation.
2. The reference entity does *not* default *but* the protection seller files for bankruptcy thus rendering its protection worthless.

. . . defaulted asset and no protection . . .

In the *first situation*, the protection buyer would be left with a **defaulted asset and no protection**. However, the protection buyer can claim against the protection seller for any amount due from the seller that remains unpaid or unsatified through collateral arrangements just like any other **senior unsecured creditor** (including claims proved in any liquidation of the seller).

Refer to important disclosures on page 118.

The *loss* experienced by the buyer would be equal to:

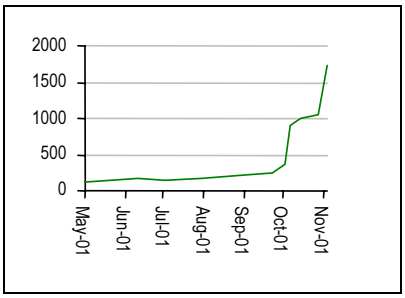
1- (recovery value of the defaulted asset + recovery from protection seller)

This loss would be substantial if the defaulted asset has a small recovery value and the protection buyer is unable to recover any significant amount from the protection seller (either via collateral arrangements or through the courts).

The greater the default correlation between the reference entity and the protection seller, the greater the likelihood of both defaulting simultaneously. For example, an investor who buys protection on an Italian company such as Fiat from that company's largest Italian lender bank would be exposed to significant correlation risk.

A good example of a large counterparty defaulting has been the demise of Enron. Enron was a relatively large player in the credit derivatives market and its failure was the first big default by a counterparty. Chart 132 illustrates the widening of default premiums on Enron as it approached bankruptcy at the end of November 2001.

Chart 132: Enron 5y Default (bps)



Source: Merrill Lynch

. . . or significant MTM loss

The *second situation* could expose the protection buyer to **significant MTM risk**. If the seller defaults but the reference entity does not, the protection buyer can terminate the existing contract and buy protection from a new counterparty. If the reference entity has deteriorated substantially since start of protection, the new default premium would be considerably larger. This would imply a relatively large negative MTM impact for the protection buyer. If the CDS with the original counterparty is documented under the ISDA Master Agreement, any difference between the related MTM is accounted for in the termination payment. However, the original counterparty may also fail to pay any termination payments required to be made by it under the ISDA.

Table 44: Protection Buyer's Counterparty Risk

Protection Buyer	Cash Flows
Buy 5y protection	+150bps
Case 1: Reference entity defaults within 5 years and seller is bankrupt	
Recovery value of defaulted asset	40%
Loss (%)	60%
Notional amount	€10mn
Loss (€)	€6mn
Amount recovered from collateral arrangements and/or bankruptcy court	X
Net Loss (€)	€6mn - X
Case 2: Seller is bankrupt within 5 years but reference entity does not default	
Default premium (offer) at time of seller's bankruptcy	+200bps
MTM loss annuity (bps)	50bps
Notional amount	€10mn
PV01 (€) (1)	€3,000
MTM loss (€) (2)	€150,000

(1) This is an assumption. PV01(€) = (Notional Amount/10K) × Σ (Survival Probability × Risk-free Discount Factor)
(2) MTM Loss (€) = Loss annuity (bps) × PV01(€)
Source: Merrill Lynch

CLN Structure Reduces Counterparty Risk

CLN structures reduce counterparty risk . . .

An obvious way for protection buyers to reduce counterparty risk is via credit-linked notes (CLNs). CLNs are structures that provide fully funded exposures to credit derivatives such as single-name credit default swaps (CDS) or first-to-default basket swaps.

. . . since protection buyer is exposed to counterparty risk of highly rated SPV

CLNs are cash instruments that are created by embedding credit derivatives in new issues from a special purpose vehicle (SPV). The CLN investor achieves synthetic exposure to CDS (i.e. indirectly sell protection) in a funded security form. However, the protection buyer is exposed to the credit risk of the highly rated SPV.

We discuss CLNs in more detail in Volume 1, Chapter 9.

Risk Reduction by Collateralisation

Collateral Posting Arrangements . . .

Dynamic collateral posting could mitigate risk . . .

If agreed by both parties, counterparty risk for protection buyers and sellers can be mitigated by the **protection seller posting collateral** or by **two-way collateral posting** arrangements. All credit default swaps are transacted under the ISDA Master Agreement. The Credit Support Annex or CSA (which supplements the ISDA Master Agreement) establishes the collateral posting arrangement.

In general, collateral posting is based on the valuation of the portfolio of transactions under the ISDA Master Agreement and not on any individual transaction. This arrangement allows for protection buyers and sellers to agree to post collateral as MTM on this portfolio increases or decreases.

The collateral posting is **dynamic in nature** and postings are typically made either daily or weekly. The counterparties may also negotiate a minimum MTM threshold above which the collateral can be called.

. . . Can Benefit Both Counterparties

. . . for both the seller . . .

Though collateral arrangements are primarily for the benefit of the protection buyer, two-way collateral posting can also benefit protection sellers. The MTM risk for protection sellers arises when protection is bid at *tighter levels* after the protection buyer defaults on the original CDS. However, default premiums typically tighten relatively gradually which would allow the seller to recover most of the MTM loss from the collateral following such a default.

. . . as well as the buyer who is typically exposed to a larger counterparty risk

Collateral posting is particularly useful to protection buyers who are exposed to a greater level of counterparty risk. Collateral arrangements can mitigate MTM risk for the buyer especially when the protection seller goes bankrupt *before* any significant deterioration of credit quality of the reference entity. The problem arises when the credit quality of the reference entity deteriorates rapidly *and* the protection seller goes bankrupt simultaneously. The seller might be unable to post the relatively large collateral required to cover this sudden move leaving the buyer exposed to a significantly large MTM move.

Netting of Transactions Under the ISDA Master Agreement

Transactions under ISDA Master can be netted out . . .

The existence of an ISDA Master Agreement allows, where jurisdiction and type of transaction permit, the netting of transactions documented under the ISDA Master as evidenced by a Confirmation[22]. Where the ISDA Master Agreement is supplemented by a CSA, the net exposure can be collateralised on a mark to market basis under the collateral arrangement. The ISDA Master Agreement and all Confirmations there-under form a single agreement, which together with other features of the ISDA Master Agreement allows exposures to be netted.

. . . which provides substantial benefits to dealers and investors . . .

As a result, different transactions documented under an ISDA Master Agreement (e.g. CDS contracts, interest rate swaps) with the same counterparty can be netted against each other. **This could substantially lower credit exposure to a particular counterparty**. In addition, if a counterparty defaults on any transaction under the ISDA Master Agreement, the ISDA Master Agreement allows the non-defaulting party to terminate all transactions under the same ISDA Master Agreement with that counterparty. It is also likely that this will cross default into any other ISDA Master Agreements between the two parties. **The netting feature is especially beneficial when complex counterparties are on the opposite side of various ISDA documented transactions like credit default swaps, interest rate swaps, currency swaps, etc.**

[22] A "Confirmation" is the underlying document that is executed between the parties that will evidence the particular transaction (for example, the CDS) under the ISDA Master Agreement.

Refer to important disclosures on page 118.

. . . jurisdiction and type of transaction permitting

The netting of exposures under an ISDA Master Agreement and CSA may not be possible in all jurisdictions and may not be possible for all transactions under the ISDA Master Agreement. For example, there are doubts as to the ability to net CDS transactions in Italy.

Ranking of CDS in Capital Structure

Obligations under ISDA Master Agreement are pari passu to senior unsecured obligations

Obligations under ISDA Master Agreement rank ***pari passu* to senior unsecured *obligations*** of the counterparty. In the event of default by the counterparty, all ISDA transactions with the counterparty may be terminated and netted out to calculate a net MTM profit or loss. Any MTM loss may be recovered from the collateral that has already been posted. If the collateral is insufficient, the remaining amount can be claimed as a senior unsecured obligation of the counterparty.

Recovery for senior unsecured debt averages about 43% from 1987 to mid 2005

According to Moody's, the average recovery rate for senior unsecured bonds has been about 38% (issuer-weighted) over the period 1982-2005. S&P highlights an average recovery rate of about 43% for senior unsecured debt during the period 1987 to mid 2005. A more detailed discussion of average recovery rates is available in Volume 1, Chapter 3.

Factors Affecting Counterparty Risk

Increase in counterparty risk would tighten basis

The protection buyer is exposed to a larger counterparty risk than a protection seller in a CDS contract. An increase in counterparty risk would lower the premium that the protection buyer would be willing to pay. This would tend to tighten the basis between the default premium and the asset swap spread.

The counterparty risk faced by a protection buyer would take into account the following factors:

- Probability of default (or credit quality) of the protection seller (PS).
- Probability of default (or credit quality) of the reference entity (RE).
- Joint probability of default of PS and RE (or the correlation between the default of PS and the default of RE).
- Recovery rate of the RE.
- Recovery rate of senior unsecured obligations of the PS.
- Likelihood of PS defaulting *before* RE.

The last factor is important because if the protection seller defaults before the reference entity the protection collapses at that point.

Who Are The Counterparties?

Banks and insurance companies are key players

Banks, securities firms and insurance companies are actively buying and selling protection while other market participants like corporations, hedge funds and mutual funds are beginning to take an increasing interest in the credit derivative market.

Credit derivatives like credit default swaps should facilitate the transfer of credit risk between these players to the most efficient bearer of risk. Table 45 below highlights the changing activity levels of different types of market participants. For a more detailed discussion please see Volume 1, Chapter 1.

In a recent Fitch survey[23], global banks and broker dealers ranked as the top credit derivative counterparties. Fitch also observed that most financial guarantors and reinsurers are the largest sellers of protection on a net basis and cite the same banks and broker dealers above as main counterparties.

[23] "Global Credit Derivatives Survey", Fitch Rating, 17 November 2005.

Insurance companies are important protection sellers

Banks are largest buyers and sellers of protection – but market share is shrinking

Mutual & pension funds are still very small players

Table 45: Principal Buyers and Sellers of Protection – Market Share

	Protection Buyers				Protection Sellers			
	1999	2001	2003	2006 (forecast)	1999	2001	2003	2006 (forecast)
Banks	63%	52%	51%	43%	47%	39%	38%	34%
Securities Firms	18%	21%	16%	15%	16%	16%	16%	14%
Insurance Companies	7%	6%	7%	9%	23%	33%	20%	21%
Corporations	6%	4%	3%	4%	3%	2%	2%	3%
Hedge Funds	3%	12%	16%	17%	5%	5%	15%	15%
Pension Funds	1%	1%	3%	5%	3%	2%	4%	6%
Mutual Funds	1%	2%	3%	5%	2%	3%	4%	6%
Government Agencies	1%	2%	1%	2%	1%	0%	1%	1%

Source: BBA Credit Derivatives Reports 1999/2000, 2001/2002 & 2003/2004

Novation & Systemic Risks

Mary Rooney has contributed to this section

■ "Novate and Tear-Up"

Novation has become the standard practice for unwinding CDS trades, due to both the sizable amount of outstanding contracts and the back office challenges associated with settling of Delphi contracts in October of 2005. Moreover, while trade confirms have yet to be fully automated, the number of trades cleared by DTC has been rising steadily. (In 2004, 40% of CDS trades were confirmed electronically, according to ISDA.)

Novated, but unconfirmed CDS trades…

In a perfect world, all counterparties would engage in the practice of what is referred to as "novate and tear-up" upon each assigned trade. This process eliminates the layering of counterparties, keeping the total number of counterparties at just two. When counterparties don't do this they end up with a complex web of counterparties and legacy risk of trade overlays. There are two reasons why a counter-party may not engage in "novate and tear-up": 1) they seek trade anonymity; and 2) it's operationally more cumbersome.

■ Unconfirmed Trades, Systemic Risks

… make credit and counter-party risk management difficult for market participants

In normal market conditions issues surrounding assignments can usually be resolved smoothly. The risk is that under a large credit event, like Delphi, a large number of positions that were thought to be hedged turn out not to be because of improper assignment and the mark-to-markets on the positions are potentially very large. In cases where a trade results in a large loss, undoubtedly the holder will make doubly sure the trade was valid.

At worst, if in the unlikely event a large credit event takes a counterparty under, any unconfirmed assignments of trades in which that firm is the original owing counterparty will undoubtedly be challenged. This could spread losses around and reduce confidence in the system and liquidity.

In July 2005, The Counterparty Risk Management Policy Group raised concerns about a growing backlog of novated, but unsettled credit derivatives trades. Earlier in 2005, the U.K. Financial Services Authority had expressed concerns regarding unconfirmed CDS trades. Large backlogs of unconfirmed novated trades make it difficult for parties to a CDS contract to correctly mark their net position and counter-party credit risks.

ISDA-based protocol implemented to facilitate settlements

In response to the systemic risk issues posed by unconfirmed CDS trades, the Federal Reserve Bank of New York summoned the largest dealers to discuss and implement a plan of action to reduce the backlog. To that extent, ISDA developed a protocol, the Novation Protocol II (NPII), "to offer parties to ISDA master agreements efficient means to agree to a uniform process by which consents to transfer of interest in Credit Derivatives Transactions may be obtained". By December 1, 2005, nearly 2000 parties had signed up for the protocol. If a

Refer to important disclosures on page 118.

counterparty elects to NOT adhere to the new Protocol, the counterparty must receive prior written consent from the Original Counterparty before firm pricing is given on any potential assignment trades. Separately, private companies have developed services and technologies by which CDS market participants can terminate and eliminate transactions, thereby reducing operational risks and off-setting transaction costs.

■ Auctions & Cash Settlement

Cash settlement eases constrains imposed by physical settlement on indices..

Currently, the market standard for settlement calls for physical settlement of both single-name and index contracts, whereas bespoke CDOs typically settle cash. To date, however, due to concern over infrastructural strain in a physical settlement process, credit events in the CDX index (CKC, DAL, NWAC, DPH) have relied on a cash settlement process which uses an auction to determine a single settlement price. Auction mechanisms and cash settlements were introduced to reduce basis risks arising from cash settlement of indices and physical settlement of single names. Dual settlement could create realized losses on hedges for some participants. For example, an equity protection seller who hedged DPH jump-to-default risk could be placed in a position where the cash auction recovery price *received* for bonds on their short protection trade is lower than what they *paid* for bonds delivered into their single-name contract.

..and improves transparency and standardization in tranche market..

Cash settlement is vital to the smooth functioning of index and tranche[24] trading. Beyond the costs and decreased liquidity due to paperwork of a physical settle, consider that under physical settlement, the recovery price would be different across counterparties. Hence, each equity tranche contract would exhaust at a unique attachment point, making index tranches bespoke-like following a credit event, thereby significantly reducing liquidity.

..but single name market should still be able to function with physical settlement

The physical settlement process in the single name CDS for DPH was smoother than some had feared. Dealers have become very experienced in managing single-name trades and are highly motivated to exercise contracts *immediately* after the Credit Event. For example, imagine a dealer has $100 mn in "sells" (wrote protection/long risk) and $100 mn in "buys" (bought protection/short risk). The goal is to have access to bonds before one has to deliver on "buys". Thus, it will exercise its "sells" immediately. Once the seller has exercised, the buyer has 30 days to notify what instrument they will deliver to the seller. Ideally, the dealer will exercise more of its "sells" before all of its "buys" are exercised. This way a dealer will have a few days to learn what it will be delivered before it has to inform counterparties what they will deliver on their buys.

[24] See Volume 2 for an in-depth discussion of the tranche market.

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