CREDIT DERIVATIVE AND QUANTATIVE STRATEGY

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STANDARD CORPORATE CDS HANDBOOK

ONGOING EVOLUTION OF THE CDS MARKET

FOREWORD

The CDS market has recently undergone significant changes, with the contractual changes that formed the Big Bang and the Small Bang, the modification to trading conventions via new standard corporate CDS contracts and the move towards central clearing.

Over the course of 2009, we published several articles reporting on the market changes. This handbook contains a compilation of these articles (Chapters 3 and 4) as well as new primer material, covering the standard corporate CDS product, its pricing and risk (Chapters 1 and 2).

Credit Derivative and Quantitative Strategy

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1. THE CDS PRODUCT

THE CDS PRODUCT

Ongoing evolution of the CDS market

The single-name Credit Default Swap (CDS) is one of the simplest and most popular forms of credit derivative. In essence, it is a protection contract between two counterparties, which provides a straightforward transfer of credit risk. The buyer of protection pays a regular fixed premium to the seller of protection in return for compensation contingent on the occurrence of a specified credit event, such as default[1], on certain debt obligations of a company. This transfer of risk takes place without requiring any direct involvement of the reference entity.

The CDS market began to develop in the 1990s as banks utilised them initially to hedge credit exposures on their balance sheets. Their growing popularity led to contractual standardisation through the establishment and ongoing enhancement of the ISDA Credit Derivatives Definitions. This reduced legal risk and supported extraordinary product expansion via a broader set of uses and investors. Typical applications of CDS include the hedging of company debt, portfolio risk management, the provision of synthetic credit exposures (long and short), regulatory capital management and the development and hedging of synthetic collateralised debt obligations (CDOs). They are also employed as a tool for outright proprietary positioning; for example, taking a position on the future creditworthiness or survival of a company or for basis trades (which aim to exploit the relative value between CDS and underlying debt securities), curve trades and capital structure trades.

Until now, CDS transactions have entailed bilateral agreements between counterparties. This has led to a large build up of gross notional exposures, with little transparency of risk. Furthermore, owing to the contractual structure of the product and trading conventions employed by dealers, the ability to net offsetting risk has been very limited. In addition, the failure of some high-profile, dealer counterparties, has highlighted the systemic risk and opacity of the market. Consequently, dealers, investors and regulators have been working hard to address these issues, resulting in the biggest overhaul of the market since its inception. Contract terms (via the ISDA Credit Derivatives Definitions) and trading conventions have changed in order to standardise the product and thereby facilitate improved netting and transparency of risk. Central clearing is being established, with the aim of reducing counterparty risk.

As we enter the next stage in the development of the CDS market, we take the opportunity to present an introduction to the new CDS product. This section is intended as a primer for investors who are new to the CDS market and as an update, incorporating the new market standards, for investors who are already familiar with the product.

[1] In this handbook we will often use the term default in place of credit event. For example, when we refer to default probabilities we are referring to the probability of any credit event occurring.

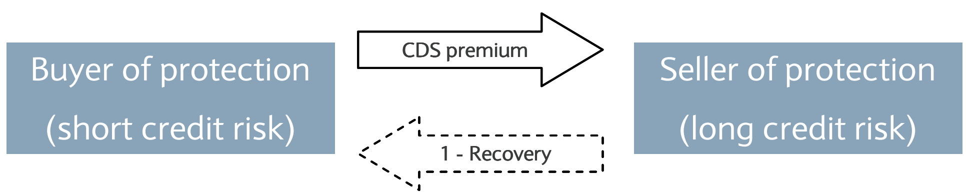
Structure of the CDS product

In this chapter we describe the cash flow arrangement and the protection leg details, including a discussion of the different potential credit events, valid deliverable obligations and the settlement process when a credit event occurs and a contract is triggered. We also go through the standard trading conventions used in the European and North American corporate markets.

Cash flows

A CDS is a credit derivative in which two counterparties agree to exchange a regular, fixed coupon for a one-off payment contingent on the occurrence of a credit event of a specified reference entity or obligation (see later for credit event definitions). It can be viewed akin to an insurance contract where the buyer of protection pays a premium to the seller of protection in order to receive protection against a credit event, as illustrated by Figure 1. As such, the trade comprises a premium leg (the fixed-coupon stream) and a protection leg (the one-off, contingent payment).

Figure 1: CDS contract



Source: Barclays Capital

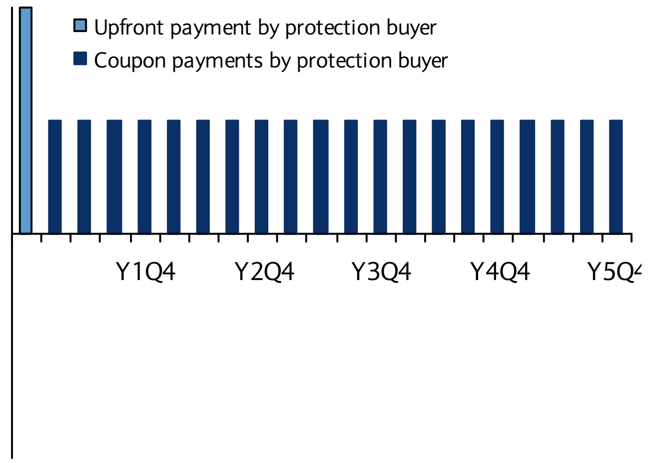
The contract terminates on a predetermined, fixed maturity date, unless it is triggered prior to that date by one of the counterparties. Typically, either party may trigger the contract[2] upon the occurrence of a credit event, in which case:

- The premium payments terminate and the buyer of protection makes an accrued interest payment to the seller to pay for the protection received since the previous coupon date.
- The protection buyer may sell any valid deliverable obligation to the protection seller for a price of par and for the notional of the contract. Valid deliverable obligations depend upon the type of and timing of the credit event (see later). The value of the delivered security at the time of delivery is known as the Recovery Value or Recovery Rate. The economic transfer is therefore Par minus Recovery.

Figure 2 depicts example cash flows in the cases where a credit event does not occur and Figure 3 depicts the cash flows in the cases where a credit event does occur before the contract maturity.

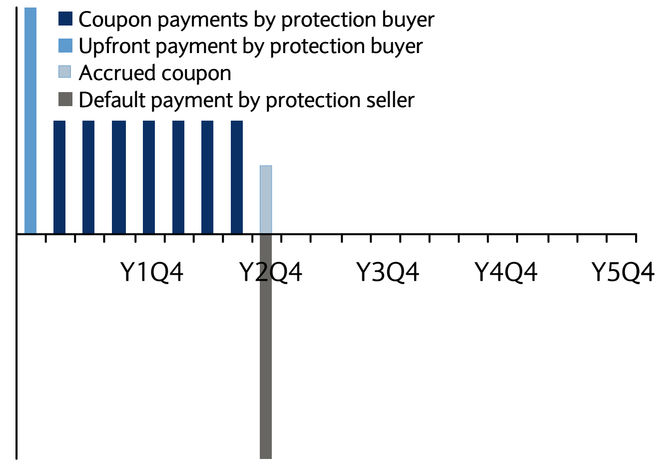
[2] Note that with the exception of restructuring events, most standard contracts are triggered automatically following a credit event. See discussion later.

Figure 2: No credit event occurs within five years



Source: Barclays Capital

Figure 3: A credit event occurs in the second year



Source: Barclays Capital

Transaction specification

CDS transaction standards have developed hand in hand with the growth of the market. The ISDA Credit Derivatives Definitions, which are incorporated into all trade confirmations, provide a common contractual foundation; for example, covering terms pertaining to credit events, settlements and deliverable obligations. They allow for an efficient market, with each trade requiring only minimal supplementary information to be agreed and specified.

A typical CDS trade confirmation specifies the following key, transaction-specific terms:

- the underlying reference entity;
- the transaction notional;
- the trade tenor or maturity;
- the fixed coupon;
- the valid seniority for deliverable obligations (via the Reference Obligation); and
- the document clause defining what constitutes a credit event.

Even these details have been standardised to a large extent. By convention, dealers only trade a small number of agreed, fixed maturity dates and coupons.

Cash flow trading conventions for standard corporate CDS

There are a number of conventions used by CDS dealers to specify standardised cash flows for CDS transactions, which we summarise below. All conventions we refer to are for Standard European Corporate (STEC) and Standard North American Corporate (SNAC) CDS contracts.

Standard coupons

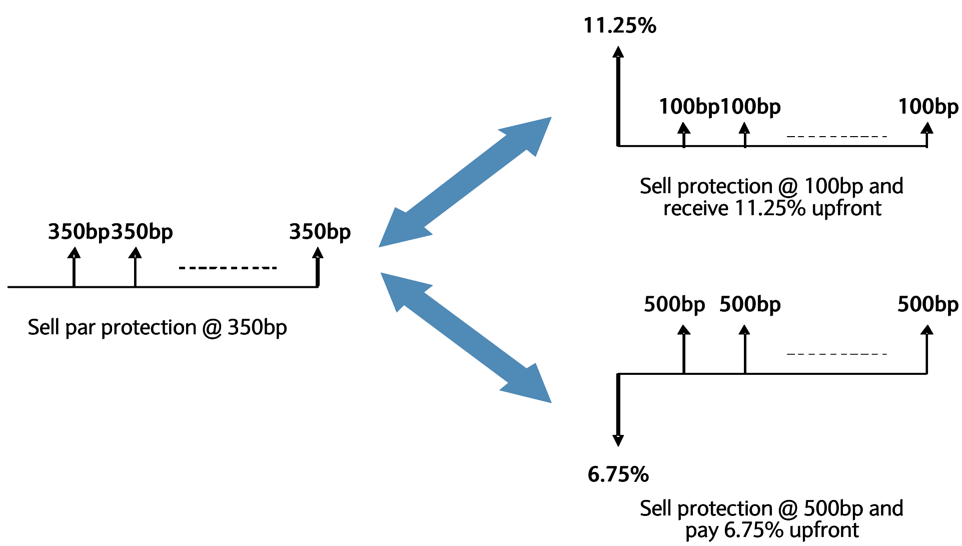
Up until 2009, the CDS market traded on a par basis. At trade inception, the counterparties would agree upon a fixed-coupon level, which made the net present value of the contract zero and as the market moved the tradable coupon would change. Since June 2009 in Europe and April 2009 in North America, dealers quote CDS for standard fixed coupons as follows:

- Europe - 25bp, 100bp, 500bp and 1000bp
- North America - 100bp and 500bp

Consequently, the net present value of a CDS transaction at inception is generally not zero and, as a result, a compensating upfront payment is made between the buyer and seller. This payment can be in either direction, depending on the credit quality of the reference entity.

Consider the following example. A dealer considers the fair premium (ie, the par premium which would make the contract worth zero) for 5yr protection to be 350bp. However, suppose the standard contract is for a 100bp coupon. If the dealer is buying protection, then in addition to the 100bp coupon, he will pay the protection seller an upfront amount to compensate for the 250bp shortfall. On the other hand, if the standard contract being used is for a 500bp coupon, then the dealer will be compensated by the protection seller for the 150bp excess coupon being paid. We show the cash flows for these examples in Figure 4.

Figure 4: CDS premium cash flows with par and standard coupons



Note: we assume the CDS has a PV01 of 4.5. Source: Barclays Capital

As of September 2009, emerging market CDS for Latin America, Eastern Europe, Middle East and Africa also trade with new standard conventions. The contracts are known as STEM and they trade with 100bp and 500bp coupons[3].

Maturity and coupon frequency

CDS contracts trade with standardised maturity and coupon dates.

Contracts are always traded with a maturity date falling on one of four roll dates, 20 March, 20 June, 20 September or 20 December. When specifying a contract term, eg, 5y, the maturity date is rounded up to the next roll date. For example, a 5y contract traded on 17 July 2009 will have a maturity date of 20 September 2014. Once every three months the maturity corresponding to each fixed-tenor rolls forward three months. If the maturity date falls on a non-business day, then it is moved to the following business day.

[3] See "Update on the new EM CDS Standard Contract", 2 September 2009, Barclays Capital.

In the North American and European markets, CDS coupons are paid on a quarterly basis, coinciding with the CDS roll dates. The size of the coupon payment is calculated on an Actual/360 basis.

Full first coupons

A full first coupon is paid on CDS transactions. If an investor sells protection on 17 July 2009, then the first coupon will be paid on 20 September 2009 and it will be calculated on an Actual/360 basis from the previous roll date, 20 June 2009. The protection seller pays the protection buyer accrued interest proportional to the time between the last roll date (20 June 2009) and the trade date (17 July 2009). This is comparable to accrued interest payments in the bond market.

Credit events and deliverable obligations

Below we describe the main features of the protection leg, including the period for which protection is provided, what constitutes a credit event, how the occurrence of a credit event is determined, triggering contracts and the valid deliverable obligations once a contract has been triggered. All of these features are specified by the ISDA Credit Derivatives Definitions, which are incorporated into standard CDS transactions. We assume all contracts are subject to the 2009 ISDA supplements, ie, the Big Bang and Small Bang changes. This text covers what we consider to be the key features. We refer readers to the ISDA documentation for full details.

Credit events and triggering contracts

Credit events are defined on either the reference entity or the entity's debt, as summarised in Figure 5.

Figure 5: Possible credit events

Credit event	Defined on	Comment
Bankruptcy	Reference entity	Reference entity is either dissolved or becomes insolvent or is otherwise unable to pay its debts
Failure to pay	Reference entity's obligations	Reference entity fails to make payments when they become due after expiration of any applicable grace period
Restructuring	Reference entity's obligations	A change in the terms of debt which are unfavourable to the creditor
Obligation acceleration	Reference entity's obligations	An obligation becomes due before it would otherwise have been because of a default
Obligation default	Reference entity's obligations	An obligation becomes capable of being declared due before it would otherwise have been because of a default
Repudiation/Moratorium	Reference entity's obligations	Reference entity announces repudiation or moratorium on obligation and subsequently fails to pay

Source: Barclays Capital

CDS contracts specify the applicable credit events (see "Credit event trading conventions" below).

Contracts with no restructuring (XR)

Any of the credit events listed, excluding restructuring, triggers the contract (once the Determinations Committee has decided a credit event has occurred – see later). Triggering is automatic and a Credit Event Notice is not required[4]. This results in a curtailment of premium payments (except for the accrued premium for the prevailing coupon period, which the protection buyer must pay to the seller) and settlement of the protection leg.

Contracts with restructuring (R, MR, MMR)

Any credit event other than restructuring has the same consequences described above for no restructuring contracts. However, following a restructuring event, the buyer or seller of protection may trigger the contract by serving a Credit Event Notice to their counterparty. If either party triggers then the contract terminates as with any other credit event (although the basket of acceptable deliverable obligations may differ). If neither party triggers then the contract survives unchanged. With a restructuring event, the contract may be partially triggered (ie, for less than the full notional).

Deliverable obligations

Following a credit event, the buyer of protection may deliver any acceptable deliverable obligation to the seller of protection for a price of par. The contract specifies a permissible obligation category (ie, the type of debt, such as a bond or loan) and obligation deliverable characteristics (defining, for example, valid subordinations, currencies or a maximum maturity). A Reference Obligation is typically specified to define the level of subordination which may be delivered.

Restructuring types and maturity buckets for restructuring events

There are four possible types of restructuring which may be specified. These are summarised in Figure 6.

Figure 6: Restructuring types

Contract value	Clause	Comment
Least valuable	No Restructuring (XR)	Debt restructuring is not considered a credit event
	Modified Restructuring (MR)	Caps the maturity of deliverable obligations at the earlier of 2.5y from restructuring date or the longest maturity of a restructured bond or loan (but not earlier than the CDS contract termination date). Subject to bucketing rules.
	Modified Modified Restructuring (MMR)	Caps the maturity of deliverable obligations at the later of the CDS maturity and 5y (for restructured bonds or loans – 2.5y for other deliverables) after the restructuring date. Subject to bucketing rules.
Most valuable	Old (or Full) Restructuring (R)	No additional restrictions on deliverable obligations. Bucketing rules do not apply.

Source: Barclays Capital

[4] Exceptions apply for non-standard contracts. If a counterparty has not signed up to the 2009 ISDA protocols or the transaction type is not subject to the protocol or only one counterparty is permitted to trigger or the trade date is later the auction date and the transaction is not auction settled, then a Credit Event Notice is required for the contract to be triggered.

For contracts triggered by a restructuring event which use MR or MMR, maturity bucketing rules apply (these were introduced in 2009 to facilitate auction settlement for restructuring events). The maturity bucket end dates are the CDS roll dates on or immediately after the following time periods beyond the Restructuring Date: 2.5y, 5y, 7.5y, 10y, 12.5y, 15y, 20y, 30y. Each triggered CDS contract is allocated a bucket according to the contract's Scheduled Termination Date. That bucket's end date provides an upper limit for any deliverable obligation's maturity. In addition:

- If there is no deliverable obligation in the allocated bucket period, then a CDS contract is moved down to the next available bucket with a deliverable obligation. This is known as the **Rounding Down Convention**. It has no effect on the list of deliverables but can affect the auction in which a contract is entered into if it is auction settled.
- If the protection seller triggered the contract then it falls into the 30y bucket[5].
- For MMR contracts, the 2.5y bucket is referred to as the ModMod 5y Bucket, as Restructured bonds or loans maturity up to five years after the Restructuring Date are also deliverable.
- For MR contracts, if there are CDS maturing prior to the longest dated of any restructured bond or loan, which in turn is maturing prior to the 2.5y bucket end date, then a pre-2.5y bucket is also used, with an end date equal to the longest-dated restructured bond or loan maturity.

Protection period

The Credit Event Backstop Date of a CDS contract is the date from which protection is provided. It has rolling and look-back features. The effective date of any trade is always equal to the current date minus 60 days. This means that not only is the protection coverage retroactive but, as every day passes, the effective date rolls forward one day for all deals.

Credit event trading conventions for standard corporate CDS

As well as the cash flow conventions described earlier, dealers trade standard corporate CDS with agreed conventions for the protection leg of the trade. Both STEC and SNAC contracts incorporate Bankruptcy and Failure to Pay, although they have different conventions for restructuring.

Restructuring

Since the CDS market standardisation in 2009, the restructuring conventions for standard CDS are as follows:

- Europe – with restructuring (MMR)
- North America – no restructuring (XR)

Modified Restructuring (MR) is no longer generally used, although there may be some legacy North American MR contracts outstanding, initiated prior to the market standardisation. For STEM (standard emerging market) CDS for Latin America, Eastern Europe, Middle East and Africa, the contract standard is to trade with the Full Restructuring clause.

[5] Except for Recovery Locks.

Triggering convention

Both parties, the protection buyer and the protection seller, have the right to trigger the contract following a restructuring event. In the case of any other type of event, the contract is triggered automatically upon a decision by the relevant Determinations Committee.

Obligation category and characteristics

The deliverable obligation category is “Bond or Loan” and the obligation characteristics are: not subordinated (to the reference obligation); specified currency; 30y maximum maturity; transferable; not bearer; not contingent; assignable loan and consent required loan. See the ISDA documentation for definitions of these terms.

The Determinations Committees and auction settlement

The contractual modifications that formed the Big Bang and Small Bang changes (in April 2009 and July 2009, respectively) included establishment of regional Determinations Committees (DCs). The regions are The Americas, Asia Ex-Japan, Australia-New Zealand, EMEA (Europe, Middle East and Africa) and Japan. Each committee comprises fifteen voting members: eight global dealers; two regional dealers; and five non-dealers. In addition there are four non-voting members: two dealers; one non-dealer; and the DC secretary.

The main responsibilities of the Committees are to:

- determine whether a credit event has taken place and if so the type of event and the date it occurred;
- determine whether auction settlement is required and if so the terms of the auction(s);
- specify valid deliverable obligations; and
- determine whether a succession event has occurred (see later for a discussion of succession events).

The purpose of the DCs is to standardise the treatment of all CDS contracts and to formalise the determination and settlement of credit events.

Any ISDA member may notify ISDA of a possible credit event (which must have occurred within 60 days prior to the notification). ISDA will then ask the DC to determine whether a credit event has occurred[6]. The DC resolutions are binding; however they are subject to external review unless an 80% supermajority is achieved. In practice, however, most DC votes are unanimous and, at the time of writing, External Review had only been used once.

Auction settlement

CDS were originally developed as a hedging instrument for cash bonds, and thus initially settlement in the case of a credit event occurring happened through the physical sale of a valid deliverable obligation from the protection buyer to the protection sellers. As CDS became more popular, the volume of outstanding notional in the derivative outstripped that of the underlying bonds for many issuers. After a credit event, physical settlement meant protection buyers faced the prospect of a short squeeze as the price of bonds would be bid up by protection buyers needing to deliver into their CDS contracts. This risk could be mitigated by allowing cash settlement.

[6] Note that if DC deliberations extend more than 60 days past the event date then the protection is still valid provided the original notification was within the look back period.

The credit event auction was developed to provide a transparent price discovery mechanism for cash settlement. When first developed, market participants had to opt in to the ISDA protocol for each defaulting entity separately, which could be a time-consuming process. Since the global Big Bang and Small Bang changes to the ISDA Credit Derivatives Definitions in 2009 this process has been hardwired into most CDS contracts as the standard settlement mechanism.

The auction is a two-stage process:

- **Stage 1**. Dealers make two-way markets for the cheapest to deliver. They also make physical settlement requests on their own behalf and on behalf of their clients. This stage determines the volume and direction of the open interest on the defaulted assets, as well as an Inside Market Midpoint (calculated from the two-way markets provided), which is used to constrain the final price determined in Stage 2.
- **Stage 2**. In the second stage of the auction, which usually takes place a few hours after the first stage, dealers make limit orders to buy or sell (depending on the direction of the open interest) on their own behalf and on behalf of their clients. These bids or offers are then matched to the open interest in price order until the last order is filled. It is essentially the last order price that determines the final price.

The final price is then the recovery rate at which CDS contracts are cash settled[7].

Physical settlement

Any participants wishing to buy or sell obligations (thus replicating the effect of physical settlement) can do so by making physical settlement requests in the first stage of the auction process.

Although auction is the standard settlement method, there are situations where an auction may not be held, for example, if there are not many outstanding contracts[8]. If it is deemed that no auction is necessary, then the fallback settlement method is physical or dealer poll.

Auction settlement for restructuring events

The Small Bang protocol of July 2009 was mainly concerned with facilitating auction settlement for restructuring events. The protocol extended the Determinations Committees' powers to allow them to make binding decisions as to the occurrence of a restructuring event and the determination of any necessary auctions. A separate auction may take place for each restructuring bucket containing live CDS contracts.

If no auction is held for a contract's assigned restructuring bucket, then the protection buyer has the option to move the transaction down to the nearest bucket with an auction and the protection seller has the option to move the transaction up to the 30y bucket. This is known as the **Movement Option**.

Process following a credit event

Below we highlight the key steps of the process from the occurrence of a credit event to the settlement of the CDS contract. Timelines are set out in the DC rules. The DC may amend the timelines by vote.

[7] For more detail concerning the auction process and for examples we recommend "Credit Event Auction Primer", Markit.
[8] If there are at least 300 transactions outstanding and five or more dealers are party to them, then an auction is compulsory.

1. An ISDA member notifies ISDA (in their own name or anonymously) of the possible occurrence of a credit event.

2. ISDA requests that the appropriate DC determines whether a credit event has occurred and if it has, when it occurred and what type of event it was. The DC also determines whether an auction will take place, although this is decided later for a restructuring event (as the DC requires further information, such as the number of outstanding, triggered contracts).

3. If an event has occurred and an auction is to take place then the DC must determine and publish a list of deliverable obligations (determined in accordance with the ISDA definitions). If the event is a restructuring then the DC must publish CDS contract-assigned maturity buckets. This can take several weeks from the initial announcement that a credit event has occurred.

4. For restructuring events, sellers of protection have two business days and buyers of protection have five business days following the DC's publication of the final list of deliverables, during which period they may trigger their contracts.

5. For restructuring events, the announcement of any necessary auctions will be no later than the business day following the trigger exercise deadline.

6. For restructuring events, the Movement Option may be applied up to three business days following the trigger exercise deadline. The auction date will be set to occur at least two business days following the Movement Option deadline.

7. Any necessary auctions take place.

8. Contracts are settled.

9. Any purchases or sales of deliverable obligations that were traded through the auction are settled.

Note that provided the credit event is within the 60 day look back period as of the date of the initial notification in step 1, CDS protection is valid, no matter how long the above process takes.

Succession events

A succession event occurs when one entity (or several entities) succeeds to the obligations of another (for example, via a merger, consolidation, amalgamation, transfer of assets or liabilities, demerger or spin-off). Such an event can lead to a modification of a CDS contract's reference entity and deliverable obligations. In extreme cases, a CDS may be "orphaned", if a succession event results in there being no valid deliverable obligations, rendering protection worthless (unless future deliverables are anticipated).

Figure 7 summarises the rules for determining successors and the reference entities applicable to transactions following a succession event.

Figure 7: Determining a successor

Condition	Outcome
One successor has more than 75% of the relevant obligations	This successor becomes the sole reference entity
Only one successor has more than 25% of the relevant obligations and less than 25% remain with the original reference entity	This successor becomes the sole reference entity
Several successors have more than 25% of the relevant obligations and less than 25% remain with the original reference entity	Each successor with more than 25% of the relevant obligations are reference entities
Several successors have more than 25% of the relevant obligations and more than 25% remains with the original reference entity	Each successor with more than 25% of the relevant obligations and the original reference entity are reference entities
No successor has more than 25% of the relevant obligations and the original reference entity still exists	No change
No successor has more than 25% of the relevant obligations and the original reference entity ceases to exist	The successor with the greatest proportion of relevant obligations becomes the sole reference entity

Source: ISDA, Barclays Capital

2. CDS PRICING

CDS PRICING

Pricing, risk and quotation conventions

This section of the handbook is concerned with the pricing aspects of CDS. Topics include valuation of all-running and standard CDS contracts, which are closely linked, and the PV01 (present value of a stream of 1bp payments), which is of central importance in their valuation. Quotation conventions for standard CDS and the convention for converting between spread and price quotes are also discussed. Key risk factors are then examined, as well as the mechanics of closing out a trade, counterparty risk and margin. We include a summary of CDS calculations in Bloomberg and introduce the Barclays Capital Live CDS converter. We finish with a Technical Appendix, which goes over the key pricing and risk calculations.

Valuation and mark-to-market

For more than a decade after they were first introduced most CDS contracts traded with coupons in all-running format. The quoted spread on an entity was the annual premium paid by the buyer of protection in return for credit event protection. There were exceptions, where contracts were traded on an upfront and fixed-coupon basis, for example:

- CDS on distressed names, with a high likelihood of short-term default, typically traded with an upfront payment and a 500bp coupon. This was to spare sellers of protection from the risk of having to make large payments following a short-term credit event prior to having received much coupon income.
- CDS indices, like iTraxx and CDX, always traded with upfront and fixed coupons. Given the high volume, liquid nature of the index products, fixing the coupon allowed for better netting of trades.

Today, however, with the adoption of STEC and SNAC contracts in the European and North American markets in June 2009 and April 2009, respectively, all such standard corporate CDS contracts trade upfront. They were introduced as part of the broad standardisation of the CDS market and in support of the establishment of central clearing. Upfront contracts provide the following advantages over all-running contracts:

- they improve price transparency for existing contracts;
- the mark-to-market calculations are usually straightforward;
- they facilitate easier unwinding of trades; and
- they facilitate better netting of trades.

From a valuation perspective, all-running contracts can be thought of as a special case of an upfront and fixed-coupon contract, where the upfront is zero and the fixed coupon is equal to the par spread.

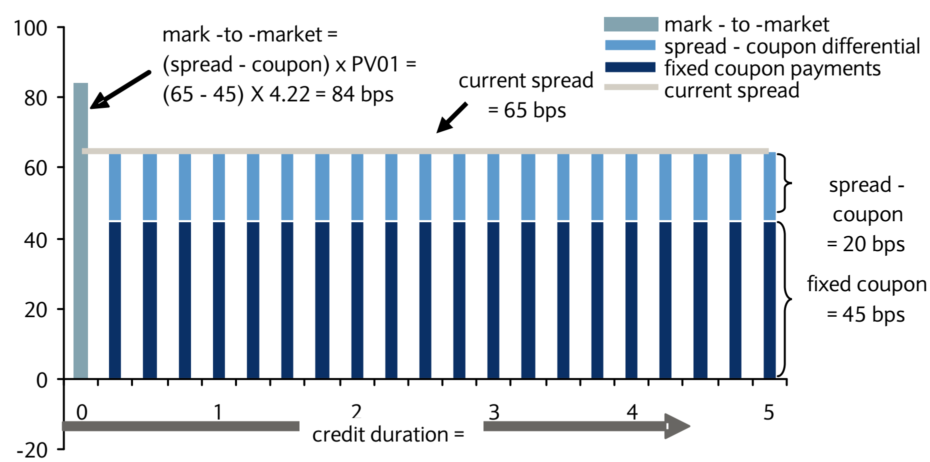
All-running contracts

For an all-running contract, the spread quoted is the par spread and it is precisely the coupon that is agreed for the premium leg in return for credit event protection.

Consider the example where an investor buys 5yr CDS protection for a coupon equal to the initial par spread of 45bp. Suppose that the price of protection has now moved to 65bp. The investor could now sell protection with a higher coupon (65bp). In case of default, the recovery legs would exactly match for this investor. Until the earlier of maturity or a credit event the investor would receive a stream of payments equal to the difference between the coupons, in this case 20bp.

The mark–to–market is thus the PV of this stream of cash flows. We calculate the present value of 1bp (the PV01, also sometimes referred to as the CDS duration – see below) for this contract to be 4.22. Hence, the PV of the cash flows is 20bp x 4.22 = 84.4bp. The buyer of protection has a positive mark–to–market of 0.844% of the contract notional in this example (-0.844% for the seller of protection). The calculation is illustrated in Figure 8.

Figure 8: Cash flows for a buyer of 5y CDS protection; spread widening scenario



Source: Barclays Capital

Generalising this analysis we have, for the buyer of protection:

CDS mark–to–market = (Current par spread – Original par spread) x Current PV01

PV01 (or duration)

The PV01 is a central component in the mark-to-market calculation of a CDS contract. It is sometimes referred to as the risky PV01 or the CDS duration and we define it as follows:

PV01 is the present value of a stream of 1bp payments at each CDS coupon date

Analytically, PV01 can be calculated as:

$$PV01 = \sum_i Df(t_i)S(t_i)B(t_i)$$

where i = coupon index

t_i = coupon date

$Df(t_i)$ = discount factor until t_i

$S(t_i)$ = survival probability until t_i

$B(t_i)$ = day count fraction (essentially the coupon time interval) at t_i

This expression is analogous to the duration calculation for an interest rate swap; however, the cash flows are additionally discounted by the survival probability. Consequently, the risky PV01 is lower than the equivalent risk-free PV01. The term structure of survival probabilities are typically calibrated to a term structure of market CDS quotes (see Technical Appendix).

As a credit becomes riskier, the associated survival probabilities decrease therefore so does the PV01. Hence, the buyer of protection has negative convexity. As spreads widen, the investor makes money but the rate of gain is dampened by the decreasing PV01. On the other hand, as spreads tighten, the investor loses money, but the rate of loss is enhanced by the increasing PV01. The survival probabilities (and therefore the PV01 and the CDS value) also depend on the recovery rate assumption (see the discussion on recovery rate sensitivity later).

Standard contracts

The coupon in a standard contract is conventionally set to be one of a few fixed levels, the most common being 100bp and 500bp. There is an upfront payment (which could either positive or negative) to compensate for the difference between the par spread and the fixed coupon. While a CDS in standard (upfront) format has different premium leg cash flows to an all-running contract, they offer exactly the same protection through the default leg.

When calculating the upfront payment, such contracts are best thought of as off–par CDS contracts, with an initial mark-to-market adjustment. Thus, the upfront payment on a credit trading with an all-running spread of S, and with a fixed coupon of C, is set equal to (S – C) x PV01.

Upfront Payment = (Par Spread – Fixed Coupon) x PV01

This payment is from the protection buyer to the protection seller. For example, if the par spread is 45bp, the PV01 is 4.22 and the fixed coupon is 100bp, then the upfront payment equals -2.32% of notional. As this is negative, the protection seller pays the protection buyer, in this case, to compensate for the excessive premium that the seller will receive.

Note that the protection buyer does not realise an immediate profit in this example, as the mark-to-market of the trade is 2.32% in favour of the seller. Under standard margining arrangements, the buyer would immediately have to transfer collateral of this value to the seller.

Quotation conventions for standard contracts

Quotations for standard contracts come in two formats: quoted spreads for low spread (typically IG) names and points upfront for high spread (typically distressed or HY) names. The latter is extremely transparent and makes calculating mark-to-market very easy, as it is just the difference between the upfront payment at inception and the current upfront quote.

For names quoted on a spread basis, there is a market-wide convention for converting from spread to upfront. This is to assume a flat CDS curve equal to the quoted spread, a 40% recovery rate (20% for sub contracts) and an ISDA-standard hazard rate model[9] when calculating the PV01. The model is openly available and can also be applied through Bloomberg analytics. Consequently, given a spread quotation, there can be no ambiguity in the value of the contract.

Note that this spread is known as the Quoted Spread and it usually differs from the Par Spread. While the Par Spread is the level at which a dealer would be willing to fix the coupon such that there would be no upfront payment, the Quoted Spread is simply the spread which converts to the upfront level at which the dealer is willing to trade the standard,

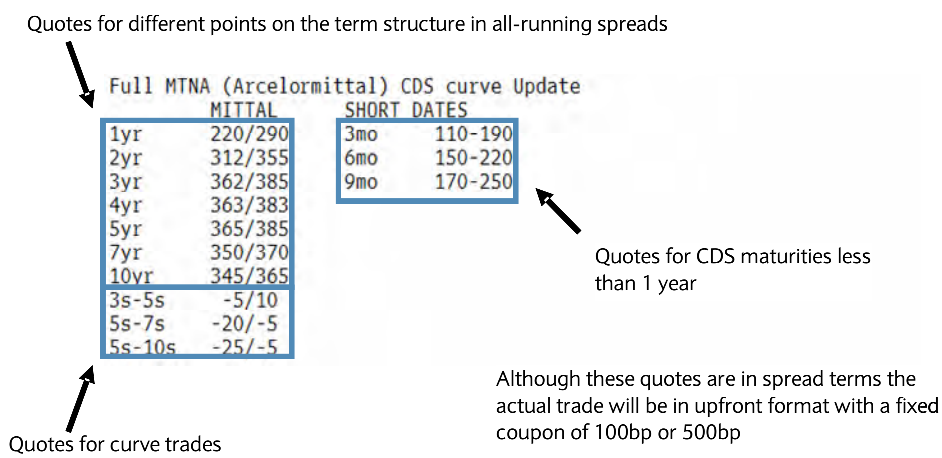
[9] See http://www.cdsmodel.com/cdsmodel/

fixed-coupon contract using the above conventions. The spreads differ as the par curve is not generally flat and the dealer's recovery rate assumption may not match the conventional rate. However, the two consistently imply the same upfront level and are related as follows:

$$\text{(Quoted Spread – Fixed Coupon) x PV01(Quoted Spread Flat Curve)}$$
$$=$$
$$\text{(Par Spread – Fixed Coupon) x PV01(Par Spread Curve)}$$

Figure 9 illustrates a run for a credit that is quoted in spread terms.

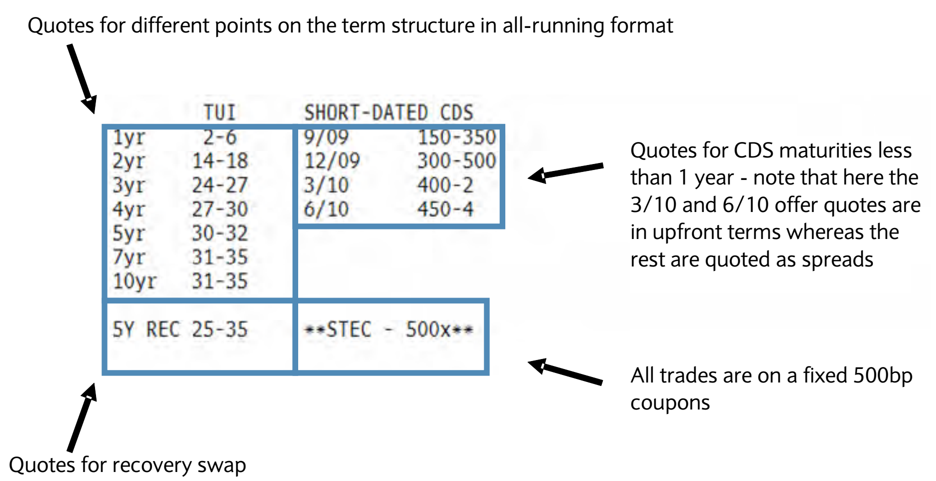
Figure 9: Trader run for Arcelor-Mittal, quotes in spread terms



Source: Bloomberg, Barclays Capital

Figure 10 illustrates a run for a credit that is quoted in points upfront.

Figure 10: Trader run for TUI, quotes in points upfront



Source: Bloomberg, Barclays Capital

Despite how they are quoted, the actual contracts trade in STEC or SNAC format with fixed coupons. While spread-quoted names can trade with any one of the fixed coupons conventions, for names quoted in points upfront the fixed coupon is usually 500bp.

CDS exposures

The main risks or exposures of a CDS position are its DV01 (or delta), credit event risk, recovery rate sensitivity, interest rate sensitivity and exposure to the passage of time. All of these elements are described below.

DV01 (or spread delta)

The DV01 generally differs from the PV01 described earlier. It is also known as the risky DV01 or delta and it is the sensitivity of the CDS contract mark-to-market to a change in spread. We define it as follows:

DV01 is the CDS contract sensitivity to a parallel shift in the par term structure

Given the PV of the CDS is

$$PV = (S - C) * PV01$$

Where *S* is the prevailing spread and *C* is the contract coupon, we derive the CDS DV01 as follows:

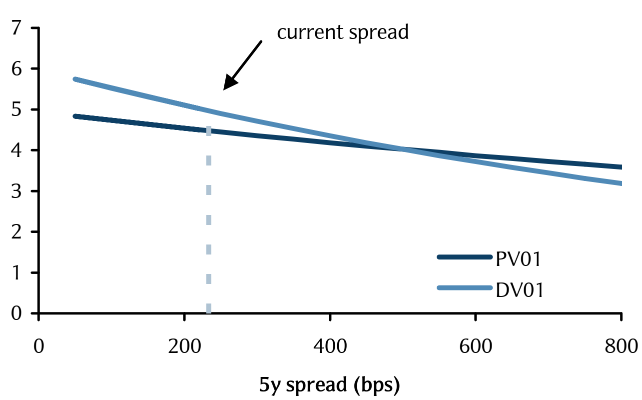
$$DV01 = \frac{\partial PV}{\partial S} = PV01 + (S - C)\frac{\partial PV01}{\partial S}$$

For a contract at par, S is equal to C, and so the DV01 and PV01 are identical. However, the further away from par a contract is, the more the spread sensitivity diverges from the duration.

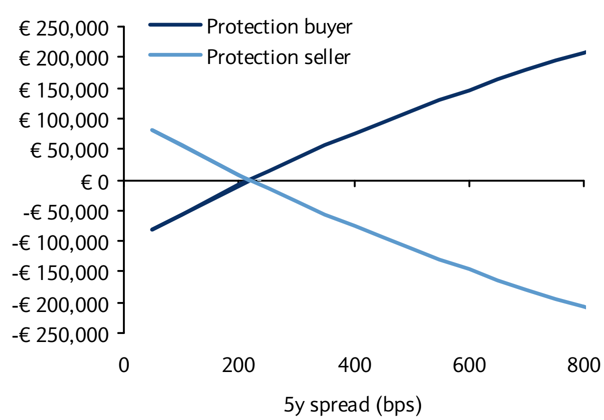
Figure 11 Panel A highlights how PV01 and DV01 for a single name change as a function of spread. In Panel B, we show the mark-to-market, for the buyer and seller of protection, of a contract struck at 220bp as the market spread changes. The negative convexity profile of the long protection position and the positive convexity profile of the short protection position are also visible.

Figure 11: PV01, DV01 and mark-to market for CDS with a 500bp coupon and 220bp par spread (21 January 2010)

A: PV01 and DV01



B: mark-to-market for €1 MM notional



Source: Markit, Barclays Capital

Credit event risk

A credit event has several effects on the CDS contract:

- It triggers a compensation payment from the seller of protection to the buyer of protection equivalent to par minus the recovery rate multiplied by the notional of the contract.
- It terminates the contract (except for contracts not triggered following a restructuring event). No further premium payments are made to the seller and the buyer has no further protection against subsequent credit events. Consequently, any pre-existing mark-to-market is eliminated and the upfront payment made at contract inception becomes a realised component of the P&L.
- Accrued interest is paid from the buyer to the seller for the protection received since the previous coupon date (except for contracts not triggered following a restructuring event).

For example, if an investor sells protection, as in our earlier example, with a coupon of 100bp, a PV01 of 4.22 and a par spread of 45bp, then they must pay an upfront amount equal to 2.32% of notional. To balance this, they have an initial positive mark-to-market of 2.32%. If there is an immediate credit event with a recovery rate of 40%, then they will realise a loss of 62.32%, as their positive mark-to-market is eliminated and they are obliged to pay the buyer compensation of 60%. In addition, the accrued interest since the previous coupon date is paid from the protection buyer to the protection seller.

Recovery rate sensitivity and the Credit Triangle

CDS valuation is dependent on the expected recovery rate, as it is this rate that defines the credit event leg's cash flow. There is an intuitive relationship between the recovery rate, the spread and the default probability, known as the Credit Triangle:

The Credit Triangle

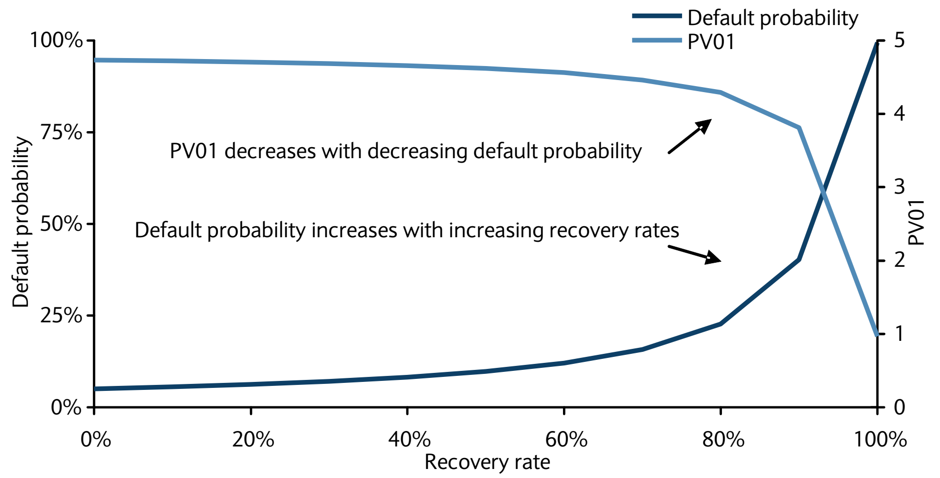
1y Spread ≅ 1y Default Probability x (1 – Expected Recovery Rate)

This formula states that the premium received should match the expected loss, ie, the loss following a credit event multiplied by that probability of the loss occurring. (Note that this approximation does not work well for wide credit spreads.)

Default probabilities and expected recovery rates are both generally unobservable (the latter is sometimes available via a market for recovery swaps, which tend to trade for distressed issuers). The CDS spread is observable and can be used to calculate default probabilities *given a recovery rate assumption*. From the Credit Triangle we can see that if we raise the recovery rate then we implicitly raise the default probability. For instance, a credit spread of 100bp would imply roughly a 1% chance of default per year if the expected recovery rate was zero. Suppose now the expected recovery rate is increased to 50%. The loss on default is halved, so the default probability must then double to 2% to make the 100bp premium fair compensation for the risk of default.

In Figure 12, we show the 5y default probability as a function of the recovery rate assumption, keeping the CDS spread constant. We also plot the PV01. As the recovery rate increases, this increases the default probability, which in turn decreases the PV01, although this only drops off sharply when recovery rates become very high.

Figure 12: Default probability and PV01 against expected recovery rate (constant spread)

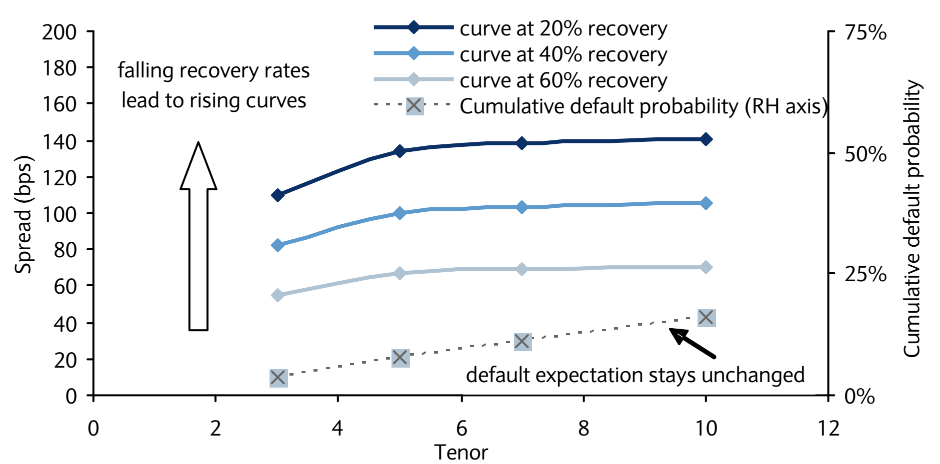


Source: Barclays Capital

Recall the mark-to-market of a contract depends on the PV01, therefore recovery rate affects the CDS value. Following CDS standardisation in 2009, the recovery rate is fixed by convention at 40% (or 20% for contracts referencing sub debt), therefore there is no ambiguity when calculating default probabilities and CDS mark-to-market from the quoted spread.

Given a spread term structure for one recovery rate assumption, we can calculate the implied default probability curve and use it to calculate spreads for another recovery rate. Figure 13 shows how lowering the recovery rate causes an increase in the term structure, if we hold the default probabilities constant. This can be useful for valuing contracts of one level of subordination from another.

Figure 13: Spread as a function of recovery rate, keeping default probabilities constant



Source: Barclays Capital

Interest rate sensitivity

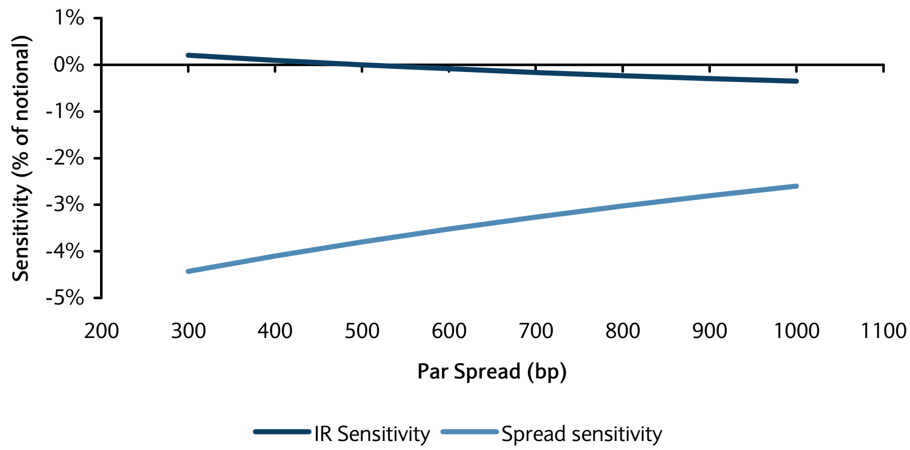
The interest rate sensitivity of a CDS contract is

$$\frac{\partial PV}{\partial r} = (S - C) * \frac{\partial PV01}{\partial r}$$

where r represents the risk-free rate[10]. For a par contract, where the par spread equals the coupon, the rate sensitivity is zero. For off-par contracts it is positive if the spread is lower than the coupon and negative if the spread is higher than the coupon (the PV01 sensitivity to rates is negative – as rates increase, the PV01 decreases).

In Figure 14, we plot the CDS sensitivity as a function of par spread for a standard contract with a 500bp fixed coupon. We also show the spread sensitivity to illustrate the relative magnitude of the rate sensitivity. Even for off-par contracts, the rate sensitivity is relatively small, highlighting the fact that CDS are reasonably pure representations of credit risk.

Figure 14: CDS sensitivity to 1% shift in rates against par spread for a 500bp fixed coupon



Note: Rate sensitivity assumes a 100bp parallel increase in the interest rate curve. Spread sensitivity assumes a 100bp increase in the par curve. Source: Barclays Capital

Time decay and carry

A CDS contract will generate P&L simply from the passage of time, even if the credit quality of the issuer does not change. There are several components which may contribute to this:

- Carry – the coupon income paid to the protection seller.
- Pull-to-par (or theta) – this arises through the natural amortisation of the upfront payment to zero over the life of the trade, as the CDS duration drops to zero. It is analogous to the pull-to-par concept in the bond universe.
- Upfront funding – the cost of funding the upfront payment over time.

For all-running contracts, the pull-to-par and upfront funding are zero; it is a par contract already which requires no upfront payment. For standard contracts these are generally non-zero. A 5y all-running contract with a par spread of 200bp will pay the protection seller 200bp per year. In standard format it would typically pay a coupon of only 100bp per year together with an upfront payment of, say, 4.5% (the PV01 multiplied by the 100bp coupon shortfall). This 4.5% is not immediate profit as the contract has a -4.5% mark-to-market. Over time, however, in the absence of a credit event, this negative mark-to-market will increase to zero as the contract duration falls. This pull-to-par effect compensates for the inadequate coupon.

[10] Note that r could represent any of several possible risk-free rates or parameters used to bootstrap the risk-free discount curve. Also if spreads and rates are correlated then a change in rates could induce some spread sensitivity.

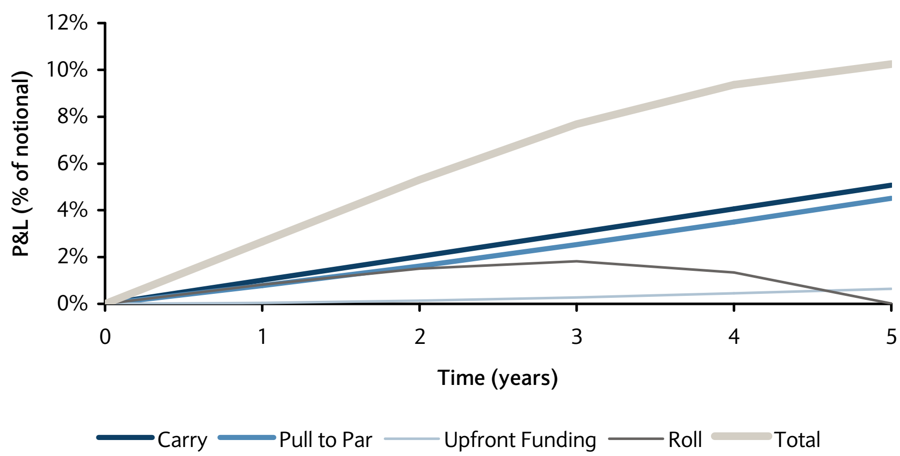
While the carry and upfront funding are unambiguous, there are a number of ways to define the pull-to-par. Perhaps the simplest method is to assume that the quoted spread does not change over time and then recalculate the mark-to-market. The pull-to-par is then the quoted spread minus the fixed coupon multiplied by the change in PV01 calculated using the quotation standard conventions – a flat curve and a 40% recovery rate (20% for sub).

Pull-to-par = (Quoted Spread – Fixed Coupon) x ΔPV01 (Quoted Spread)

The roll

There is an additional concept sometimes considered to be a component of the time decay: the roll. In this case time decay is not defined as the P&L assuming the quoted spread does not change over time but as the P&L assuming the entire credit curve does not change over time, so that the credit spread rolls down the curve (or up it if it is inverted). The roll value is then defined as the mark-to-market due to the resulting change in credit spread.

Figure 15: Components of time decay (100bp coupon, 200bp par spread)



Source: Barclays Capital

Figure 15 shows a breakdown of the different components of time decay. Even though the trade only makes 100bp per annum in carry it makes almost the same amount in pull-to-par. Note that the roll in this example initially has a significant influence (we chose a positively sloped credit curve). However, the roll benefit becomes dampened as the duration of the contract falls.

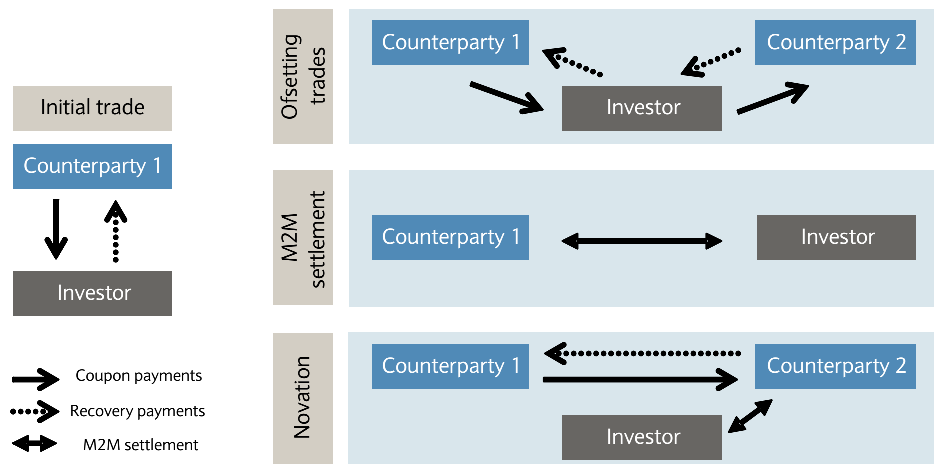
Closing out a CDS trade

There are a number of ways an investor can close an existing transaction or attempt to cancel existing exposures, as illustrated in Figure 16. The first shows an offsetting transaction with a second counterparty. Provided the fixed coupon is the same on both contracts all default and premium leg cash flows will cancel out. Prior to contract standardisation, it was unlikely that the coupons would be struck at the same level and the investor would be left with a residual annuity contingent on the occurrence or not of a credit event.

The second option is the simplest, where the investor and the counterparty agree to tear up the contract and settle the current mark-to-market between them. This is simple and transparent for all standard contracts because of the agreed convention for converting a spread quote to an upfront value. Previously, for all-running contracts, the prevailing mark-to-market was not always clear, as each dealer used their own recovery rate assumptions and credit curves to calculate it.

Another option is to novate the initial trade to a third party. In this case a new counterparty agrees to take over the investor's exposure. There is an exchange of the current value (potentially subject to additional liquidity costs) between the investor and the substituting counterparty.

Figure 16: Cash flows in closing out a CDS trade



Source: Barclays Capital

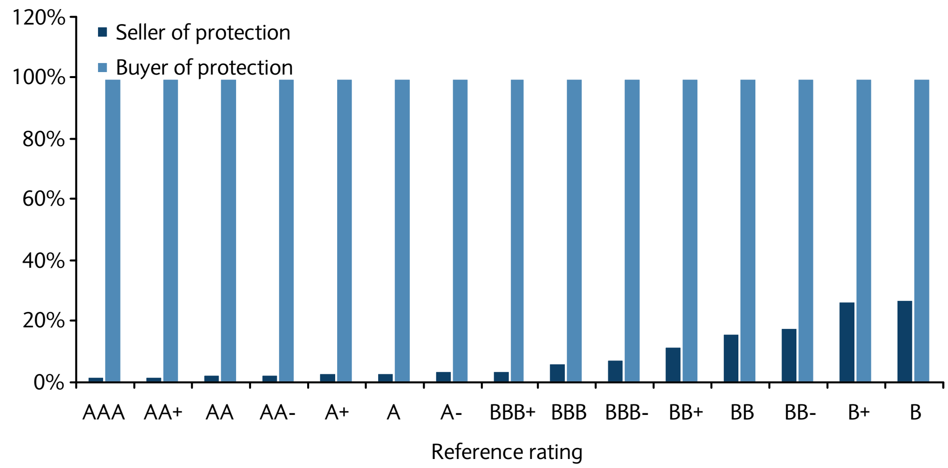
Closing out a trade with central clearing

With the advent of central clearing for CDS, the above mechanics are modified. For example, without central clearing, in the case of the offsetting trade, the investor still bears counterparty risk. The investor is exposed if the reference entity defaults at the same time as the counterparty from whom the investor bought protection. Central clearing eliminates this risk. Any CDS transaction that is centrally cleared is effectively replaced by two transactions, one long and one short, which both face the Central Counterparty (CCP). If the investor enters into an offsetting trade with an alternative counterparty and the transaction is cleared via the same CCP as the original trade, then the deals will be offset exactly through the CCP. The CCP effectively eliminates counterparty risk in this instance.

Counterparty risk, margin and central clearing

Counterparty risk is the risk taken on by each party that the other will not fulfil the obligations of that contract. As an illustration, Figure 17 shows the maximum potential loss to either party of a CDS contract. While the maximum potential loss to the seller of protection is the coupon for the rest of the contract duration, the buyer of protection could arguably lose the full notional of the contract (in case of simultaneous defaults by counterparty and the reference credit and zero recovery). Thus, counterparty risk is evidently more of a concern for buyers of protection.

Figure 17: Maximum potential loss due to counterparty failure



Note: based on spreads measured on 25 January 2008. Source: Markit, Barclays Capital

In the event of a counterparty failure, the protection buyer may face one of the following scenarios:

- *The original contract is out-of-the-money*, in which case the survivor may close out the position with the defaulter by paying off its obligations and then reinstating its position with a new counterparty. There is no profit or loss incurred in this case by the survivor due to the counterparty defaulting (unless the spread moves before the contract is reinstated).

- *The original contract is in-the-money,* in which case the survivor has a claim against the defaulter. The survivor could lose not only the market value of the contract but also any further losses should the reference entity's spread move against the survivor before they are able to reinstate the trade with an alternative counterparty.

The correlation between the reference entity and the counterparty is important. If they are strongly, positively correlated, then the buyer of protection faces an enhanced risk that the protection is worthless at the very time it is needed. This is sometimes referred to as "wrong-way risk".

Margin and Master Agreements

It is standard practice for financial institutions to enter derivative contracts documented under Master Agreements as recommended by the International Swaps and Derivative Association (ISDA). All ISDA contract holders are ranked *pari passu* to senior debt, for claims on a defaulting counterparty. The Credit Support Annexes (CSA) to the Master Agreement help parties establish bilateral mark-to-market collateral arrangements. Collateral posting and netting methods are typically adopted to help mitigate credit risk.

Margin and collateral posting

Margin agreements require banks to post different levels of collateral against their outstanding contracts. Typical acceptable collateral is either cash or highly-rated (AA or higher) securities. There are two types of margin typically employed:

- **Variation margin**. This requires regular posting of collateral between the two counterparties. It protects the prevailing profit on a trade should a counterparty default.

- **Initial margin.** This provides some protection against a jump in the mark-to-market between the time of the last variation margin exchange and the time at which the surviving counterparty is able to execute a substitute trade with an alternative counterparty.

Variation margin thresholds are usually the prevailing mark-to-market for all outstanding contracts; however, they can vary depending on the credit quality of a counterparty. For example, given their higher risk profile, margining for hedge funds tends to be somewhat more stringent. They typically post collateral at 100% of their current exposure, and furthermore might also be asked to post collateral to cover close-out risk on their contracts for a certain number of days *going forward*.

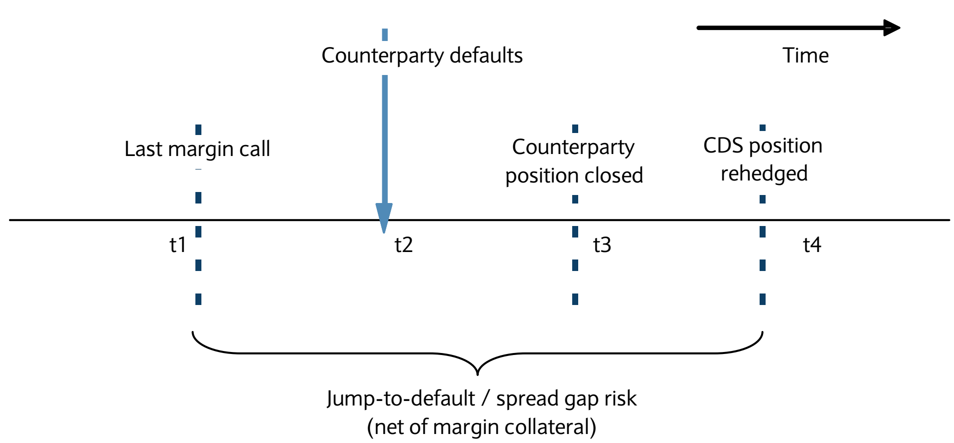
Initial margin also varies according to credit quality and is dependent on other factors, such as whether the counterparty is long or short protection, the duration of the contract and the reference entity's current spread.

While margining mitigates to a large extent the mark-to-market risk of liquid instruments, it is only as effective as its operational implementation. Various factors play a role such as the:

- frequency of margin calls;
- time it takes for collateral posted to reach the bank (typically t+2 or t+3 but it could be longer);
- quality of collateral; and
- difficulty in pricing complex illiquid instruments on a daily basis.

Figure 18 illustrates a possible timeline around a typical counterparty default scenario, highlighting the risks faced by the surviving counterparty.

Figure 18: Timeline around CDS counterparty default



Source: Barclays Capital

Even though margin has been exchanged at time t1, it is still likely that there is further mark-to-market movement between t1 and t4, the time at which the CDS contract can be reinstated. The initial margin may provide some protection against any potential default or spread gap risk. A buyer of protection can be significantly exposed to default of the reference entity between t1 and t4, particularly if that entity's spread was relatively tight at the time of the last margin call.

Netting agreements

Another advantage of trading within the ISDA framework is the provision of netting. Netting agreements come into action in the case of actual counterparty default. Without such agreements, a surviving counterparty would legally have to fully meet its obligations to the defaulting counterparty, while only being left with a claim on its dues from the same. However, the provision for netting allows a counterparty to calculate its dues to a defaulter by netting out-of-the-money and in-the-money contracts. In fact, netting agreements are typically applicable across all derivatives that are traded on ISDA contracts, effectively building in a natural hedge to counterparty default risk on a firm-wide level.

Central clearing

One of the main goals of central clearing is to reduce counterparty risk significantly. For every transaction that is centrally cleared, each of the two counterparties faces the clearinghouse separately with opposing trades. Individual counterparty risk is replaced with the centralised counterparty risk of the clearinghouse. Margin is controlled via the clearinghouse and, provided it is adequately capitalised, counterparty risk for cleared trades is eliminated.

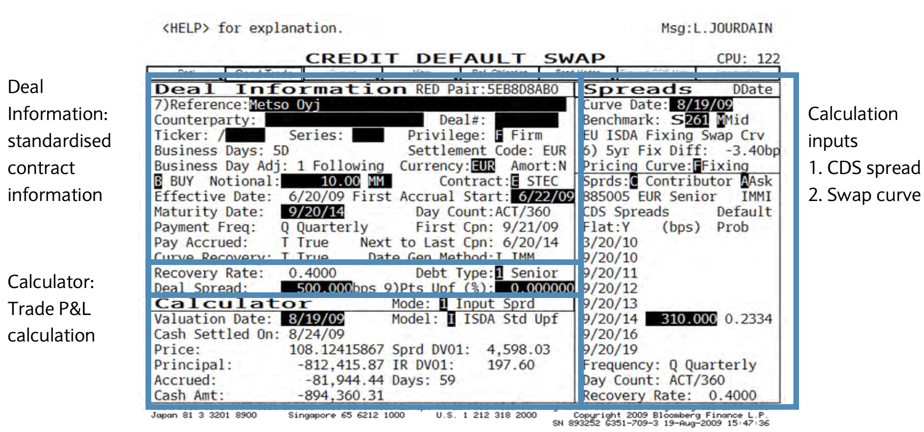
Central clearing also permits netting of contracts across trades initiated with multiple counterparties. This potentially improves the netting benefit over bilateral agreements, although it should be noted that for this to be most efficient as many trades as possible should be cleared through the same clearinghouse. For example, bilateral agreements may permit netting across asset classes. This benefit could be lost if, say, CDS are moved to a clearinghouse but other derivates are not (or they are moved to a different clearinghouse).

Pricing in practice: the CDSW function

The Bloomberg pricing functions are possibly the most commonly used tools for valuing single name and index credit default swaps. The relevant function is CDSW. For example, Figure 19 presents the CDSW pricing screen for a Metso contract of 5yr maturity, and this was brought up by the command: ***METSO CDS EUR SR 5Y <Corp> CDSW***

The screen is divided into three sections as indicated – deal information, calculator, and spreads. We highlight the important variables in the following sections.

Figure 19: Bloomberg CDSW pricing screen

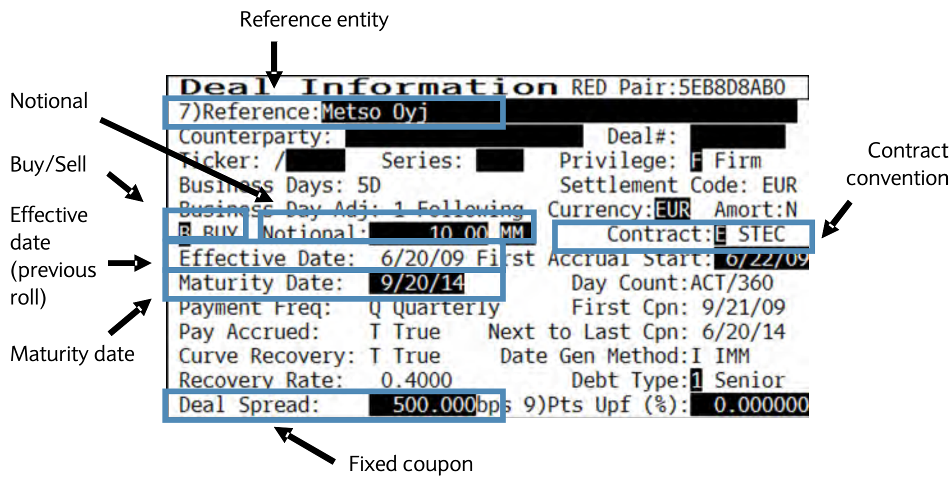


Source: Bloomberg, Barclays Capital

Deal information

The fields in the ‘Deal Information’ section in our example are for STEC contracts, and thus are mostly unchangeable. These include the Effective Date, which specifies the date from which the first coupon is accrued, as well as the Recovery Rate. The Deal Spread specifies the fixed coupon at which the contract is struck.

Figure 20: ‘Deal Information’ section from the Bloomberg CDSW pricing screen

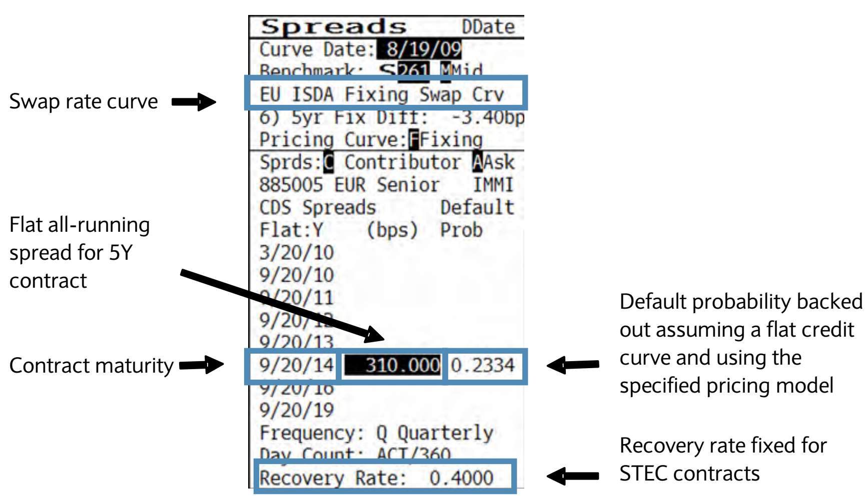


Source: Bloomberg, Barclays Capital

Spreads

This section requires the CDS quoted spread at which the contract is being priced. As per STEC convention, a flat credit curve is used for trades, so the only input is the spread for the relevant contract maturity as illustrated in Figure 21. Further, this section shows the implied default probability of the entity. This is backed out from the flat credit curve using the pricing model chosen in the ‘Calculator’ section.

Figure 21: ‘Spreads’ section from the Bloomberg CDSW pricing screen

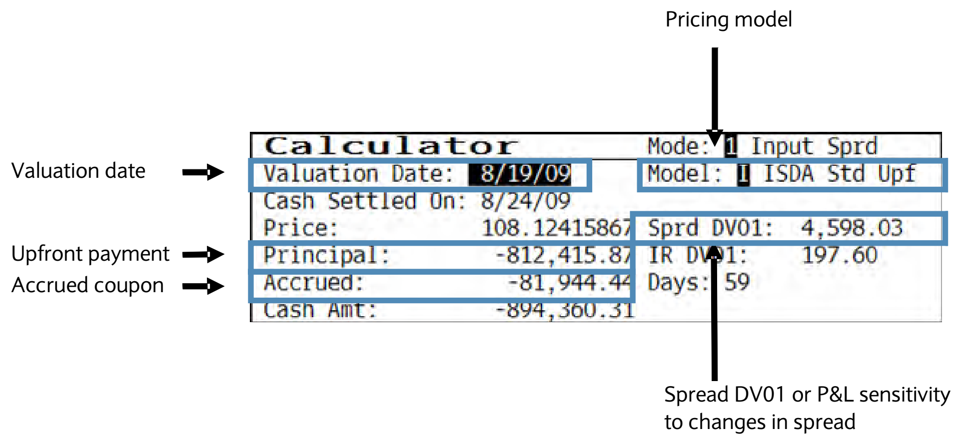


Source: Bloomberg, Barclays Capital

Calculator

The 'Calculator' section provides the choice of different models for pricing contracts. The other fields provide various pricing information, including mark-to-market, carry and P&L sensitivity to spread and interest rate changes. These are explained in more detail in Figure 23.

Figure 22: 'Calculator' section from the Bloomberg CDSW pricing screen



Source: Bloomberg, Barclays Capital

We highlight each factor briefly by presenting actual calculations of the scenario presented in Figure 19, namely 5yr Metso at 310bp on 19 August 2009.

Figure 23: Pricing fields from the 'Calculator' section of CDSW

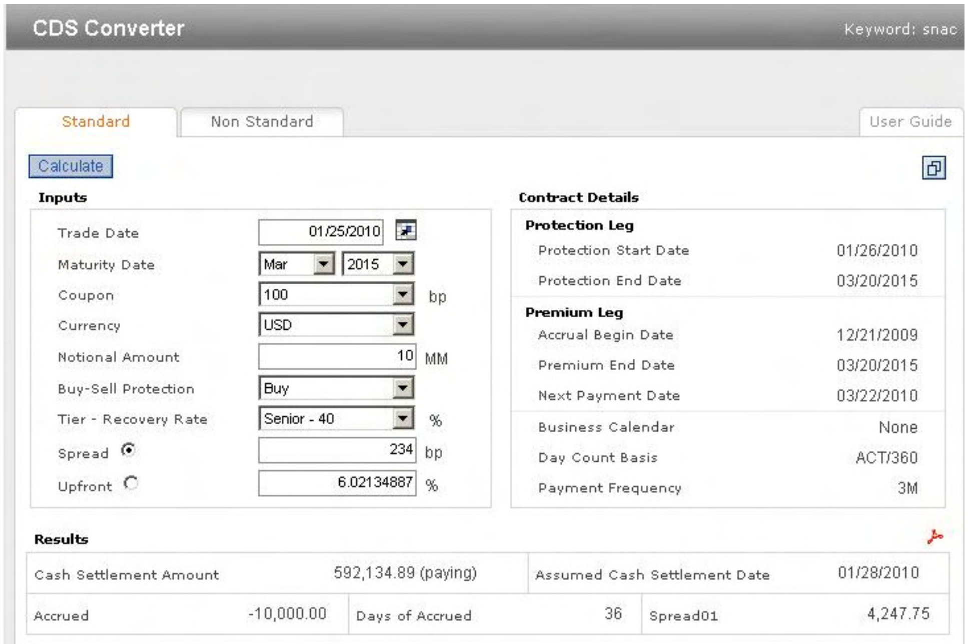
Fields	Description
Effective date	This is the previous roll date and the first coupon is accrued from this date for STEC contracts
Settlement date	This is the valuation date
Principal	This field gives the upfront payment that needs to be made by a buyer of protection on the valuation date. The calculation of the actual value is as follows: $\left(Spread_{final} - Coupon\right) \times PV01_{final} \times Notional$ = (310 – 500) bp x 4.27 x €10mn = -€812,415 Note that at the time of writing the PV01 (or credit duration) of the contract is not available directly from the CDSW screen, but can be backed out from the above expression for Principal
Accrued	This field gives the carry earned by the seller of protection from the last coupon date till the settlement date. The market convention is ACT/360. The calculation is as follows: $Coupon \times \frac{ACT}{360} \times Notional$ = - 500bp x 59/360 x 10mn = - €81,944
Sprd DV01	This field gives the mark-to-market sensitivity of the contract to a 1bp change in the CDS spread. Thus, a buyer of protection can expect to gain/lose €4,598 for every basis point increase/decrease in spread. Note that the value of the PV01 implied by the field Principal is different from that given by Sprd DV01. This is because the contract being analysed is off-par.
IR DV01	This field gives the mark-to-market sensitivity of the contract to a 1bp change in the interest rate swap curve. Thus, a buyer of protection can expect to lose/gain €197 for every basis point increase/decrease in swap spreads.

Source: Bloomberg, Barclays Capital

Pricing in practice: the Barclays Capital Live CDS Converter

Barclays Capital Live currently provides analytics which allow users to convert between quoted spread and upfront pricing formats. The tool can be reached by typing “SNAC” in the search bar. Figure 24 shows a snapshot of the converter.

Figure 24: Barclays Capital Live CDS Converter



Source: Barclays Capital

Technical Appendix

We go through some of the main calculations for CDS pricing, bootstrapping survival probability curves and decomposing return.

Pricing

The value of a CDS contract, from the perspective of the protection buyer, is the present value (PV) of the credit event (or default) leg minus the premium leg.

$$PV(CDS) = PV(def) - PV(prem)$$

Suppose the risk free discount factors and survival probabilities are known already:

$Df(t)$ = risk-free discount factor until time *t*

$S(t)$ = survival probability until time *t*

Then the PV of the premium leg is

$$PV(prem) = C\sum_{t_i} Df(t_i)S(t_i)B(t_i)$$

where i = coupon index

t_i = coupon date

$B(t_i)$ = money market basis (essentially the coupon time interval) at t_i

The present value of a basis point (PV01) is the PV of 1bp payments at each CDS coupon date, so the premium leg value is the CDS coupon times the PV01.

$$PV(prem) = C * PV01$$

The credit event leg pays par minus the recovery rate, *R*, if a credit event occurs. As this payment can be triggered at any time over the life of the contract, the default leg PV is:

$$PV(def) = (1-R)\int_0^T Df(t)dQ(t)$$

Here T = CDS maturity date

$Q(t)$ = event probability = $1 - S(t)$

Par and upfront contracts

For a par (or all-running) contract, the coupon is set such that the initial value of the transaction is zero. So if *S* is the par spread then.

$$0 = PV(def) - S * PV01$$

The PV of the default leg is the same irrespective of the coupon level, so we can substitute for the default leg PV and calculate the PV of an off-par contract (such as a standard CDS) as:

$$PV(CDS) = (S-C) * PV01$$

When an off-par contract is initially traded, this value is the upfront payment that changes hands. It can be positive or negative depending on the size of the coupon relative to the par spread.

Adjusting for the accrued at default

After a credit event, in addition to the compensation payment, there is also an accrued payment from the protection buyer to the protection seller, for the protection received between the last coupon date and the event date. In order to account for this the default leg above is adjusted to:

$$PV(def) = (1-R)\int_0^T Df(t)dQ(t) - C\int_0^T B(t)Df(t)dQ(t)$$

where $B(t)$ = the day count fraction since the previous coupon payment

The PV of the CDS becomes

$$PV(CDS) = (S-C) * (PV01 + A)$$

where

$$A = \int_0^T B(t)Df(t)dQ(t)$$

In effect, the PV01 is adjusted to account for the PV of the additional accrued at default coupon payment.

Bootstrapping a survival curve

The CDS market does not directly provide a survival probability function for each particular issuer. Instead we have a series of quotes for contracts of varying maturity. In practice, in order to derive a survival function we must make some assumption about its form and construct it such that it consistently prices the quotes. Typically, the survival function is expressed in terms of a hazard rate function $\alpha(t)$:

$$S(t) = \exp\left(-\int_0^t \alpha(t)dt \right)$$

The hazard rate is the instantaneous forward default probability, conditional on prior survival. In order to calibrate the hazard function to market quotes it is commonly assumed that it is piecewise constant:

$$\alpha(t) = \alpha_i\,,\ t \in [T_{i-1}, T_i)$$

with T_i the quote maturity dates and α_i constant between T_{i-1} and T_i. Then the survival probability at a maturity date T_n is

$$S(T_n) = \exp(-\sum_{i=1}^{n} \alpha_i (T_i - T_{i-1}))$$

From the market quotes we can bootstrap the piecewise constant hazard rate. Starting with the shortest maturity CDS, the survival probability to time *t* is

$$S(t) = \exp(-\alpha_1 t),\ t < T_1$$

The first step is then to find α_1 which solves the PV equation exactly. For example, if *U* is the upfront quote then α_1 solves

$$U = PV(def) - PV(prem)$$

Given α_1 then find α_2 which solves the PV equation for the second shortest maturity CDS quote and so on through all the CDS quotes until the full hazard rate function, and therefore the survival probability curve, is obtained.

Once the survival function is known then any CDS of the same issuer can be valued.

3. STANDARD CDS ECONOMICS

STANDARD CDS ECONOMICS

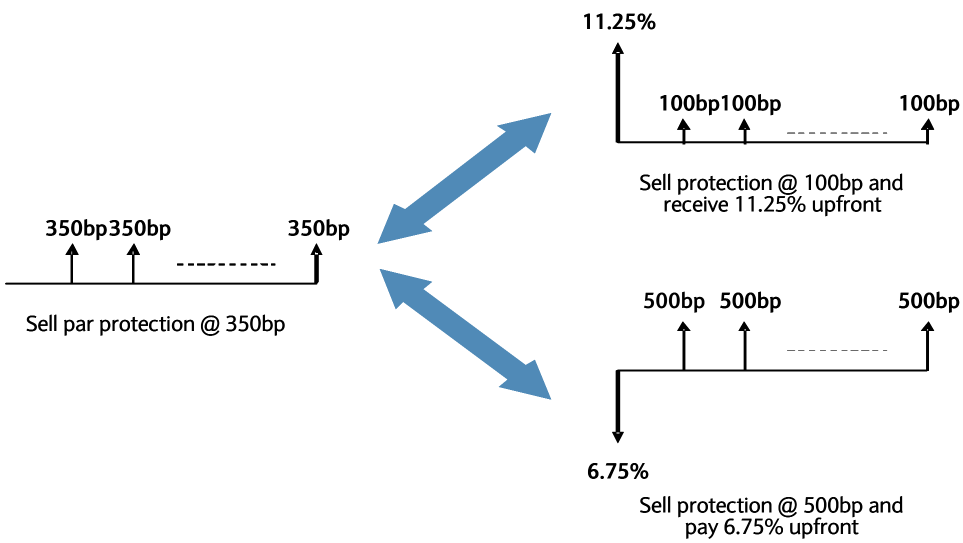
In this chapter, we analyse how the economics of a single-name CDS trade differ when using standard, fixed-coupon contracts rather than par contracts. First, we consider a single CDS position and then common combinations: pair switches; curve trades; forwards; capital structure trades; and basis trades.

Single standard CDS positions

With the recently introduced standardised contracts, corporate CDS contracts have effectively become off-par contracts and, hence, trade with upfront payments. This is regardless whether they are quoted as running spreads or upfronts.

The existence of this upfront cash flow substantially modifies the risk profile of CDS trades, which can be seen as follows. In switching from a par contract to an upfront contract, there is in effect an exchange of a stream of risky cash flows for a risk-free upfront payment, as illustrated in Figure 25.

Figure 25: Converting par contracts to equivalent fixed-coupon contracts



Source: Barclays Capital

The present value of the CDS from the protection seller's perspective is[11]:

$$\text{CDS Present Value} = (\text{Fixed Coupon} - \text{Par Spread}) * \text{PV01}$$

We can see from this that not only does changing the coupon change the value of the contract (leading to an upfront cash flow) but it also changes its sensitivity to various risk parameters. We demonstrate the different risk profiles of par and off-par CDS contracts with an example.

[11] The PV01 is the present value of a stream of 1bp coupons over the life of the transaction.

Example: Pernod

Figure 26: Pernod credit curve (bp)

	1y	2y	3y	4y	5y	7y	10y
Par spread	295	315	330	332	330	325	325

Note: spreads are indicative, mid levels are taken from 2 June 2009. Source: Barclays Capital

We use the sample, indicative, mid credit curve given in Figure 26. In Figure 27, we summarise the key features of a short 5y protection position for a par contract and for each of the 100bp and 500bp contracts.

Figure 27: Risk profile of short 5y protection

	Par = 330bp	Coupon = 100bp	Coupon = 500bp	Description
Upfront income	0.0%	9.7%	-7.2%	The 5y par spread is 330bp and we calculate a 5y PV01 of 4.23. At a fixed coupon of 100bp the protection seller is being under compensated for the risk taken. The buyer thus pays the seller an additional 9.7% (= 230bp * 4.23) of notional at trade inception. At a fixed coupon of 500bp the protection seller is being over compensated and must pay the buyer an upfront amount equal to 7.2% (= 170bp * 4.23) of the notional.
PV01	4.23	4.23	4.23	The credit duration remains unchanged with changing coupon.
DV01	4.23	3.84	4.51	As spreads fall, the PV of the premium leg rises as coupon payments become more likely, and the PV of the protection leg drops. Both of these effects collaborate to increase the CDS value. With a higher coupon, the contribution of the premium leg sensitivity to the DV01 is higher.
Default risk	-60.0%	-50.3%	-67.2%	In the event of immediate default, assuming a 40% recovery rate, the par contract loses 60%. With the 100bp format, this loss is reduced to 50.3% due to the 9.7% upfront income already received. Using the 500bp contract, the loss is increased to 67.2% due to the 7.2% upfront payment.
No default PV	15.5%	14.4%	16.4%	Should no default occur, the seller of protection is better off with as high a coupon as possible.
Interest rate risk	0bp	24bp	-18bp	Generally, a par CDS contract has very little exposure to interest rates, as the premium and protection leg rate sensitivities offset each other. As the CDS coupon increases, the premium leg generates more sensitivity to rates than the protection leg. Therefore a higher coupon results in the short protection position having a negative sensitivity to an increase in rates.
Carry (1y)	330bp	100bp	500bp	Carry is equal to the running spread on the contract.
Time decay (1y)	323bp	293bp	345bp	While the carry of the three trade formats differ from each other substantially, the time decay (in which we incorporate carry, roll, shortening duration and upfront funding) is similar in each case

Source: Barclays Capital

Note that the higher DV01, greater default risk, higher ‘no default PV’ and higher time decay of the 500bp coupon indicate that the short protection position becomes more bullish with increasing CDS coupon.

Switch trades

This section, in which we examine the notional-neutral switch out of one name and into another, was previously published as *Standard CDS Economics: Switch Trades*, 3 July 09.

Buy Allianz protection, sell Aviva protection[12]

One of the simplest pair trades is a notional-neutral switch between two names, in which the investor buys protection on one name and sells protection on another for the same notional and with the same maturity. To examine this type of trade, we use the following example:

Figure 28: Subordinated CDS levels for Allianz and Aviva

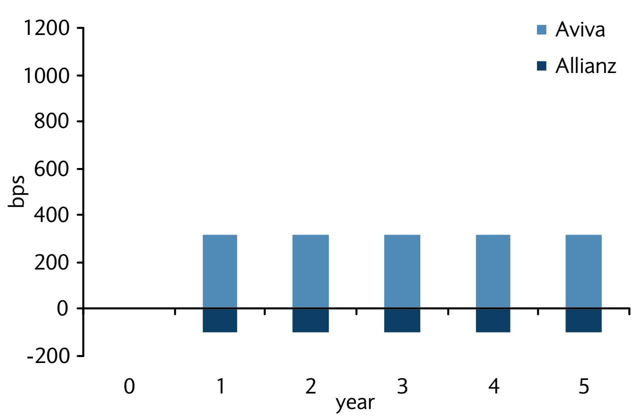
	All-running CDS	STEC
Buy €100mm 5y sub protection on Allianz	106bp	0.3 pts + 100bp running
Sell €100mm 5y sub protection on Aviva	324bp	10 pts + 100bp running
Net cash flows	218bp	9.7 pts upfront

Note: Upfront amounts calculated using Bloomberg's CDSW page. Source: Markit, Bloomberg, Barclays Capital

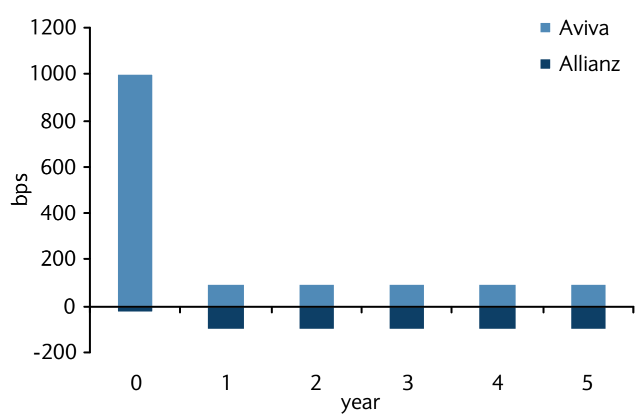
In Figure 29, we contrast the cash flows of the trade using old par contracts and new standard fixed-coupon contracts.

Figure 29: CDS cash flows for Aviva and Allianz

A: All-running CDS cash flows; Aviva and Allianz



B: STEC cash flows; Aviva and Allianz



Source: Markit, Bloomberg, Barclays Capital

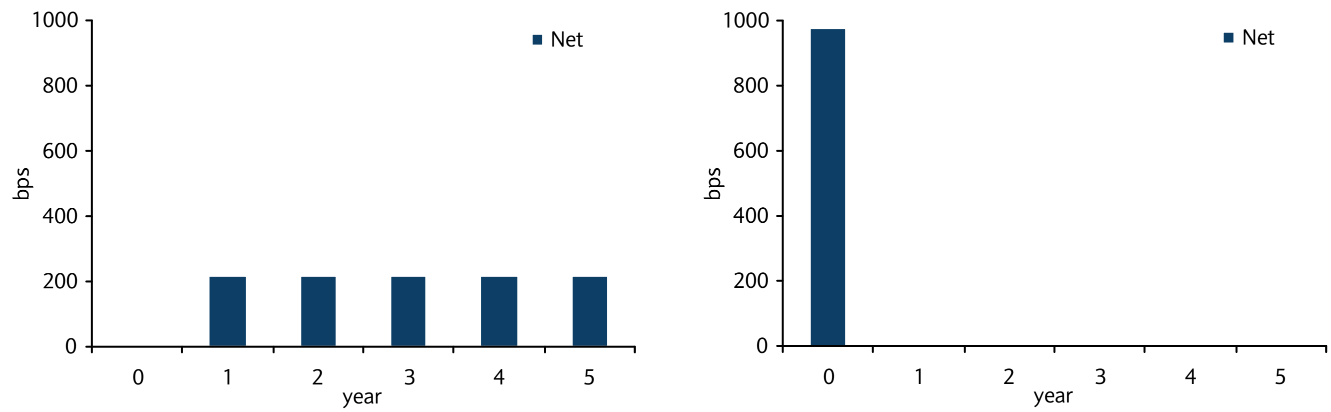
In this example, we have taken both CDS as having fixed coupons of 100bp under the STEC format. This in effect replaces the stream of positive coupon cash flows, with a single payment at the beginning of the trade as illustrated in Figure 30.

[12] Note that although this is indented as an illustrative example, we have chosen a trade favoured by our fundamental analysts: for example, see *High Grade European Insurance: New ratings system*, 5 May 2009, Barclays Capital.

Figure 30: Net cash flows on switch trade

A: All-running CDS net cash flows

B: STEC net cash flows



Source: Markit, Bloomberg, Barclays Capital

As the cash flows between par and standard CDS are different, the P&L mechanics are also different. Figure 31 summarises the key differences, which are described in more detail below. For more information, we recommend *Standard CDS: risk profiles and applications*, 4 June 2009.

Figure 31: Summary of trade format differences

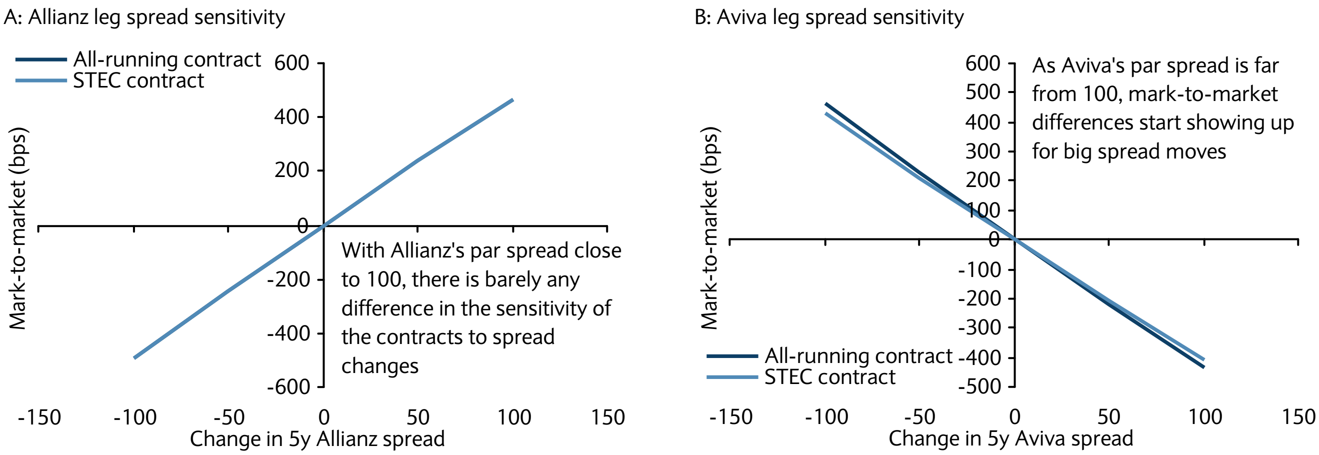
	Par CDS format	Standard CDS format
Carry	+218bp	No carry as fixed coupons cancel
Upfront	0%	+ 9.7% income
Pull-to-par	None	Upfront income turned into profit as negative MtM pulls to par (ie to zero)
Spread MtM sensitivity	Spread sensitivities differ due to differences in DV01, however the effect is only noticeable for large spread movements and when the par spread is far from the fixed coupon	
Default risk	Each leg is exposed to 100% – Recovery Rate	Each leg is exposed to 100% – Recovery Rate – Upfront

Source: Barclays Capital

Mark-to-market due to spread variation

The mark-to-market of the trade due to changes in the spread of either issuer is equal to the size of the spread movement multiplied by the prevailing DV01 (ie, the spread sensitivity) of the contract. However, because of the different coupons, the DV01s differ between par and standard contracts. In this example, the standard CDS have lower DV01s and therefore the mark-to-market sensitivity of each leg of the trade to spread changes is lower when implemented with standard rather than par contracts. The mark-to-market sensitivities are very similar, with noticeable differences occurring only for large spread movements and when the par spread is far from the fixed coupon. We demonstrate this in Figure 32, which shows the P&L of each leg for changes in the spread of the respective credit.

Figure 32: Spread sensitivities for all-running and STEC formats



Source: Markit, Bloomberg, Barclays Capital

P&L due to the passage of time

There are three sources of P&L due to the passage of time:

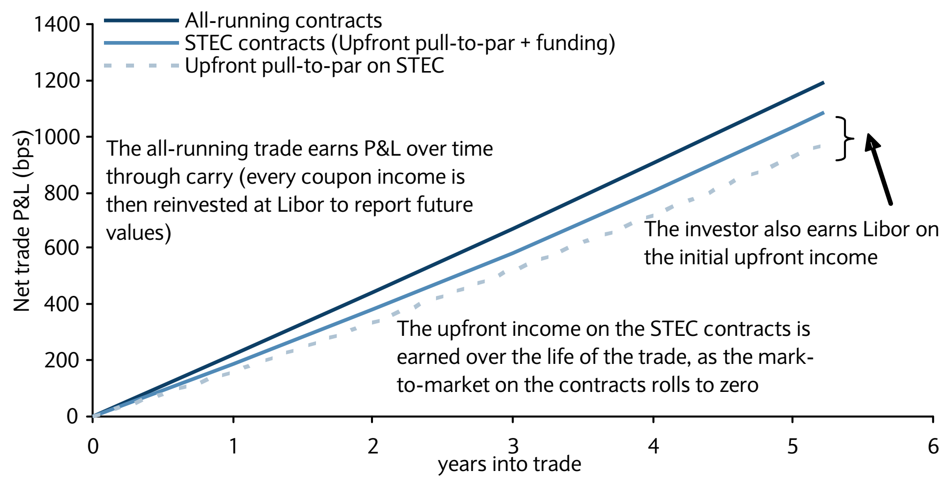
- carry due to coupon payments;
- pull-to-par mark-to-market effect; and
- upfront funding.

Using the old par CDS format for the trade, the P&L generated as time passes is straightforward: it is the difference in carry (ie, the coupon income) between the two legs of the trade, in our case 218bp.

Using the new standard CDS format, the trade has zero net carry, as the 100bp coupon payments cancel each other out. However, there are two other sources of P&L: the pull-to-par effect and the funding of the upfront[13]. In the STEC format, the investor receives a net upfront income of 9.7%. This compensates for the CDS positions having a net mark-to-market of -9.7%. However, assuming there is no default, this negative mark-to-market amortises to zero over the life of the trade as the CDS durations drop to zero (this is exactly analogous to the pull-to-par effect in off-par bond positions). So although there is no carry income, there is a time decay benefit. Furthermore, the upfront received can be reinvested to earn interest, thereby providing additional income to the investor. Assuming this interest is earned at the risk-free rate and the CDS spreads do not change, Figure 33 contrasts the P&L evolution over time of the standard contract trades to the equivalent par trade.

[13] Note that for margined accounts with standard CSAs, the economic impact of the upfront format is only via the funding benefit (or cost). Even though in our example the investor receives an upfront payment at inception, the same amount will subsequently be paid back as collateral through variation margin to compensate for the transaction's negative mark-to-market.

Figure 33: Carry on par contracts vs. time decay and funding on STEC



Source: Markit, Bloomberg, Barclays Capital

We see that P&L accrues faster for the par trade. This is because carry is received for the full life of the transaction given no default has occurred, whereas the upfront is calculated as the expected coupon income, assuming default can occur.

Default risk

Jump to default risk also differs between the two formats, as summarised in Figure 34.

Figure 34: Jump to default exposure of par and standard formats

	Par CDS format	Standard CDS format
Aviva defaults	$-(100\% - R_{Aviva})$	$10\% - (100\% - R_{Aviva})$
Allianz defaults	$100\% - R_{Allianz}$	$100\% - R_{Allianz} - 0.3\%$
Both issuers default	$R_{Aviva} - R_{Allianz}$	$9.7\% + (R_{Aviva} - R_{Allianz})$

R = recovery rate. Source: Barclays Capital

An immediate default eliminates any existing mark-to-market. Consequently, when Aviva defaults, the standard format has a net benefit over the par format equal to the 10% upfront amount. Similarly, when Allianz defaults, the standard format is worse off due to the 0.3% upfront amount paid on the Allianz leg of the trade.

The effect of STEC on a pair trade with different standard coupons

It is interesting to re-examine this Aviva – Allianz switch as of 24 June. On that date, the two names were being actively quoted with two different fixed coupons: Aviva sub with a coupon of 500bp and Allianz sub with a coupon of 100bp. If these coupons were used, the STEC cash flows would be different, as indicated in Figure 35 and Figure 36.

Figure 35: Sub CDS levels for Allianz and Aviva

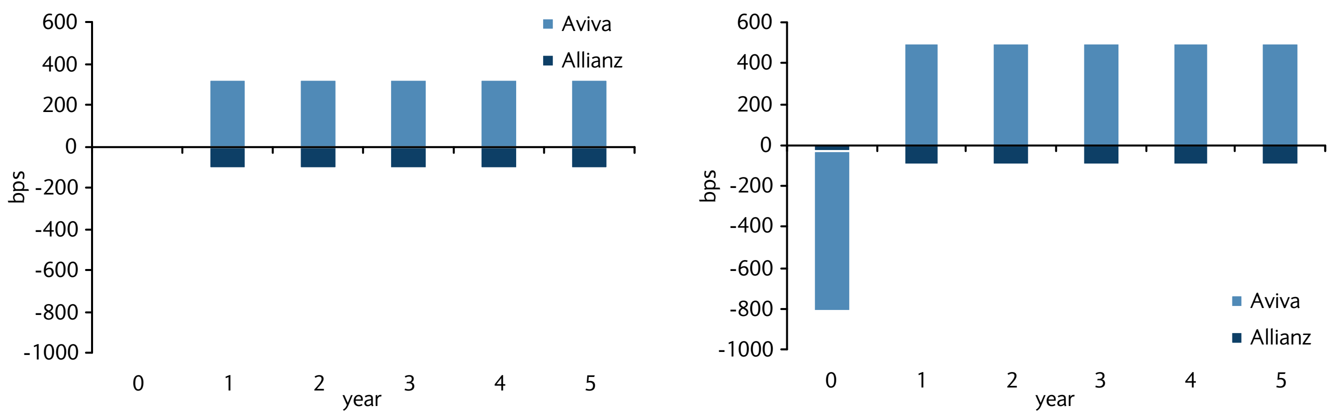
	All-running CDS	STEC
Buy €100mm 5y sub protection on Allianz	106bp	0.3 pts + 100bp running
Sell €100mm 5y sub protection on Aviva	324bp	-7.9 pts + 500bp running
Net cash flows	218bp	-8.2 pts + 400bp running

Source: Markit, Bloomberg, Barclays Capital

Figure 36: CDS cash flows for Aviva and Allianz

A: All-running CDS cash flows; Aviva and Allianz

B: STEC cash flows; Aviva (100bp running) & Allianz (500bp running)



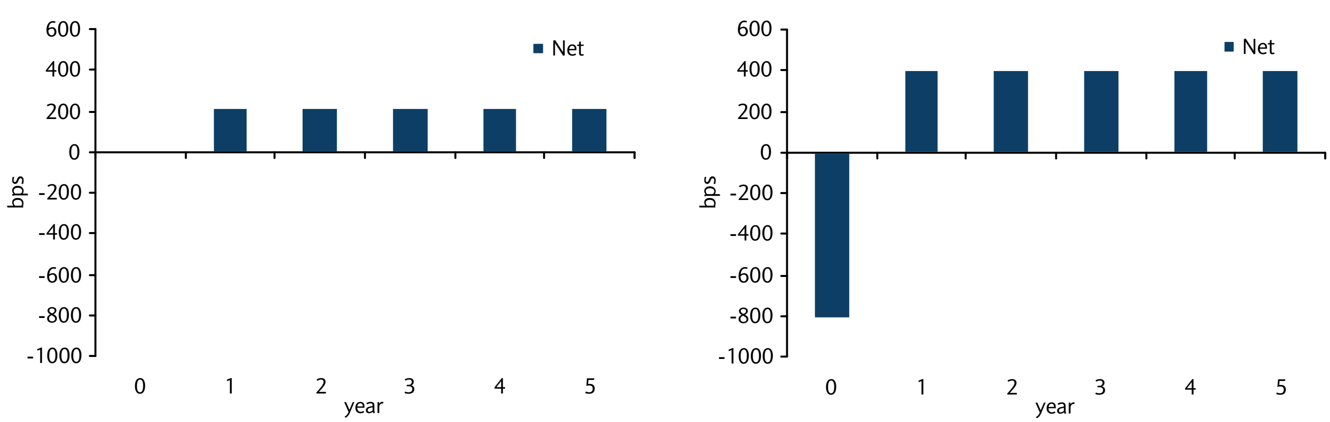
Source: Markit, Bloomberg, Barclays Capital

Thus, the trade economics would be quite different, with an initial upfront ***payment*** compensated for by a positive carry of 400bp for the life of the trade as indicated in the net cash flows in Figure 37.

Figure 37: Net cash flows on switch trade

A: All-running CDS net cash flows

B: STEC net cash flows

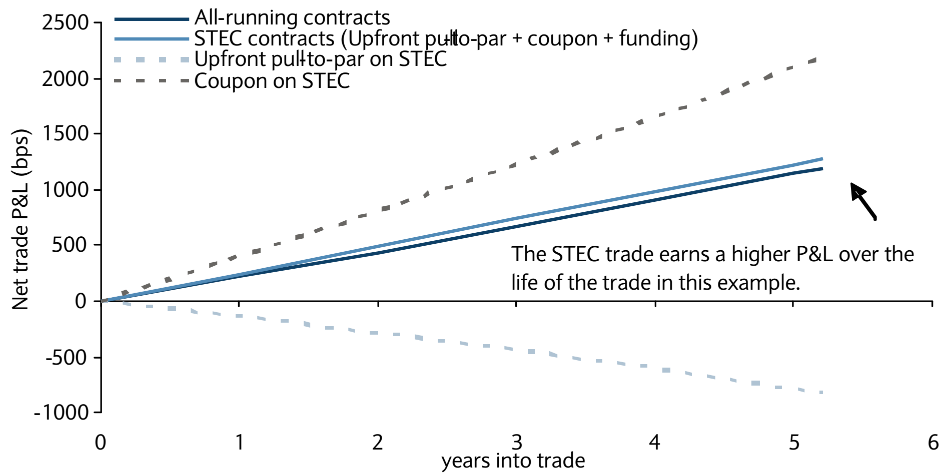


Source: Markit, Bloomberg, Barclays Capital

In this case, a positive carry trade is converted into one with even higher carry but an upfront cash outflow.

The P&L evolution over time is also different for this trade as indicated in Figure 38. The upfront pull-to-par is now negative as the initial positive mark-to-market is amortised down over the life of the trade. However, the net coupon income on the STEC contracts is even higher, compensating for this. In fact, at maturity the STEC trade now has a higher P&L than the par trade. Also, the STEC investor now has to fund the upfront cost, but also accrues interest on the higher coupon stream.

Figure 38: Carry on par contracts vs. time decay and funding on STEC



Source: Markit, Bloomberg, Barclays Capital

Curve trades

This section was previously published as *Standard CDS Economics: Curve Trades*, 3 July 09. We look at DV01-neutral curve trades: trades in which the investor buys protection in one maturity and sells it in another, with the ratio of notionals such that the trade is neutral to parallel spread movements across maturities.

Telecom Italia 5s10s DV01-neutral steepener

A common way to express a view on the slope of the credit curve of an issuer is through a DV01-neutral curve trade – either a steepener or a flattener. We will examine the changes to this kind of trade by analysing a 5s10s DV01-neutral steepener on Telecom Italia[14]. Figure 39 shows the indicative levels of the Telecom Italia curve we use for our analysis.

Figure 39: Indicative quotes for Telecom Italia

	All-running CDS	STEC
5y protection	201bp	4.6pt + 100bp running
10y protection	213bp	8.5pt + 100bp running

Note: We have used mid-market data for 7 July 2009, using Bloomberg CDSW to calculate upfronts.
Source: Bloomberg, MarkIt, Barclays Capital

Due to the different cash flows, the DV01 of a STEC CDS differs from that of a par (all-running) CDS. This means that the notional ratios needed to construct a DV01-neutral steepener trade are different. Figure 40 shows these ratios for Telecom Italia. In the given example, the DV01s of the 5y and the 10y legs are lower in the STEC format than in the par format and their ratio is lower.

Figure 40: Hedge ratios

	All-running CDS	STEC
5y DV01	4.57	4.38
10y DV01	7.53	6.87
Hedge ratio	1.65	1.57
5y short protection notional	€165mn	€157mn
10y long protection notional	€100mn	€100mn

Source: Barclays Capital

The P&L sensitivities of par and standard steepeners therefore differ owing to two effects:

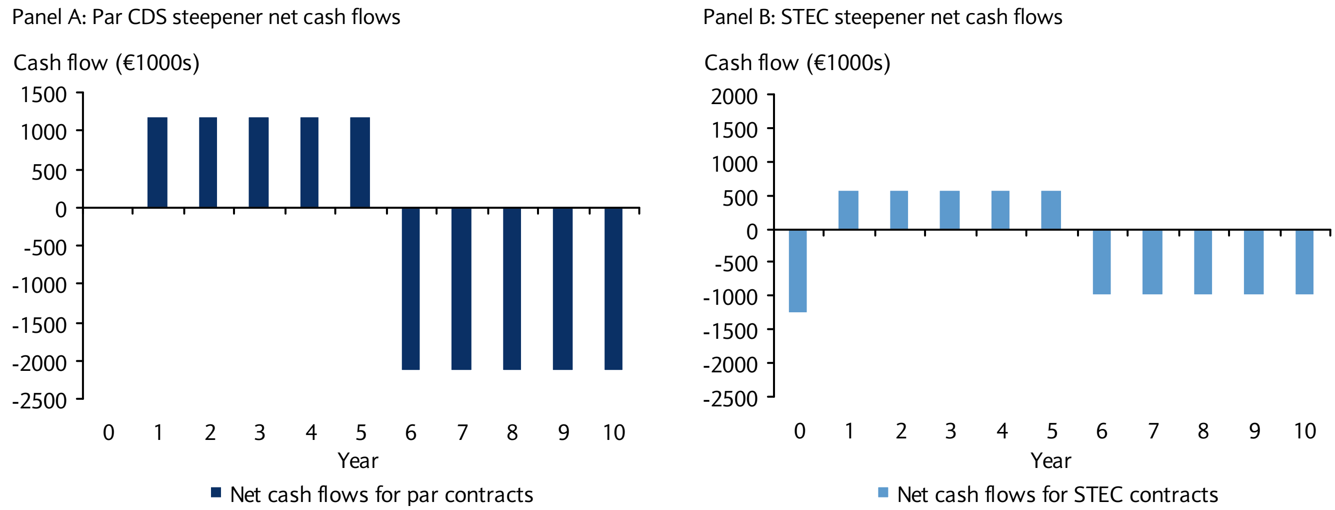
1. The relative notionals are different

2. The cash flows of standard CDS are different from those of par CDS

In Figure 41 we show the cash flows over the life of a steepener trade, assuming no default occurs, in par (Panel A) and standard CDS (Panel B) format.

[14] Note that although this is intended as an illustrative example, we have chosen a trade favoured by our fundamental analysts: see *HG European telecoms: Priced for perfection, primed for problems*, 24 June 2009.

Figure 41: Net cash flows for steepener trade in par and standard CDS format



Note: For clarity, we have shown coupon flows as an annual cash flow. Source: Barclays Capital

Figure 42: Summary of trade format differences

	All-running CDS	STEC
Upfront	None	-€1.25mn
Coupon for first 5y	€1.18mn	€572k
Coupon after 5y	-€2.13mn	-€1.00mn
Pull-to-par	None	Initially positive; turns negative after 5y. In total, P&L due to passage of time is very similar to par trade.
Steepening sensitivity (per bp)	€75k	€68k
Loss on default	€65mn x (100% - recovery rate)	€57mn x (100% - recovery rate) + €1.25mn

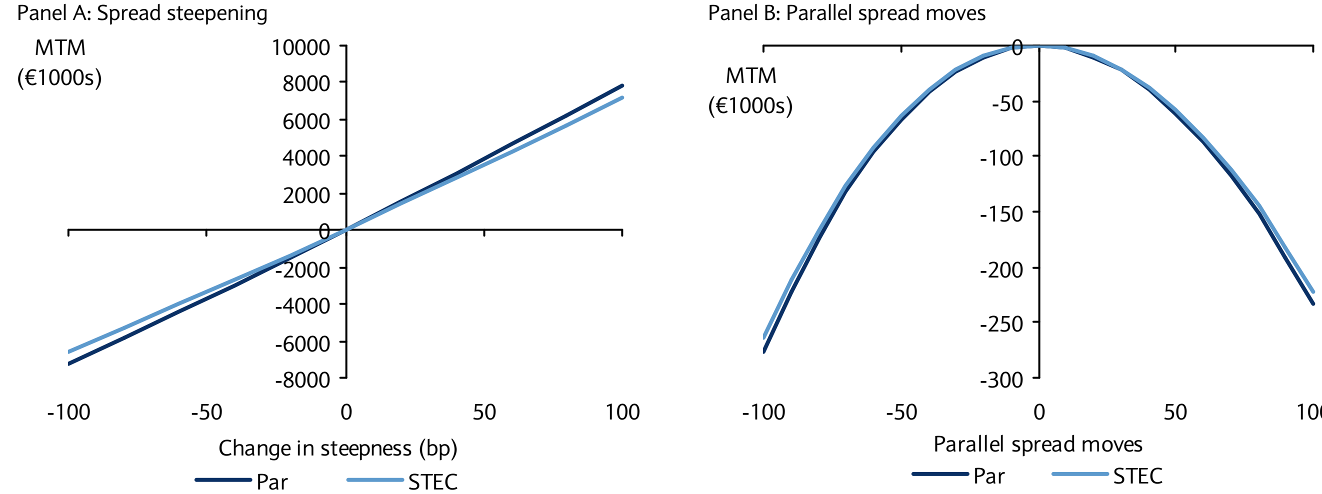
Source: Barclays Capital

In the following sections, we examine the difference in sensitivities between the two formats. The key differences are summarised in Figure 42.

Mark-to-market due to spread variation

The mark-to-market of the trade is approximately equal to the change in the 5s10s curve spread multiplied by the DV01, multiplied by the notional of one of the legs. Figure 43 Panel A shows this sensitivity for our example trade. We see that the mark-to-markets of the two different formats are similar, with noticeable differences occurring only for large spread movements. In our example, the STEC DV01s are lower than the par DV01s for both legs (because of the lower STEC coupons). These differences cancel each other out to some extent when combined in the curve trade.

Figure 43: Sensitivity to spread movements



Note: We change the curve steepness by adjusting the 5y spread while keeping the 10y spread constant. Source: Barclays Capital

Since the trade is DV01-neutral, by construction, it is not sensitive to small parallel changes in spread. However, for larger spread moves, convexity effects come into play. In Figure 43 Panel B we show the mark-to-market of the steepener trade due to parallel spread variations. Again, the difference is very small.

P&L due to the passage of time

We identify three sources of P&L due to the passage of time:

1. Carry due to coupon payments
2. Pull-to-par
3. Funding of the upfront cost

Figure 44 compares the contribution of these three components to the P&L of the steepener trade. Using par contracts, the net coupon income is the only contributor, which generates a carry of €1.18mm in the first year. Using the STEC format, the net coupon income is initially lower. However, this is compensated by the beneficial, initially positive pull-to-par effect[15]. The funding of the upfront makes a small, negative contribution.

Figure 44: P&L breakdown in 1y assuming contract spreads do not change

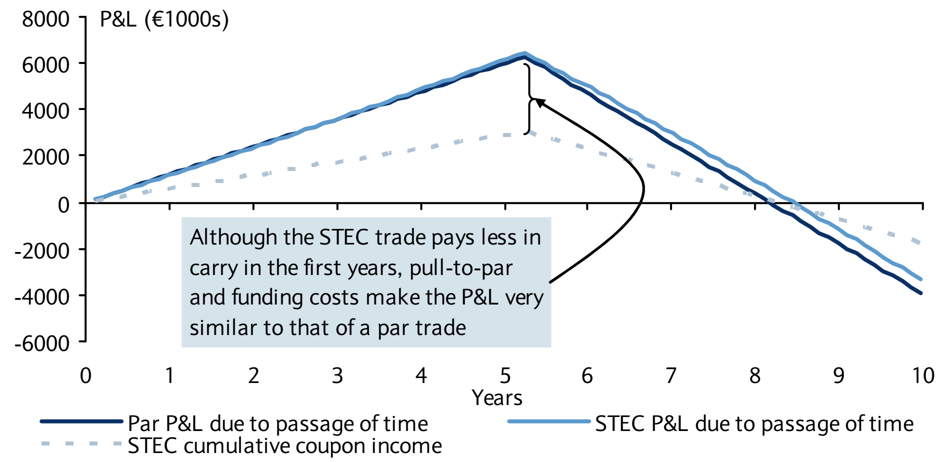
	Par CDS format	STEC format
Carry	€1.18mn income	€572k income
Pull-to-par	none	€635k income
Funding	none	€60k cost
Total time decay	€1.18mn income	€1.15mn income

Note: We assume the upfront is funded at LIBOR. Source: Barclays Capital

Figure 45 shows how the P&L evolves throughout the life of the trade, assuming spreads do not change and default does not occur. As the short protection leg matures, the carry and other time decay components turn negative and undo the gains of the first years. Although the cash flows of the two formats are different, the P&L profiles are similar.

[15] Initially, the trade has a positive mark-to-market of €1.25mn, which compensates the upfront payment made at trade inception. In the absence of default, this mark-to-market is lost after both legs have expired in 10y. However, the positive pull-to-par of the 5y leg initially outweighs the negative pull-to-par of the 10y leg.

Figure 45: Time profile for par and STEC steepeners

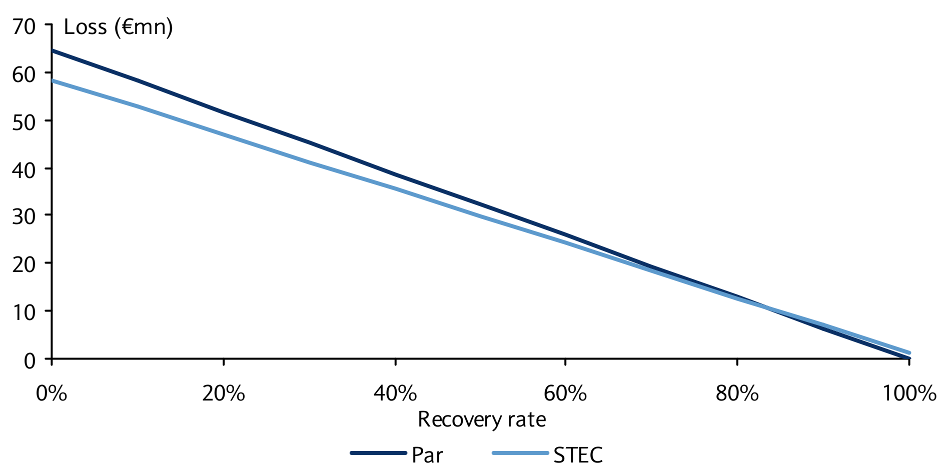


Source: Barclays Capital

Default risk

DV01-neutral steepener trades are long default risk because of the greater notional in the short-term short protection leg. When the underlying issuer defaults, a par CDS steepener realises a loss of $(N_{short} - N_{long}) \times (100\% - R)$, where R is the recovery rate.

Figure 46: Loss on default



Source: Barclays Capital

When implemented using standard CDS this default exposure is changed by two effects.

1. The positive mark-to-market of the CDS (which is initially equal to the upfront payment U = €1.25mn) is lost on default; this effect increases the loss on default to $(N_{short} - N_{long}) \times (100\% - R) + U$.
2. The relative notionals of the STEC trade are different. For Telecom Italia, the notional of the short protection leg is smaller for the STEC trade, leading to a smaller loss on default.

Figure 46 shows the loss in case of default for our Telecom Italia example. The net effect in this case is a smaller loss on default in the STEC format for recovery rates under 85%.

Forward trades

This section was previously published as *Standard CDS Economics: Forward Trades*, 15 July 09. In it, we look at forward trades – ie a trade in which investor buys protection in one maturity and sells protection in another maturity for the same notional.

Telecom Italia 5s10s forward

Forward trades are interesting for two principal reasons. First, they allow investors to express a view on the perceived future default risk of a company, as this kind of trade effectively buys/sells protection forward. Second, forward trades allow investors to express absolute spread views with no (par format) or limited (new standard contracts) actual default risk.

We examine how forward trades are affected by the introduction of the new standard format "Standard European Corporate" (STEC), focusing on a 5s10s forward on Telecom Italia[16].

In the next sections, we analyse the forward trade using par CDS and STEC format as shown in Figure 47; results are summarised in Figure 48.

Figure 47: Trade scenario – 5s10s forward

	Par CDS	STEC
Buy €100mn 10yr protection on Telecom Italia	230bp	9.7pt upfront + 100bp running
Sell €100mn 5yr protection on Telecom Italia	212bp	5.1pt upfront + 100bp running

Note: We have used mid-market data for 10 July 2009. Source: Barclays Capital

Figure 48: Summary of trade format differences

	Par CDS	STEC
Upfront	None	450bp cost
Coupon for first 5y	18bp cost	None
Coupon after 5y	230bp cost	100bp cost
Pull-to-par and funding (1yr)	None	1.4bp
Parallel widening (per bp)	2.9bp income	2.3bp income
Steepening sensitivity (per bp)	4.5bp income	4.3bp income
Effect of default	None	450bp loss

Note: For steepening sensitivity we move the 5yr CDS 1bp, keeping the 10yr CDS fixed.
Source: Barclays Capital

Cash flow

In Figure 49, we show the cash flows over the life of a forward trade, assuming no default occurs, in par (Panel A) and STEC (Panel B) format. The trade with par CDS has negative annual cash flow for the first five years of 18bp and, after the 5yr leg matures, negative annual cash flow of 230bp.

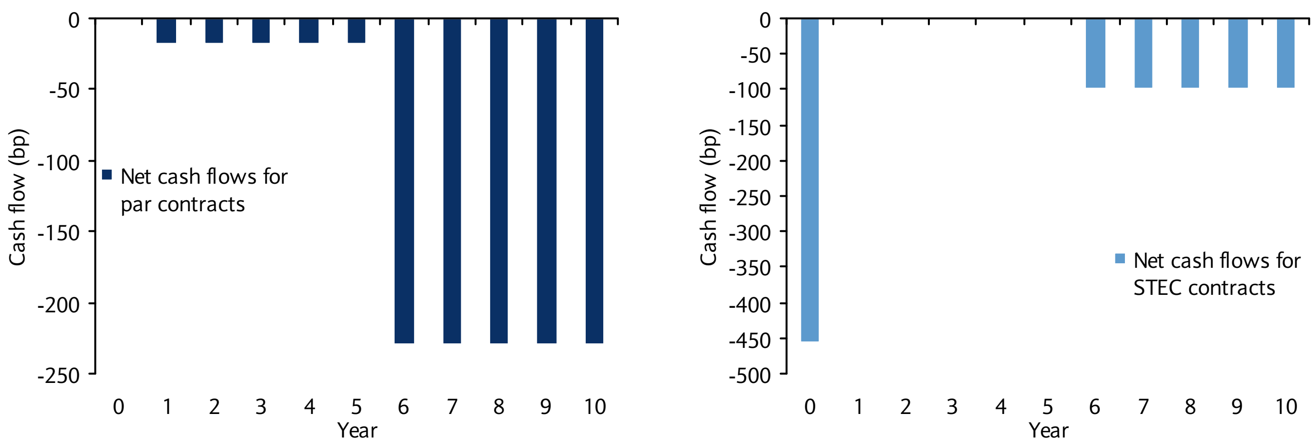
In contrast, the STEC trade has no cash flow between years one and five and negative annual cash flow in years six to ten of 100bp. The flipside of this is a negative cash outflow at inception of 450bp. This happens as it costs 9.7pt upfront (see Figure 47) to buy 10yr protection but the investor only receives 5.1pt upfront for selling 5yr protection.

[16] Note that although this is intended as an illustrative example, we have chosen a trade that is in line with the view of our fundamental analysts: see *HG European telecoms: Priced for perfection, primed for problems*, 24 June 2009.

Figure 49: Net cash flows for forward trade

Panel A: Par CDS forward net cash flows

Panel B: STEC forward net cash flows



Note: For clarity, we have shown coupon flows as an annual cash flow. Source: Barclays Capital

Mark-to-market due to spread changes

We focus on two kinds of spread changes: parallel spread moves with the 5yr and 10yr spreads moving together (Figure 50 Panel A) and curve steepening with the 5yr spread moving, keeping the 10yr spread unchanged (Figure 50Panel B).

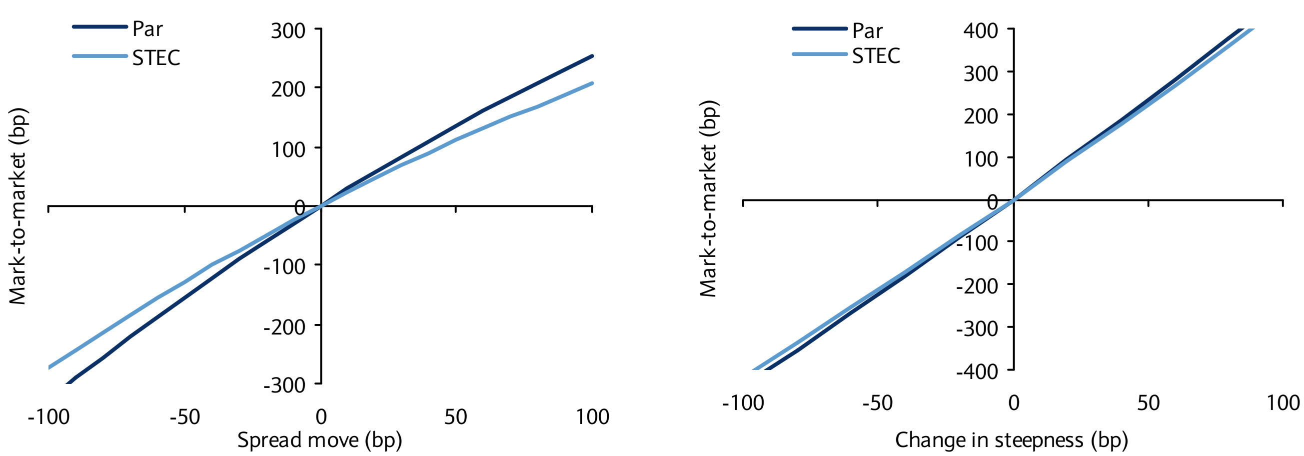
For a parallel spread move (Figure 50 Panel A), the par format has a higher sensitivity to parallel spread moves than the STEC format. This happens because even if the STEC DV01s are lower than the par DV01s for both maturities, the DV01 is significantly lower for the longer maturity (as a larger part of the premium is paid upfront for the 10yr maturity compared to the 5yr maturity).

For CDS curve steepening (Figure 50 Panel B), changing the 5yr CDS and keeping the 10yr point fixed, there is very little difference between the par and STEC formats, the difference is driven entirely by the difference in 5yr DV01s. This causes the par format to have a slightly higher sensitivity to a CDS curve steepening.

Figure 50: Sensitivity to spread movements

Panel A: Parallel spread moves

Panel B: Spread steepening



Note: We change the curve steepness by adjusting the 5y spread while keeping the 10y spread constant. Source: Barclays Capital

P&L due to the passage of time

We identify three sources of P&L due to the passage of time:

1. carry due to coupon payments;

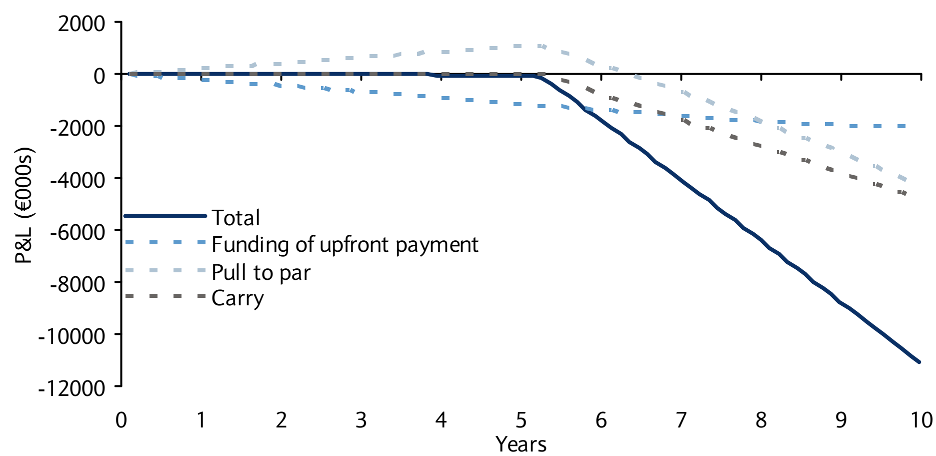
2. pull-to-par; and

3. funding of the upfront cost.

For the STEC forward, we show the evolution of these three sources – as well as total P&L – over time in Figure 51, assuming spreads remain unchanged and default does not occur. Funding the upfront cost of the trade at Libor results in a steady negative outflow of cash. For the first five years, this outflow is countered by the positive mark-to-market of the trade due to time decay. For the first five years, the trade has positive mark-to-market because the (positive) pull to par on the 5yr leg is larger than the (negative) pull to par on the 10yr leg. For the first five years, there is zero carry cost of the trade, such that the total P&L of the trade for the first five years is virtually zero.

After the first five years pass, the negative carry and roll-down of the 10yr leg causes the trade to show negative P&L at an increasing rate.

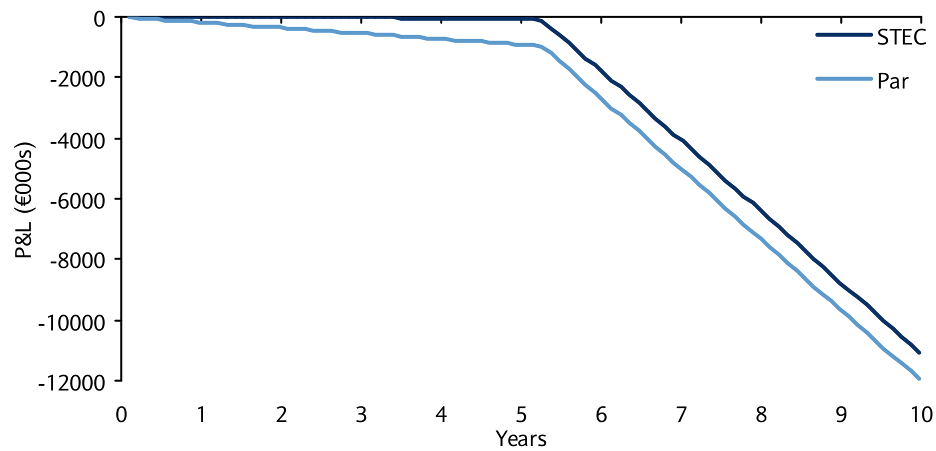
Figure 51: Time profile for STEC forward – components



Source: Barclays Capital

How does the P&L profile of the STEC forward compare to that of a par format? We show this in Figure 52. In the par format, the only driver of P&L is the cost of carry. For the first five years, the trade has a low but negative cost of carry which jumps up significantly in the next five years. In all, we see that the STEC trade (in the absence of default) is cheaper than the par trade.

Figure 52: Time profile for par and STEC forwards



Source: Barclays Capital

Default risk

A par forward trade has no jump-to-default risk in the first five years since the trade involves buying and selling protection at different maturities but for the same notional. In contrast, a STEC forward trade has default risk, due to the presence of the upfront payment. In our example, the STEC forward has an upfront cost of €4.5mn. Suppose the trade is implemented and the name defaults the following day. The default payments of the 5yr and 10yr legs cancel out, but the €4.5mn upfront payment is lost. A STEC forward will thus have jump-to-default risk even if the two legs in the trade are of equal notional.

Capital structure trades

This section was previously published as *Standard CDS Economics: Capital Structure*, 24 July 09. We work through a simple example of a capital structure trade and look at how the economics of the trade are modified when using fixed-coupon rather than par contracts.

Commerzbank sub-senior compression[17]

CDS capital structure trades entail buying protection at one level of subordination and selling protection at another. They are typically implemented to take a view on the ratio of spreads at different subordinations[18]. As an example, we consider a Commerzbank compression trade, in which the investor sells 5yr sub protection and buys 5yr senior protection, as detailed in Figure 53.

Figure 53: Indicative quotes for Commerzbank

	All-running CDS	STEC
Buy €100mn 5y senior protection	105bp	0.2pt + 100bp running
Sell €40mn 5y sub protection	259bp	7.2pt + 100bp running
Net cash flows	None	Receive €2.7mn upfront Pay €0.6mn coupon

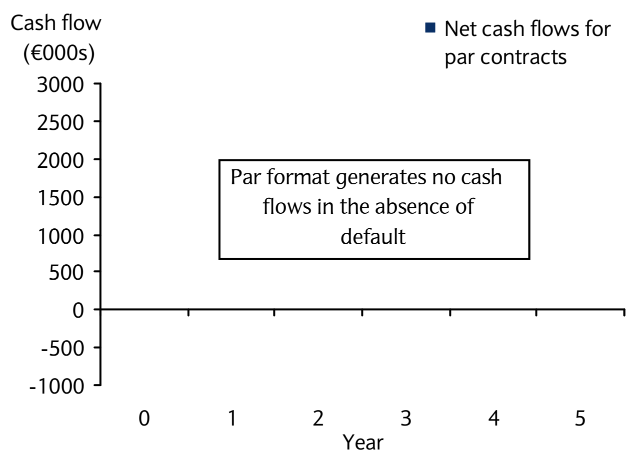
Note: We have used mid-market data for 22 July 2009, using Bloomberg CDSW to calculate upfronts.
Source: Bloomberg, MarkIt, Barclays Capital

The current ratio of sub to senior spreads is approximately 2.5 (=259bp/105bp). By using 2.5 as the hedge ratio (ie, buy 2.5x as much senior protection as sold sub protection), the investor gains when this ratio decreases and loses when it increases.

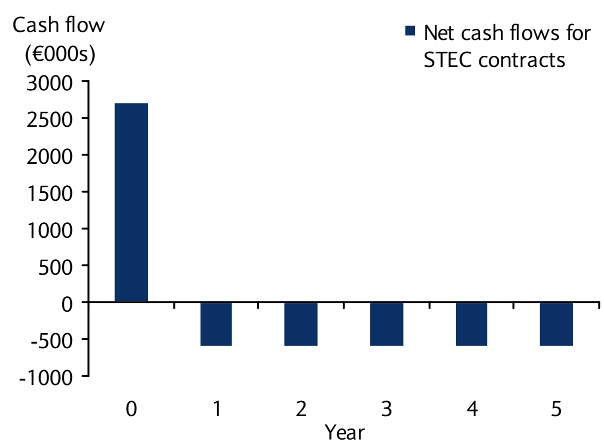
By construction, the notional exposures are such that the par format generates no cash flows at all. On the other hand, the Standard European Corporate (STEC) version generates a net outgoing coupon, in exchange for an initial upfront income, as illustrated in Figure 54.

Figure 54: Net cash flows for capital structure trade in par and standard CDS format

Panel A: Par CDS net cash flows



Panel B: STEC net cash flows



Note: For clarity, we have shown coupon flows as an annual cash flow. Source: Barclays Capita

[17] Note that although this is indented as an illustrative example, we have chosen a trade favoured by our fundamental analysts.
[18] The spread ratio is roughly the ratio of par minus the expected recovery rate at the two subordinations; therefore, the capital structure trade effectively expresses a view on the relative pricing of expected recovery rates. See *Making sense of iTraxx financials sub vs senior*, 19 September 2008, for more details.

As the cash flows in the par and standard CDS formats are different, the P&L mechanics are also different. However, we find that although the cash flows differ significantly, the net sensitivities to changes in spread, default and the passage of time are fairly similar. Figure 55 summarises the key differences, which are described in more detail below.

Figure 55: Summary of trade format differences

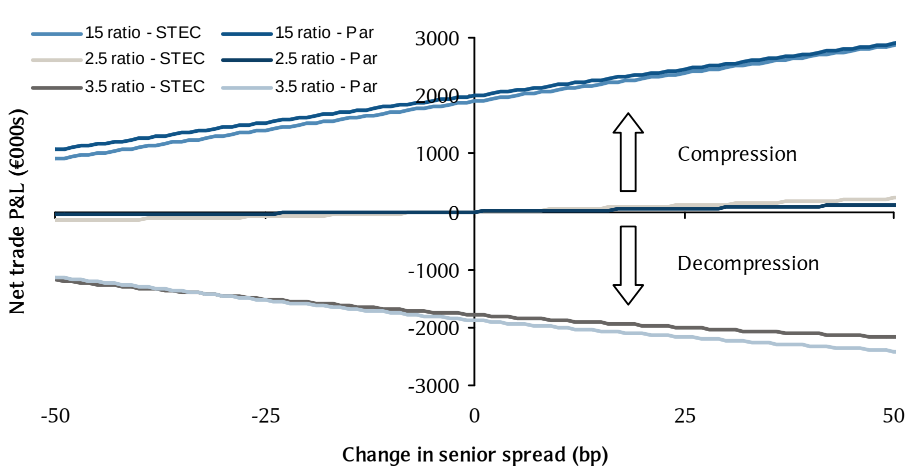
	Par CDS format	Standard CDS format
Carry	None	-€600k
Upfront	0%	+ €2.7mn income
Pull-to-par	None	Upfront income turned into profit as negative MtM pulls to par (ie, to zero)
Spread MtM sensitivity	Spread sensitivities differ due to differences in DV01; however, the effect is only noticeable for large spread movements and when the par spread is far from the fixed coupon.	
Default risk	The STEC format outperforms the par format by the upfront amount as a default eliminates mark-to-market and locks in the upfront income as profit.	

Source: Barclays Capital

Mark-to-market due to spread variation

As the par and equivalent STEC contracts have different DV01s (due to their differing coupons), the mark-to-market sensitivities of the trade are different. Figure 56 shows the net trade sensitivity for our Commerzbank example for various changes in the senior spread, assuming fixed sub to senior spread ratios of 1.5, 2.5 and 3.5. We see that the mark-to-market exposures of the two different formats are very similar, with noticeable differences occurring only for large spread movements.

Figure 56: Sensitivity to spread movements



Note: Net P&L shown for changes in senior spread and different sub to senior spread ratios.
Source: Barclays Capital

P&L due to the passage of time

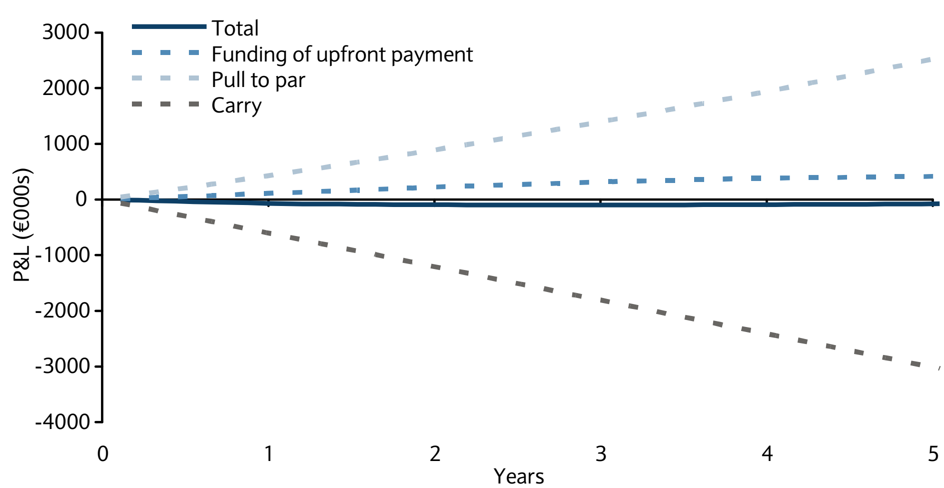
There are three sources of P&L due to the passage of time:

- carry due to coupon payments;
- pull-to-par mark-to-market effect; and
- upfront funding.

Using the old par CDS format for the trade, the P&L generated as time passes is zero. There are no net coupon payments and the legs of the trade are already par contracts, so there is no pull-to-par effect and there is no upfront to fund.

Using the new standard CDS format, the trade has negative net carry of €600k and the investor receives a net upfront income of €2.7mn. This compensates for the CDS positions having a net initial mark-to-market of -€2.7mn (the PV of the coupon stream). However, assuming there is no default, this negative mark-to-market amortises to zero over the life of the trade as the CDS durations drop to zero (this is exactly analogous to the pull-to-par effect in off-par bond positions), generating a positive time decay contribution. Furthermore, the upfront received can be reinvested to earn interest, thereby providing additional income to the investor[19]. In Figure 57, we show the P&L evolution of the standard contract over time, assuming spreads remain unchanged, and we show a breakdown of the three P&L components listed above. We see that even though the means by which P&L is generated in the STEC format is very different to the par format, the net result is very similar (ie, close to zero).

Figure 57: Time profile for the STEC capital structure trade



Source: Barclays Capital

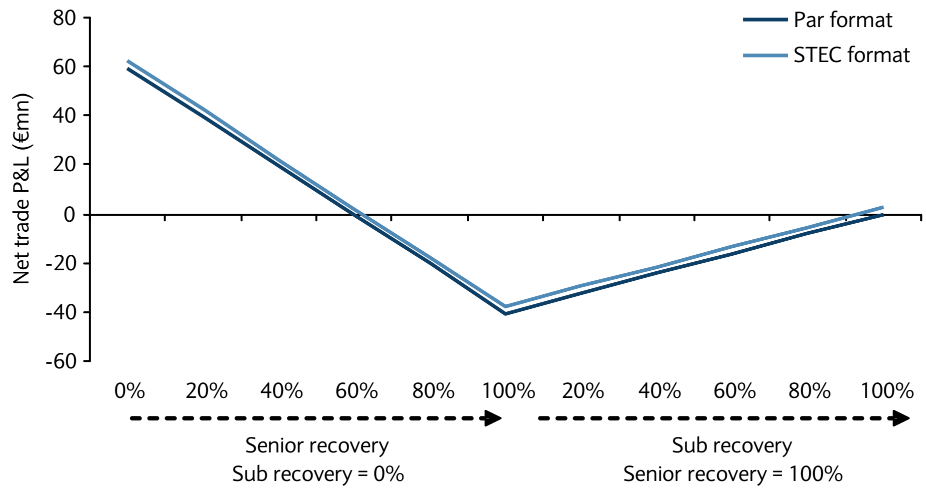
Default risk

If the company defaults, then the STEC format of this trade outperforms the par format simply because a default immediately eliminates all prevailing mark-to-market of the transactions, so the €2.7mn upfront income received becomes realised profit. In Figure 58,

[19] Note that for margined accounts with standard CSAs, the economic effect of the upfront format is only via the funding benefit (or cost). Even though in our example the investor receives an upfront payment at inception, the same amount will subsequently be paid back as collateral through variation margin to compensate for the transaction's negative mark-to-market.

we show the P&L for an immediate default for varying senior recoveries when the sub CDS recovers 0% and for varying sub recoveries when the senior CDS recovers 100%.

Figure 58: P&L on default



Source: Barclays Capital

Basis trades

This section is an extract from *Standard CDS: risk profiles and applications*, 5 Jun 09. In it we examine the effect of contract standardisation on basis trades: trades in which the investor buys a bond and buys CDS protection on the issuer of that bond.

Cash-CDS Basis

In previous publications we introduced the BRD framework[20] to analyse cash-CDS basis trades, which we argue should replace standard methods of basis analysis (such as those based on the difference between CDS spread and Z- spread). When CDS trade with upfront payments, traditional measures often fail to represent the economics of a basis package. Instead, we highly recommend using a method such as BRD.

Impact of changing CDS format

To explain the impact of CDS changes on basis packages, we revisit the example of Pernod and also consider an ITV example. All the examples in this publication look at hedging the full notional of the bond with a maturity matched CDS contract.

Figure 59 presents the indicative economics for the ITV 7.375, Jan '17 bond.

Figure 59: ITV basis package: indicative economics for different CDS running spreads

	Bond	CDS	Net
Value of package on default	Recovery	£100 – Recovery	£100
Value of package on redemption	£100	£0	£100
All-running CDS at 640bp			
Day zero outlay	-£65.13	£0	-£65.13
Net annual cash flow received	737.5bp	-640bp	97.5bp
CDS at 6.8 points upfront + 500bp running			
Day zero outlay	-£65.13	-£6.8	-£71.93
Net annual cash flow received	737.5bp	-500bp	237.5bp
CDS at 26 points upfront + 100bp running			
Day zero outlay	-£65.13	-£26	-£91.13
Net annual cash flow received	737.5bp	-100bp	637.5bp

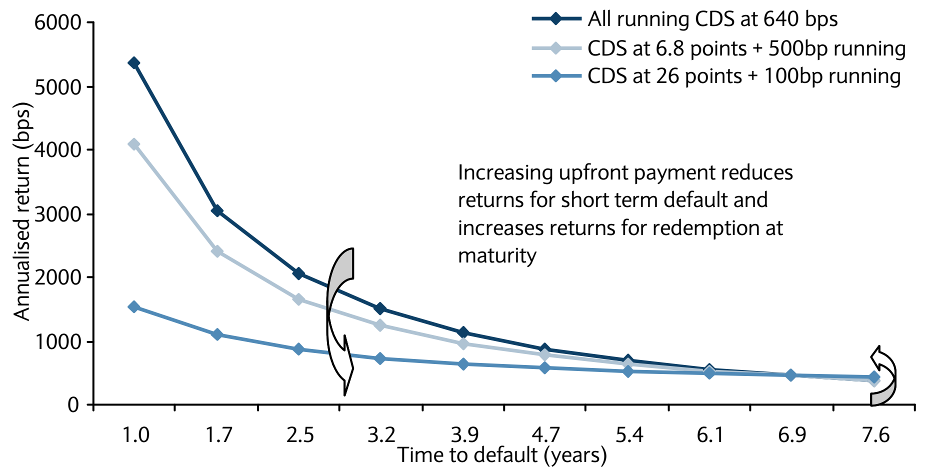
Note: For simplicity we assume the CDS is traded in GBP to match the bond. In practice the € CDS may be used. Source: Markit, Barclays Capital

As is evident from the highlighted cells above, different CDS formats change the cash flow profile of the basis package. A higher upfront cost adds to the initial package price, but also results in a higher carry through the life of the trade.

Figure 60 plots the returns for basis packages with each of the different CDS formats. The BRD shows potential default-time scenarios along the horizontal axis, in years from trade inception. The final point in 7.6 years, is the scenario of no default – ie, the bond redeems at par. For each scenario, the graphs plot the annual return on a package, expressed as an excess spread over Libor. In this case we plot three returns profiles for the three different CDS formats.

[20] Please refer to our publication *Basis trades: bullish or bearish*, 19 February 2009 for more details

Figure 60: BRD for ITV 7.375, Jan '17 (maturity in 7.6 years)



Source: Markit, Barclays Capital

Figure 60 highlights how increasing the upfront cost of a CDS reduces the returns on a basis package in the case of short-term default. This reduced default upside is offset by an increase of returns in the case of redemption at maturity.

As another interesting example, we consider the effect of CDS format changes in the case of a bond trading close to par, with a par CDS spread between the 100bp and 500bp standard coupons. Figure 61 presents the indicative economics for Pernod 7, Jan '15, a bond trading at €102.

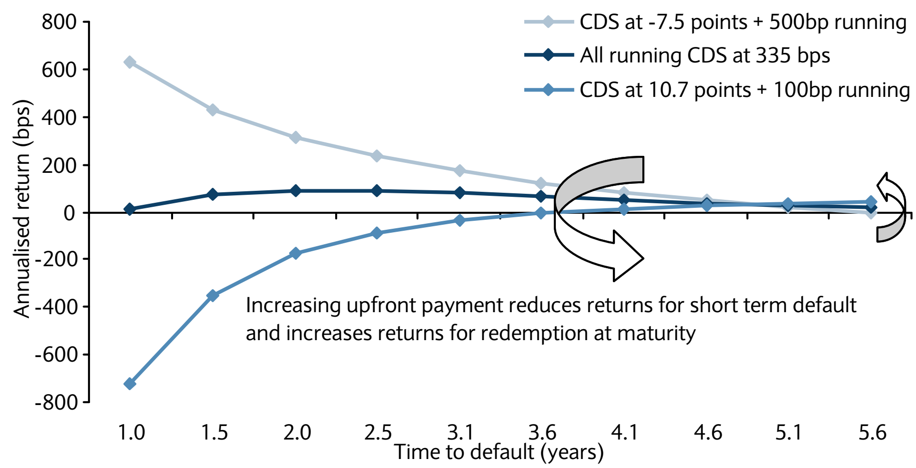
Figure 61: Pernod basis package: indicative economics for different CDS running spreads

	Bond	CDS	Net
Value of package on default	Recovery	€100 – Recovery	€100
Value of package on redemption	€100	€0	€100
All-running CDS at 335bp			
Day zero outlay	-€102	€0	-€102
Net annual cash flow received	700bp	-335bp	365bp
CDS at 10.7 points upfront + 100bp running			
Day zero outlay	-€102	-€10.7	-€112.7
Net annual cash flow received	700bp	-100bp	600bp
CDS at -7.5 points upfront + 500bp running			
Day zero outlay	-€102	€7.5	-€94.5
Net annual cash flow received	700bp	-500bp	200bp

Source: Markit, Barclays Capital

In this case, the highlighted cells indicate how changing the CDS format (and hence upfront cost) pushes the price of the package above par in one case, and below par in another. When the package cost is above par, an investor risks losing a part of the initial capital invested in the case of short-term default. The resulting return profiles are plotted for each CDS format in Figure 62.

Figure 62: BRD for Pernod 7, Jan '15 (maturity in 5.6 years)



Source: Markit, Barclays Capital

A CDS format of 500bp running has highest return in case of short-term default, but actually returns -4bp (annualised) if the bond redeems at maturity. A CDS format of 100bp has negative returns in case of short-term default, but the highest return of 43bp (annualised) of all three CDS formats if the bond redeems at maturity.

Customising basis packages

Figure 61 and Figure 62 demonstrate how changing the upfront cost of a CDS contract skews the returns profile of a basis package. An increased upfront reduces returns for short-term default while increasing returns at maturity (and vice versa). Therefore, by customising the upfront and coupon of the CDS protection, the basis package can be tailored to suit the view of the investor. For example, a more bullish basis investor can engineer a higher carry trade at the expense of a lower return on default.

Figure 63 illustrates this for the ITV and Pernod examples. Along with the previous return profiles, we show some profiles for the following custom CDS coupons:

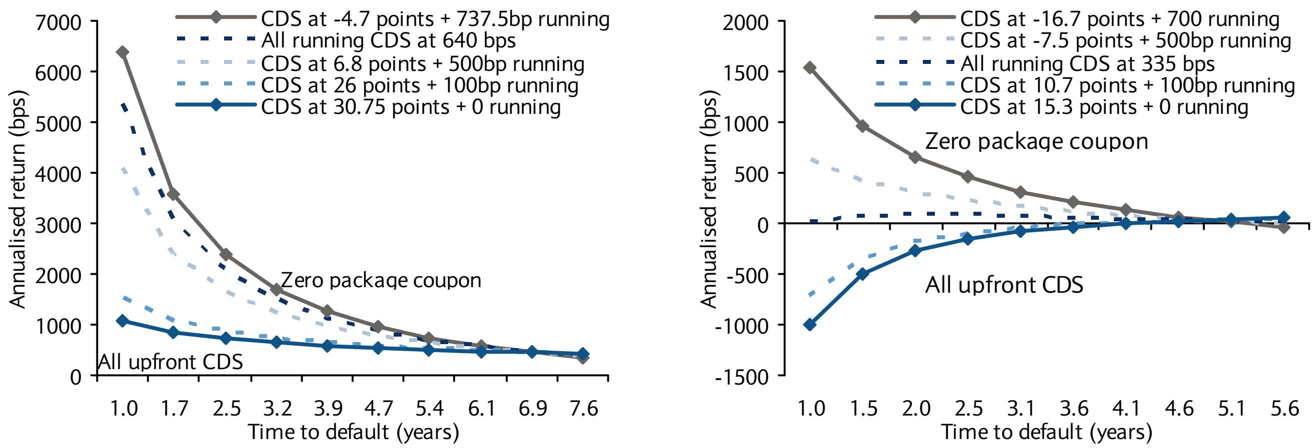
- a case where the CDS contract is all upfront with zero running coupon; and
- where the CDS coupon exactly offsets the bond coupon, creating a basis package with net zero carry

In Figure 63, these two return profiles are indicated by the bold lines. The dashed lines indicate the return profiles for the CDS formats previously examined.

Figure 63: BRD for ITV and Pernod; custom CDS coupon return profiles

A: ITV 7.375, Jan '17

B: Pernod 7, Jan '15



Note: Default probabilities have been kept off these graphs for reasons of clarity. Source: Markit, Barclays Capital

Figure 64 highlights the returns for default in one year and redemption at maturity for both of these examples, arranged in order of ascending upfront cost in each case.

Figure 64: 1y default and maturity returns for ITV and Pernod basis packages

ITV 7.375, Jan '17			Pernod 7, Jan '15		
CDS contract	**1y default return**	**Maturity return**	**CDS contract**	**1y default return**	**Maturity return**
CDS at -4.7 points + 738bp running	6399bp	342bp	CDS at -16.7 points + 700 running	1536bp	-34bp
All-running CDS at 640bps	5357bp	368bp	CDS at -7.5 points + 500bp running	631bp	-4bp
CDS at 6.8 points + 500bp running	4093bp	387bp	All-running CDS at 335bps	15bp	17bp
CDS at 26 points + 100bp running	1547bp	431bp	CDS at 10.7 points + 100bp running	-721bp	43bp
CDS at 30.75 points + 0 running	1076bp	440bp	CDS at 15.3 points + 0 running	-997bp	52bp

Source: Markit, Barclays Capital

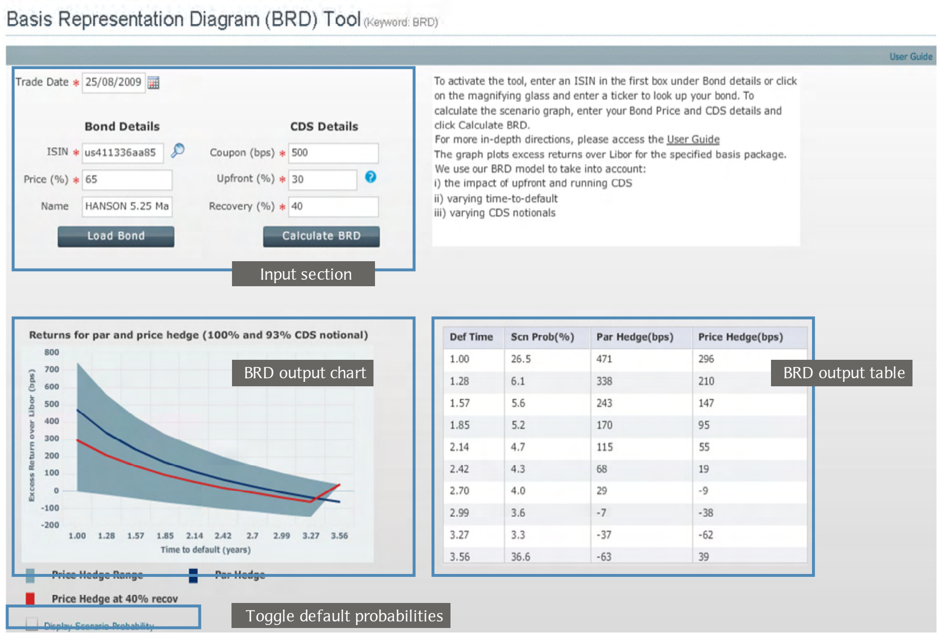
In summary, an investor can customise the return profile for any given basis package.

Analysing basis: the Barclays Capital Live BRD tool

All users of Barclays Capital Live can analyse basis packages online using our BRD methodology, with complete control over all input parameters like bond price and CDS levels. To launch this tool, type the keyword "BRD" into the search box in the upper right hand corner on the Barclays Capital Live page. A detailed help file is provided to guide users on every aspect of the tool.

To access the tool directly please click on the link: *BRD web tool*

Figure 65: Barclays Capital Live BRD tool



Source: Barclays Capital

4. CDS MARKET STANDARDISATION

CDS MARKET STANDARDISATION

CDS market changes in 2009

Over the course of 2009, there was an enormous effort between dealers, the investor community and regulators to standardise CDS contracts. The goals of these changes were to improve market transparency, increase netting efficiency, reduce legal risk, improve operational efficiency, move the product onto central clearing platforms where possible and reduce counterparty risk.

Standardisation entailed two main types of changes: to the contract and to trading conventions. The contractual changes involved two supplements to the ISDA Credit Derivative Definitions (thereby having global effect). These changes were known as The Big Bang and The Small Bang. The convention changes were local market modifications agreed between dealers and investors, designed to improve the fungibility and transparency of the product. From these changes the Standard European Corporate (STEC) and Standard North American Corporate (SNAC) CDS contracts were born. In Figure 66, we summarise the key changes to the contract and conventions.

Figure 66: CDS market standardisation – changes in 2009

Contractual changes (affecting all contracts globally)		
Change	**Date**	**Main effects**
Big Bang	8 April 2009	■ Determinations Committees (DCs) established ■ Auction becomes standard settlement mechanism ■ Rolling, look back effective date established
Small Bang	27 July 2009	■ Extend DC powers to cover restructuring events ■ Auction settlement for restructuring ■ Restructuring buckets established
Trading convention changes (local market standards)		
Change	**Date**	**Main effects**
Launch of SNAC North America	8 April 2009	■ 100/500bp standard coupons ■ No restructuring ■ Full first coupon
Launch of STEC Europe	22 June 2009	■ 25bp/100bp/500bp/1000bp standard coupons ■ Restructuring retained ■ Full first coupon

Source: Barclays Capital

The remainder of this section is a compilation of short reports first published during 2009, which pertain to the CDS market changes summarised above and to the effort towards central clearing solutions for credit derivatives.

Developments in the European CDS market

This section was originally published on 9 April 2009

The CDS market is undergoing important changes regarding contract definitions, trading conventions and central clearing, with the aim of improving the transparency and liquidity of the market. These are significant changes that we believe will be of central importance in the evolution of the credit markets.

In this report, we review the changes to date, expose the key CDS standardisation issues presently under discussion between European dealers, and summarise the progress towards European central clearing. We also give a timeline for anticipated changes.

The changes: contract, conventions and clearing

A broad effort is currently underway to make improvements to the global market for CDS. The main goals are to enhance transparency, simplicity, fungibility and liquidity of the product. To this end, various changes are in progress or under discussion. The changes can be divided into three main categories – contractual, trading conventions and central clearing[21] – as summarised in Figure 67.

Figure 67: European CDS market changes

Category	Main changes	Notes
Contractual modifications	■ Determination Committees ■ Auction settlement ■ Rolling, look-back effective dates	■ Global changes to ISDA Definitions ■ Open for acceptance until 7 April 2009 ■ Acceptance affects existing trades
CDS standardisation	■ Restructuring conventions ■ Coupon conventions	■ Local market changes ■ North America already trading 100/500 coupons with No Restructuring
Central clearing	■ Commitment from nine dealers to clear index trades by 31 July 2009 ■ Four contending central counterparties for Europe	■ Local market changes ■ North American index trades already cleared through ICE

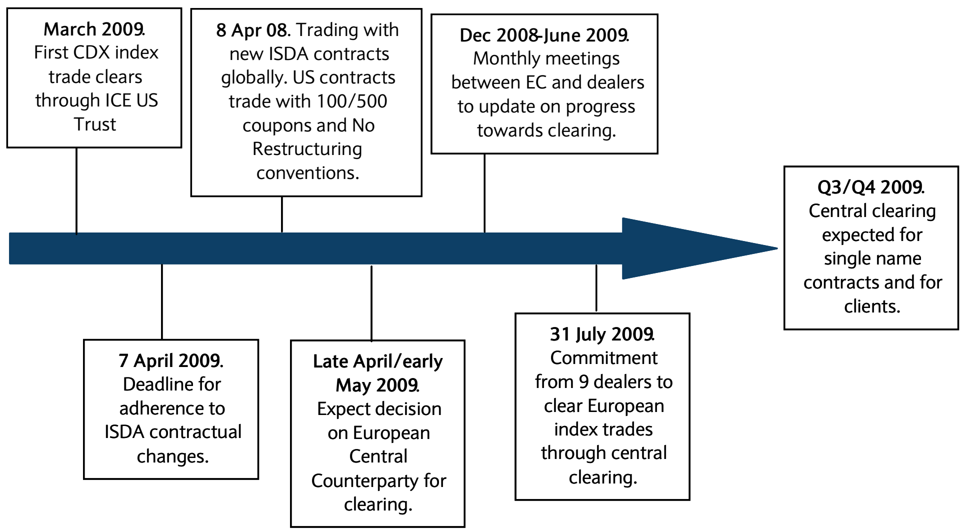
Source: Barclays Capital

The contractual modifications involve changes to the ISDA Credit Definitions, which apply at a global level and were open for acceptance until 7 April 2009. The CDS standardisation (ie, changes to CDS trading conventions) and the establishment of central clearing, however, are local initiatives. In the US market, for example, from 8 April 2009, CDS are trading with new standardised contracts (SNAC – Standard North American Contract) and some trades have already been cleared via ICE. In Europe, on the other hand, discussions are still underway between dealers in order to agree the terms of standardisation, and with the potential central counterparties for clearing.

[21] For more details on the purpose of these changes and of the global contractual changes and the North American conventional changes see 'The CDS Big Bang', 10 March 2009, Markit and *CDS Market Changes*, 9 February 2009, Barclays Capital.

In this report, we describe these developments in more detail, in particular focusing on CDS standardisation within the European market and the pros and cons of the proposals to date. Figure 68 gives a rough timeline for past and future expected developments.

Figure 68: Timeline for CDS market changes



Source: Barclays Capital

Contractual modifications

Contractual modifications are global changes affecting the ISDA Credit Definitions

The contractual modifications apply globally and involve a supplement to the 2003 ISDA Credit Definitions. They comprise the following changes:

- **The foundation of regional Determination Committees.** The regional Determination Committees will consist of a mixture of buy-side and sell-side members and it is their primary role to decide whether a credit event has occurred. Other responsibilities include determining acceptable deliverable obligations and the occurrence of succession events.
- **Hardwiring of the auction mechanism.** Note that although auction settlement becomes the standard, physical settlement will still be possible via the auction process.
- **Rolling effective date.** All trades will have a rolling 60- and 90-day look-back effective date for credit events and succession events, respectively. This ensures the fungibility of deals with the same terms but different trade dates, thereby facilitating the netting of trades.

These supplementary changes to the ISDA Definitions were open for acceptance until 7 April 2009. Acceptance is retroactive, affecting existing deals as well as new.

CDS standardisation

CDS standardisations are local market changes to trading conventions

CDS standardisation refers to the adoption of new CDS trading conventions. They are local market changes. For example, from 8 April 2009, US contracts are trading with fixed coupons of either 100bp or 500bp, an upfront payment[22] and with No Restructuring. This does not mean that CDS contracts with alternative coupons or restructuring types cannot be traded; it simply means that the greatest liquidity is in contracts that abide by the newly agreed conventions.

[22] For an in-depth analysis of upfront CDS see *Upfront CDS: A toolkit for a distressed 2009*, 8 January 2009.

In Europe, standardisation discussions between dealers and investors are still underway. The main conventions under consideration are coupon standards and restructuring type. We examine the issues currently under debate in relation to coupon and restructuring choices and also consider the impact of legacy trade considerations on the viability of the available options.

Coupon standardisation

Under current trading conventions, with the exception of very distressed names and unwind trades, every new CDS contract is struck with a fixed coupon equal to the prevailing par spread. This has a number of significant problems. For instance as soon as the market moves, the contract liquidity deteriorates. If the investor wishes to close out the trade they either have to trade off-market and suffer greater bid/offer costs or they have to trade a new par contract which leaves them with a risky annuity. Furthermore, it is easy to build up complex portfolios of CDS, which are difficult or costly to net or compress.

100/500bp fixed strikes would support simplicity, consistency across markets and deal fungibility

Standardisation of the CDS coupon to a small number of fixed levels helps resolve these issues. One of the simplest proposed solutions is for dealers to agree, conventionally, to quote CDS with two fixed strikes: 100bp and 500bp. We would expect liquidity of each contract to be driven by the proximity of the implied par spread to the contract's coupon. This approach has several benefits:

- With only two possible coupons, fungibility of trades would be dramatically improved. Within any one quarter (or any period between two consecutive roll dates), trades could potentially be compressed into just two positions: one in the 100bp contract and one in the 500bp contract.
- There would be consistency between North American and European contracts, supporting product simplicity.
- There would be no need to reset coupons every roll date as both 100bp and 500bp would be quoted on an ongoing basis.
- Quotation clarity would be good with no need to track coupons. For example, IG names could be quoted in spread terms, like IG bonds, and refer to the 100bp contract, while HY names could be quoted in points, like HY bonds, and refer to the 500bp contract.
- For highly distressed names, CDS quotes are already based upon a 500bp running contract, therefore market participants are, to some extent, already familiar with the characteristics of off-par contracts.
- For distressed names, trading upfront CDS contracts with 500bp running allows for better comparison to bonds as coupon payments and price characteristics (eg, DV01) tend to be better matched. Furthermore, there is more certainty around basis package returns than with par contracts for which the return can vary significantly as a function of default time[23].

Potential issues exist with contracts trading far from par, however…

Despite these appealing features, there are a number of potential issues to address. One problem for some participants concerns the highly off-par nature of contracts that could arise when the implied par spread is far from either of the coupons. In our opinion, this is not a significant issue. All contracts become off-par as soon as the market moves and they

[23] See *Understanding basis for discount bonds*, 7 January 2009

can quickly become significantly off-par in volatile markets. In addition, the underlying cash market is off-par in nature, so why should this not be the case for the CDS market? Several alternative proposals have been made in an attempt to reduce CDS variation from par.

One solution which mitigates this issue is to maintain an additional, conventional strike of, say, 750bp. This would reduce the variation from par of wide-spread names. However, in our opinion, this is a marginal benefit that is greatly outweighed by the resulting reduction in product simplicity and transparency. For example, whereas with just two strikes the quotation convention would be clear – spread for the lower coupon, price for the higher coupon – even with just one extra strike, quotations would always have to be accompanied by coupon specifications.

… additional strikes significantly compromise simplicity and transparency

An alternative proposal (known as MSC – Multi-step Coupons) involves using a much more granular set of possible strikes, such as 25bp, 100bp, 200bp, 300bp, 400bp, 500bp, 750bp and 1000bp. In this set-up, at any one time quotes would only be available for one of the strikes. For each traded credit, the quoted coupons would be reset at roll dates.

While this method certainly reduces the variation from par at the time the coupon is reset and it has the advantage of having only one traded contract at any one time, there are several significant disadvantages:

- Keeping track of and regularly updating on-the-run coupons for the large universe of traded credits would be an operational burden and as a result would probably make the market less, not more, simple and transparent.
- Further, any historical analysis using CDS data will entail the additional complication of patching together market quotations with different coupon conventions.
- As time passes and par spreads move, these fixed-coupon contracts will become off-par anyway.
- Netting of old trades with new trades (eg, a spot 3yr deal with a 5yr deal that is 2yrs old) will be a lot less efficient if there are potentially a large number of outstanding coupon levels.

Another issue that needs to be addressed concerns the recouponing of legacy trades in a way that preserves the restructuring risk of the original deal. Before addressing this issue, we consider restructuring conventions in European CDS contracts.

Restructuring in European contracts

From 8 April 2009, North American contracts trade with No Restructuring. This is a simplifying convention which, following a credit event, allows for all contracts to settle via a single auction. As restructuring is generally considered to be a highly unlikely event in the US, this has not been a controversial decision.

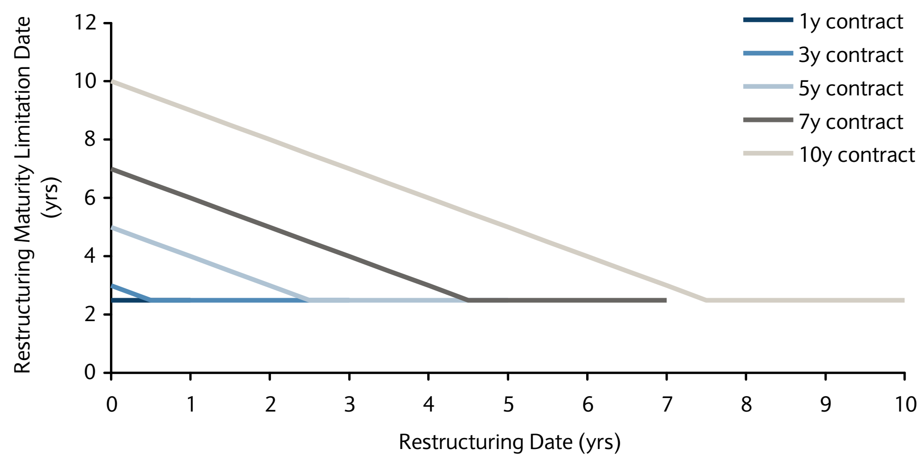
European contracts are expected to retain restructuring as a credit event

In Europe, however, restructuring events are more common. In addition, banks that hedge cash positions with CDS can lose a substantial proportion of the capital relief the hedge provides if the contract does not protect against restructuring. For these reasons, it is likely that European contract standards will include restructuring.

At present, most European contracts trade with Modified Modified Restructuring (MMR). Under these rules a Restructuring Maturity Limitation Date (RMLD) applies to Deliverable Obligations when the contract is triggered by the buyer of protection. For a restructured bond or loan, Deliverable Obligations cannot have a maturity later than the greater of the Scheduled Termination Date of the CDS contract and 60 months (30 months for other Deliverable

Obligations) after the Restructuring Date. If the seller triggers the contract then the RMLD does not apply. Figure 69 illustrates the RMLD for contracts with various Scheduled Termination Dates as a function of the Restructuring Date for non-restructured obligations.

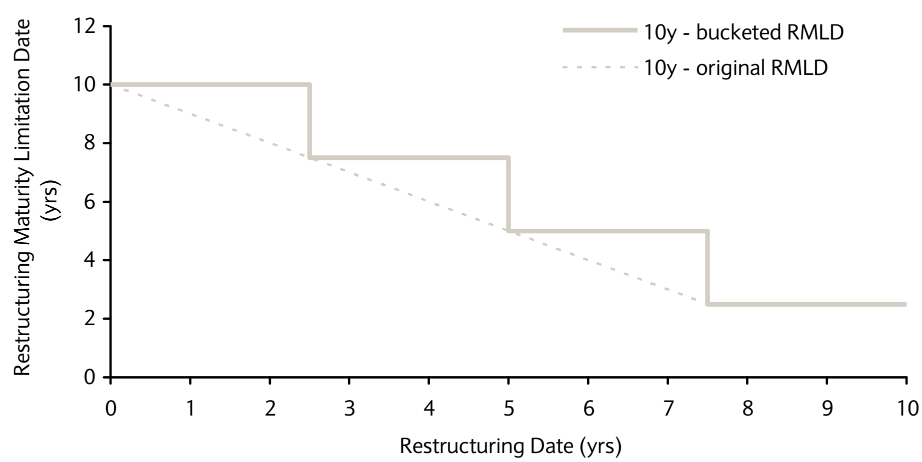
Figure 69: Restructuring Maturity Limitation Dates



Source: Barclays Capital

One problem with retaining restructuring is the potential requirement for a separate auction for each different RMLD. To resolve this issue it has been proposed that contracts be split into buckets by RMLD, such as 2.5yrs, 5yrs, 7.5yrs, 10yrs, 15yrs and 30yrs, with one auction for each bucket. As illustrated in Figure 70 for a 10yr contract, this bucketing would essentially extend the original RMLD (the dotted line) to the upper bound of the bucket it falls in, generally yielding a marginal benefit to the protection buyer.

Figure 70: Bucketed Restructuring Maturity Limitation Dates



Source: Barclays Capital

As an example, consider a 10yr CDS with a restructuring event occurring in two years. The original RMLD would be 8yrs. Under the bucketing mechanism, this RMLD would fall into the 10yr bucket and so any Deliverable Obligation with less than 10yrs to maturity, from the Restructuring Date, would be valid. Examples for other contract maturities are shown in the Appendix.

Legacy trades and recouponing

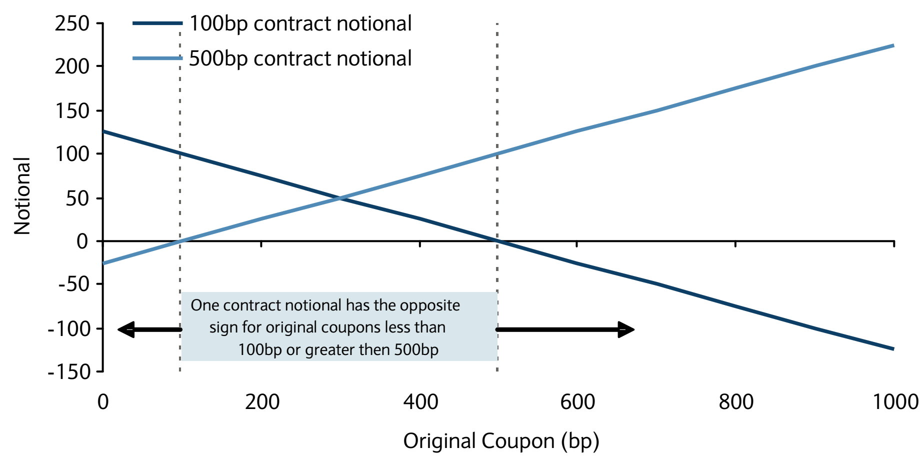
Existing trades can potentially be mapped into equivalent standard contracts

A reasonable requirement of the new trading conventions is that they allow existing trades incepted under old conventions to be easily ported to the new framework. The purpose of this requirement is to improve the liquidity and fungibility of existing trades, thereby making it cheaper to unwind and easier to compress legacy deals, while increasing the transparency of an investor's exposures.

Consider, for example, the new Standardised North American Contract, with 100/500 coupons and no restructuring. It is possible to exchange any old no restructuring trade with any coupon for two positions in the fixed-coupon contracts with notionals chosen so that the net coupon payments and event risk are identical to those of the original contract (see Appendix for details). Recouponing in this way improves the fungibility of existing trades and therefore facilitates the compression of large portfolios of CDS trades, which can have operational and capital benefits for market participants.

Figure 71 shows the equivalent notionals in the 100bp and 500bp legs of the new position as a function of the original trade coupon.

Figure 71: Equivalent positions for 100 notional in original contract



Source: Barclays Capital

Restructuring asymmetry between protection buyers and sellers needs to be resolved

If the European market were to follow the same path and establish a 100/500 standard contract then, superficially, the same recouponing process could apply for European contracts. However, there is a snag. With restructuring, the recouponing process does not always preserve the risk profile of the original trade. This relates to an asymmetry in the deliverability rights when a credit event is triggered by a buyer as opposed to a seller of protection.

For example, a 100mm long protection position originally struck at 50bp is equivalent in coupon payments and default risk to 112.5mm long protection struck at 100bp and 12.5mm short protection struck at 500bp. However, the net position does not have the same restructuring risk. In the original trade, following a credit event, the protection buyer has the right to trigger the contract, with deliverability subject to the RMLD restriction. In the new position, the investor's deliverability rights have changed. The long protection trade struck at 100bp can still be triggered, with deliverability subject to the RMLD; however, the short protection trade struck at 500bp can only be triggered without the RMLD restriction (as the investor is a protection seller). Economically the original trade and the substitute position have different potential cash flows in the event of a restructuring. For further clarification, please see the Appendix, where we give explicit details of this example.

In summary, if a long protection trade maps partially into a short protection trade, then the restructuring risk profile is modified in the process. From Figure 71 we can see that the 100/500 construct will result in one long and one short position whenever the original trade coupon is less than 100bp or greater than 500bp. Generally, when the original coupon lies between the two new coupons, we find that long positions will map into long-only positions and short positions into short-only positions, maintaining the restructuring risk profile.

One additional low strike and one additional high strike, solely for recouponing, could resolve the restructuring issue

With this in mind, a simple solution to this restructuring asymmetry problem is to use two additional strikes, one very tight, say 5bp, and one very wide, say 1000bp, to be used solely for recouponing old trades. All old trades would then be compressed into positions with 5bp, 100bp, 500bp and 1000bp coupons. This would result in a situation where:

- all new trades would be incepted with either 100bp or 500bp coupons; and
- 5bp and 1000bp contracts would exist only for recouponing old trades where the original coupon was less than 100bp or greater than 500bp.

The three strike solution mentioned earlier would reduce the number of cases where the restructuring asymmetry problem arises; however, we would still expect a need for supplementary strikes for recouponing to deal with the remaining cases. The MSC approach provides for strikes of 25bp and 1000bp. This would reduce the potential problem to trades with coupons less than 25bp or greater than 1000bp.

Our preferred solution

Given the standardisation issues and proposed solutions described above, we summarise in the box below our preferred solution for European contracts.

Coupon standardisation:

- 100bp and 500bp contracts for new trades
- 5bp and 1000bp contracts to be used solely for recouponing legacy trades

Restructuring:

- Contracts to trade with MMR
- 2.5yr, 5yr, 7.5yr, 10yr, 15yr and 30yr RMLD buckets to apply for auctions

(RMLD – Restructuring Maturity Limitation Date)

In our opinion, the two-strike construct is the simplest solution and would provide a great deal of transparency in the market and in the risk on CDS books. It allows for maximum fungibility while at the same time permitting a straightforward recouponing of existing trades. Furthermore, it would be consistent with the Standard North American Contract, which is already trading with the 100/500 construct. To preserve restructuring risk, a simple extension to include 5bp and 1000bp, solely for the purpose of recouponing trades struck at below 100bp and above 500bp, can be used.

Retaining restructuring in Europe will permit more accurate hedging of cash positions and allow the capital relief associated with such hedges to be maintained. The consequent requirement for a potentially large number of auctions can be resolved by bucketing RMLDs.

Central clearing

Central clearing is currently a top priority for CDS markets, with nine dealers having made a commitment to the EC to clear CDS index trades through a Central Counterparty (CCP) by 31 July 2009. Prior to the deadline, the EC will hold three meetings, in April, May and June, with participating dealers, to present progress updates against a Clearing Roadmap. At present in Europe there are four main contending CCPs: ICE Trust Europe; BClear; Eurex; and CME. We expect a CCP will be decided upon by late April or early May in order to leave sufficient preparation time to meet the clearing deadline.

Appendix

Recouponing old trades

Suppose 100bp and 500bp fixed-coupon trading becomes the standard. Any existing deal can be converted into two positions, one in each of the 100bp and 500bp contracts in a way that preserves both the coupon payments and the default risk of the original trade. The motivation to do this would be to improve the liquidity of the investor's positions by switching into standard coupons, to improve transparency of the book and also to ease any potential trade compression. The switch would work as follows.

In order to preserve default risk the notionals of the two new positions (N_{100} and N_{500}) must sum to the notional of the original position (*N*):

$$N = N_{100} + N_{500}$$

To preserve the coupon payments, the notional-weighted coupons of the new trades must sum to the original coupon payments. If *C* is the original coupon then:

$$N.C = N_{100}.100 + N_{500}.500$$

These equations can be solved for the new notionals in the 100bp and 500bp contracts:

$$N_{100} = \frac{500 - C}{500 - 100}.N, \quad N_{500} = \frac{C - 100}{500 - 100}.N$$

Solutions for *N*=100 and different values of *C* are shown in Figure 71.

We can see from the equations above and from the chart that if *C*<100bp then N_{500} is negative or if *C*>500bp then N_{100} is negative. In other words, in these circumstances a long protection position would switch into one long position and one short position. This does not cause any problems when the contract has no restructuring, as in the US. It does, however, cause a mismatch of risk when the contract has MMR, as illustrated by the example below (Figure 73).

Restructuring asymmetry problem

While the recouponing process described above preserves the risk profile of the original trade for no restructuring contracts, for contracts with restructuring this is not always the case. Consider the example summarised in Figure 72.

Figure 72: Recouponing example

Old trade
Investor buys €100mm protection against issuer X for 50bp
New trades
Investor buys €112.5mm protection against issuer X for 100bp
Investor sells €12.5mm protection against issuer X for 500bp

Source: Barclays Capital

The investor moves from having bought €100mm protection for 50bp to having bought €112.5mm protection for 100bp and having sold €12.5mm protection for 500bp. The net coupon income is the same and the default risk is the same. However, the restructuring exposure has changed.

Figure 73: Example of restructuring asymmetry problem

TRADE AT INCEPTION					
Notional	Coupon	Par spread	PV01	Upfront	Present value
Old position					
100	50	50	4.00	0.0%	0
New position					
112.5	100	50	4.00	2.0%	2.25
-12.5	500	50	4.00	18.0%	-2.25
JUST BEFORE RESTRUCTURING					
Notional	Coupon	Par spread	PV01	Upfront	Present value
Old position					
100	50	500	3.33	15.0%	15
New position					
112.5	100	500	3.33	13.3%	15
-12.5	500	500	3.33	0%	0
JUST AFTER RESTRUCTURING – IF CONTRACT TRIGGERED BY PROTECTION BUYER					
Notional	Recovery rate	PV = (1-RR)*N			
Old position					
100	86.67%	13.33			
New position					
112.5	86.67%	15.00			
-12.5	86.67%	-1.67			

Note: PV01 is the PV of a stream of 1bp coupon payments. Source: Barclays Capital

In Figure 73 we present the evolution of the old and new trades in the following scenario. At inception the present value of the old trade and the sum of the new trades' present values are the same: zero. Suppose now the par spread widens from 50bp to 500bp and the PV01 of the deal drops to 3.33. Now the old trade has made a profit of €15mn (= 450bp widening * 3.33 PV01 * €100mm notional). This profit is preserved by the new trades: the 100bp contract has a present value of €15mn (= (500bp-100bp) * 3.33 PV01 * €112.5mn notional) and the 500bp contract has a present value of zero because the market spread (500bp) equals the coupon.

Now suppose the issuer restructures and the cheapest to deliver, within the confines of the Restructuring Maturity Limitation Date (RMLD), has a price of 86.67%. If triggered, the old trade would move from a P&L of €15mn to €13.33mn. Hence the buyer of protection would not trigger. If the seller of protection triggers the contract, then the RMLD does not apply. Let's also assume that there is another bond outstanding, which has a price of 60% and a maturity greater than the RMLD. Then the seller of protection in the old trade would not want to trigger the contract either because the buyer would be permitted to deliver the bond with the 60% price. The seller would move from a €15mn loss to a €40mn loss. Consequently, the contract is not triggered and the buyer of protection makes €15mn on the old trade.

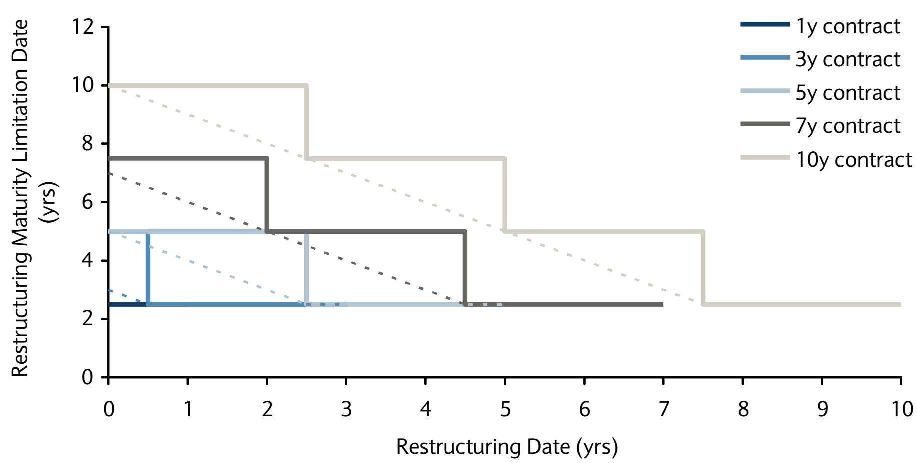
Consider now the new trades. The €112.5mm long protection position in the100bp contract is worth €15mn (=86.67% recovery rate * €112.5 notional) if the contract is triggered by the protection buyer, the same as the present value before the event. The €12.5mn short protection position will be triggered against the investor for a loss of €1.67mn (=86.67% recovery rate * €12.5mn notional). The net profit from the two trades is €13.3mn.

In the old position the investor would have made €15mn. In the new positions the investor makes only €13.3mn. Hence, in this specific restructuring event scenario the investor has an economic incentive to prefer the old trade to the new trades. This occurs as a direct result of the asymmetry between protection buyer and seller Delivery Obligation rights. The problem can always be avoided if the old trade is switched into two new trades in the same direction. If a long protection position is mapped into two other long protection positions, then the Delivery Obligation rights are preserved. This can be guaranteed by ensuring that the coupon of the original trade lies between the coupons of the two new trades.

Bucketed Restructuring Maturity Limitation Dates

In Figure 74 we extend Figure 70, showing the bucketed RMLDs (the solid lines) for 1yr, 3yr, 5yr, 7yr and 10yr contracts, contrasting them to the original RMLDs (the dotted lines).

Figure 74: Bucketed Restructuring Maturity Limitation Dates



Source: Barclays Capital

European standard contract and the small bang

This section was originally published as *European standard contract and the small bang,* 15 May 2009.

In *Developments in the European CDS market*, 9 April 2009, we discussed the CDS contractual and trading convention changes that are being implemented in order to improve product fungibility and support the establishment and efficiency of central clearing. Since then, several advances have been made towards these goals. In this report we summarise the latest developments.

European CDS market changes – update

The CDS Big Bang occurred on 8 April 2009, entailing global changes to the CDS contract. On the same date the new Standard North American Contract (SNAC) was launched, which established fixed coupons of 100bp and 500bp and No Restructuring as the local market standard. In Europe, provisional agreement has been reached on the terms and timing of new trading conventions. The main expected changes and the implications thereof are as follows:

- there will be four standard, fixed coupons of 25bp, 100bp, 500bp and1000bp;
- additional coupons of 300bp and 750bp will be available for recouponing;
- the contract will retain MMR restructuring, however, with a bucketing of Maturity Restructuring Limitation Dates in order to limit the number of potential auctions;
- the target date for implementation is the next roll date, 20 June 2009;
- restructuring bucketing will require a contractual change, therefore a new protocol further modifying the ISDA Credit Definitions will be required; and
- we expect the new contractual change also to be implemented on 20 June 2009.

Below we elaborate on these points. Also, as the deadline for central clearing of iTraxx index trades draws closer, we highlight some of the challenges that need to be addressed in order to make progress towards single-name clearing.

Trading conventions

The European Standard Coupon Working Group, which comprises buy-side and sell-side participants, recently agreed on four standard, fixed coupons of 25bp, 100bp, 500bp, 1000bp. While the SNAC uses only 100bp and 500bp coupons, additional 25bp and 1000bp strikes will be available in Europe.

Solely for recouponing existing deals, further coupons of 300bp and 750bp will be available. In our opinion, these extra strikes are superfluous and in fact their use may be detrimental to investors from a liquidity perspective. For example, why switch a €100mm position struck at 200bp into two €50mm positions struck at 100bp and 300bp contracts when the latter will not be liquidly traded? Surely it is better for the investor to switch into €75mm of a 100bp and €25mm of a 500bp contract, as both of these contracts will be standard. Where possible, we would recommend that any investors who plan to recoupon existing trades, should do so into the four standard strikes, avoiding the 300bp and 750bp options, in order to maximise liquidity.

Restructuring is expected to be retained as standard, so that the CDS contract provides a suitable hedge for the underlying cash securities. Under existing Modified Modified Restructuring (MMR) rules, if a credit event occurs, every CDS maturity date could imply a different set of deliverable obligations. Consequently, this might necessitate a large number of auctions. To avoid this scenario and limit the number of auctions, Restructuring Maturity Limitation Date buckets split at 2.5yrs, 5yrs, 7.5ys and 10yrs have been proposed, for when the buyer of protection triggers the contract. A 0-30yr bucket would apply for contracts triggered by the seller of protection. As the MMR rules are specified in the ISDA Credit Definitions, a contractual modification is required to permit the bucketing (see below).

The target date for the launch of the new European trading conventions is the next roll date, 20 June 2009.

'Small Bang' expected

As described above, a contractual change is necessary to implement bucketing of Restructuring Maturity Limitation Dates. As such we expect a CDS Small Bang to occur, similar to the Big Bang of 8 April 2009, but this time modifying the MMR (and MR) rules in the ISDA Credit Definitions. As with the Big Bang, this would be a global change and investors would be invited to sign up to a retroactive protocol, accepting the changes for all new and existing deals. Adhering to the Small Bang would entail adoption of the Big Bang protocol, for investors who are not already signed up to the latter. Accordingly, for investors who wished to sign up to the Big Bang but missed the deadline, the Small Bang would provide a second opportunity to do so.

It is likely that these changes will be targeted for 20 June 2009 to coincide with the launch of the new trading conventions; therefore, we envisage a period of a few weeks from early June during which the new protocol would be open for comment and acceptance.

Clearing considerations

The CDS standardisation and contractual changes taking place are designed to improve the fungibility of the CDS product. In turn this enhances the benefits of central clearing as it permits more effective netting of positions, leading to greater transparency and better management of counterparty risk. While CDX index trades have already been cleared through ICE Trust US, in Europe nine dealers have committed to the EC to clear iTraxx index trades through a European Central Counterparty by the end of July 2009, and there is active interest from buy-side accounts.

Recent political developments in the US and Europe have added impetus to an already compressed implementation timeline, as dealers try to address increasing volumes for the CDX cleared products, the launch of index clearing in Europe, product standardisation and single-name clearing in both regions, as well as client clearing. Against a backdrop of volatile markets and increased focus on streamlined operational flows, it seems that some compromise on the timeline may be necessary.

We continue to believe the market would benefit most from a single global clearing solution. Provided it is sufficiently well capitalised, this would permit broader netting of deals and more effective management of counterparty risk. Furthermore, a staggered approach would be most pragmatic, with an initial focus on clearing liquid index products, with high-volume single-name constituents soon after, followed by the introduction of clients to the clearing model to further reduce systemic risk. Each of these goals carries a different set of challenges, some of which will take longer to resolve than others. Also, any attempt to achieve them simultaneously unnecessarily risks overwhelming the market with a concurrent multitude of teething problems.

In particular, a number of key challenges still obstruct the successful implementation of single-name clearing. We believe market participants, the central counterparties and regulators must properly address the following complex issues before single-name clearing can commence successfully:

- Suitable specification of a single-name risk model, with adequate margining and offsetting of risk.
- A solution to ensure high-quality, liquid pricing across the full curve for cleared names.
- Clearly-defined criteria for eligible 'standardised trade'. Liquidity is critical for cleared trades. There are a number of considerations related to traded volumes, price contributions and counterparty coverage which are relevant. We expect that any suitable set of criteria will likely reveal that not all names are truly fit for clearing. For example, we believe many central counterparties and their clearing members would back away from permitting large, concentrated positions in relatively illiquid credits between only a subset of clearing members to avoid exposing the default fund to excessive risk.

Finally, in our opinion, the market should approach single-name clearing with caution, taking slow but meaningful steps with small sets of credits rather than seeking to introduce all names and products at once, which would introduce significant operational risk.

Standard European contract launched

This section was originally published on 26 June 2009

New CDS trading conventions became effective this week with the launch of the Standard European Contract (STEC). We review the new conventions, as well as the contractual changes that are already operative (the Big Bang) and those that are due next month (the Small Bang). We summarise the market reaction to the first few days of trading.

22 June marks start of STEC trading

On Monday, 22 June 2009, the European CDS market began trading the new Standard European Contract (STEC), which incorporates new standard, trading conventions. It includes the following three key conventions:

- quotations are for one of four fixed coupons: 25bp, 100bp, 500bp and 1000bp;
- transactions include restructuring as a credit event; and
- the premium leg incorporates a full first coupon and accrued interest is paid at inception.

These contracts apply to CDS referencing corporate issuers and Western sovereigns. In addition to the four fixed coupons listed above, 300bp and 750bp strikes may be used for the re-couponing of existing deals. Note that the change to the effective dates (the dates from which protection starts and from which succession events have potential impact) is a contractual modification, which formed part of the Big Bang. We describe this below.

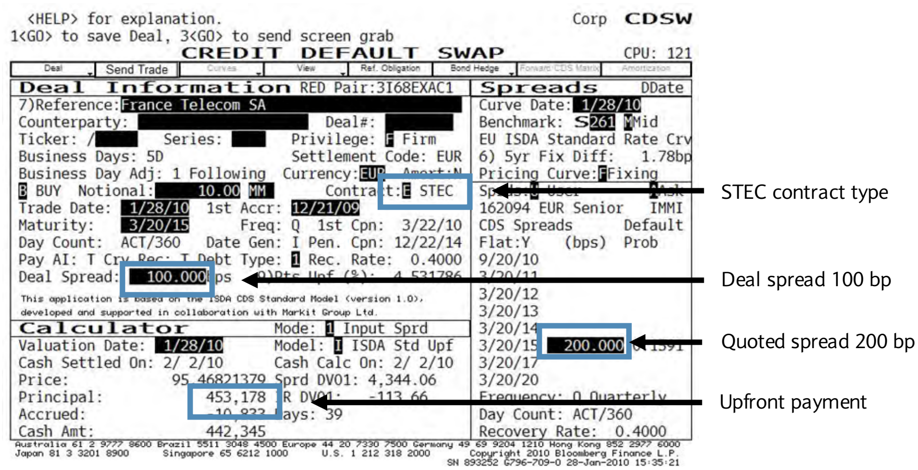
Quotation conventions

Contracts are quoted on a price or a spread basis. Wider names tend to be quoted on price terms (ie, the upfront payment required for the specified fixed-coupon contract is given). This has always been the case for CDS referencing distressed issuers. Tighter names tend to be quoted on a spread basis. However, as all STEC trades generally require an upfront payment to reflect the creditworthiness of the issuer relative to the fixed coupon being used, it is necessary to agree on a standard method for mapping between spread and price. In order to do this, dealers have agreed upon the following convention:

- Quoted spreads assume a flat credit curve is used to calculate the upfront payment;
- Recovery rates are conventionally fixed at:
  - 40% for senior, corporate debt;
  - 20% for subordinated, corporate debt; and
  - 40% for Western sovereigns.

With these underlying assumptions, a standard CDS pricer can be used to translate between quoted spread and upfront. ISDA has made such a pricer openly available, and these calculations can also be done via Bloomberg's CDSW page by setting the contract type to STEC. For example, Figure 75 gives a snapshot of a 5y CDS deal with a fixed coupon of 100bp with a quoted spread of 200bp. We indicate the output upfront payment that would be made from the protection buyer to the protection seller. In this case, it is approximately 4.4% of the notional. So although the contract is quoted at 200bp, the seller of protection will actually receive a 100bp coupon and an upfront payment of 4.4%.

Figure 75: CDSW quoted spread to upfront calculation



Source: Bloomberg

These conversion conventions also make unwinds of existing deals far more transparent, as there is no ambiguity around curve shape or recovery rate when calculating the price from the quoted spread.

The Big Bang and the Small Bang

In addition to the changes in local market trading conventions, global modifications to the contract via the ISDA Credit Derivative Definitions were made on 8 April and more are due on 27 July. These modifications are known as the Big Bang and Small Bang, respectively. We recap the former and summarise plans for the latter.

Big Bang

The Big Bang was effective from 8 April 2009 and entailed three main changes:

- the establishment of regional Determination Committees (DCs);
- auction established as the standard for credit event settlement; and
- rolling, look-back effective date.

The Determination Committees comprise 18 buy-side and sell-side representatives, and it is their responsibility to decide whether a credit event has occurred and, if it has, to determine which deliverable obligations are valid and specify any necessary auctions. They also determine the occurrence of succession events (which potentially affect the deliverable basket). Any ISDA member can notify ISDA of the possibility of a credit event. ISDA will then ask the DC to investigate further and determine whether it has occurred. The decision of the DC is binding for all contracts covered by the Big Bang.

Prior to the Big Bang, following a credit event, investors were required to sign up to the auction protocol on a case-by-case basis. Under the new rules, they are automatically signed up. Physical settlement is still possible by delivering securities into the auction.

The effective date for credit and succession events also changed as part of the Big Bang. The effective date for credit events (ie, the date from which protection commences) is now *today* minus 60 days for all new and outstanding transactions. The protection start date therefore rolls forward one day, every day, for all trades. For succession events, the look-back period is 90 days prior to today's date. Note that although the Big Bang was effective on 8 April, there was a hardening period until 20 June during which trades executed prior to 8 April would continue to use their original effective dates. This period has now expired and we now have complete fungibility of contracts with regard to effective date.

The Big Bang changes were retroactive, so any investors who signed up to it modified the contractual terms of all existing trades as well as new ones.

Small Bang

The Small Bang, due to take place in July, entails a further change to the ISDA Credit Derivative Definitions to facilitate auction settlement for the restructuring credit event. The primary mechanism for doing this is the creation of maturity buckets for the auction procedure. Under MMR and MR rules, each CDS maturity can imply a different set of deliverable obligations; therefore, to limit the large potential number of auctions following a restructuring event, trades are expected to be bucketed as follows:

- Bucket cut-offs will be 2.5y, 5y, 7.5y, 10y, 12.5y, 15y, 20y and 30y;
- Contracts triggered by the protection seller will fall into the 30y bucket; and
- Bucketing is by the maximum deliverable maturity.

To illustrate this last point, suppose that a CDS has 9y to go when a restructuring occurs and that the longest deliverable under traditional MMR or MR rules has 6y to maturity. Then this contract will fall in the 7.5y bucket, not the 10y bucket, as it is bucketed by the bond maturity and not the CDS maturity. If on the other hand the longest deliverable was 8y to maturity, then the contract would fall in the 10y bucket. Note that this creates a very marginal benefit for the buyer of protection, as it potentially extends the deliverable basket (albeit by a small amount); however we would expect the pricing impact to be negligible. For it to have any effect, not only does a restructuring event have to occur but the company's debt maturity profile has to be such that additional deliverables would be both valid and cheaper than the existing deliverables.

Other key points and dates regarding the Small Bang include the following:

- it is expected to be effective from 27 July 2009;
- a two week sign-up period is expected from 13-24 July 2009;
- it will be retroactive, affecting all existing trades as well as new; and
- Small Bang adherence entails adoption of the Big Bang; consequently, it provides a second opportunity to sign up to the Big Bang changes.

Market reaction

Since the new contract started on Monday, liquidity has almost exclusively been in the 100bp and 500bp contracts, with the exception of sovereigns, which have traded with the 25bp strike. The cut-off point between 100bp and 500bp contract seems to be around 300bp. In other words, for names with a par spread of less than 300bp liquidity has been greatest in the 100bp contract and for those with a par spread of greater than 300bp liquidity has been greatest in the 500bp contract.

Central clearing for credit derivatives

This section was originally published on 30 October 2009

The events of the credit crisis have underscored the counterparty and liquidity risks associated with credit derivatives and accelerated the regulatory programme to improve the transparency of the market and better manage counterparty risk via the establishment of central clearing. In the first section of this article, we consider the motivation behind central clearing for credit derivatives.

In the second section, we discuss some of the risks and limitations of the various clearing solutions available. Issues include the advantages and disadvantages of segregation via multiple central counterparties (CCPs), the importance of adequate capitalisation and the need for sensibly-defined eligibility criteria.

In the *US Credit Alpha*, 9 October 2009, we considered the issues pertinent to client clearing for CDS and the current contending CCPs in the US. In the third section here, we summarise the status of CDS clearing in Europe.

While we believe the best solution would be provided by a minimal number of well-capitalised, global CCPs with the ability to net across as many asset classes as possible, we acknowledge that this cannot be achieved in the short term and pragmatic, interim solutions are required.

The motivation for central clearing

Over-the-counter (OTC) credit derivatives accounted for only about 7% of the total notional amount of all OTC derivatives outstanding at the end of 2008, according to BIS statistics[24]. However, credit derivative contracts are arguably responsible for a much greater component of counterparty risk than this proportion might suggest. This results not only from their typically heavily skewed payoff profiles but also from the prevalence of "wrong-way" risk, which arises through correlation between the performance of a derivative contract and the creditworthiness of the counterparties involved. For example, in the event that the reference entity defaults, a buyer of CDS protection against a reference entity whose credit quality is positively correlated with that of the protection seller may find the ability of the seller to adhere to the contract impaired.

Counterparty risk in derivative contracts is managed via initial margin payments and regular posting of variation margin as the mark-to-market of the contracts change. The variation margin protects the prevailing profit on a trade should a counterparty default. The initial margin provides some protection against a jump in the mark-to-market between the time of the last variation margin exchange and the time at which the surviving counterparty is able to execute a substitute trade with an alternative counterparty. In the case of credit derivatives, this jump can be significant (such as in the simultaneous default of the reference entity of and counterparty to a CDS contract). With relatively low initial margin levels common (and accordingly high levels of leverage), the jump can easily exceed the initial margin, resulting in a potential loss. If the exposure is large enough, this can generate knock-on counterparty risk issues for other market participants.

As well as highlighting such contagion risk, the bankruptcy of Lehman Brothers in September 2008 also illustrated the dangers of an opaque market. With very little information available regarding outstanding derivative exposures, CDS liquidity seized up. Investors and dealers were unwilling to engage in new contracts that would expose them to the associated counterparty risk.

[24] "Credit Default Swaps and Counterparty Risk", ECB, August 2009.

Consequent political and regulatory attention has brought about an acceleration of the process to transform the market, with the goals of improving transparency and reducing counterparty risk and the related systemic risk. Over the past year, there has been an enormous, coordinated effort between dealers, the investor community and regulators to standardise CDS contracts and move the product towards central clearing platforms. The benefits of contract standardisation are clear: it permits increased netting of positions, better operational efficiency, reduced legal risk, greater clarity of exposure and more price transparency. Furthermore, it is necessary for efficient central clearing. Central clearing also facilitates netting and risk transparency. In addition, it supplies a framework for centralised management of counterparty risk, margin and leverage and can act as a crucial provider of market information for the regulators. Despite these apparent advantages, there are also several complex risks that are dependent on the specific structure of any central clearing solution.

Risks and limitations

At present, the credit derivative market comprises a network of bilateral agreements with market participants facing each other directly. Central clearing is a system in which all market participants face one or several central counterparties (CCPs). Consequently, the contagion risk highlighted above is reduced via more efficient netting of counterparty risk. On the other hand, there are concerns that such a framework centralises systemic risk, with the entire system becoming dependent on the survival of the CCPs. Despite this, arguably, centralisation of counterparty risk at least places the market in a situation in which it can start to measure the risk and adequately capitalise against it. With a bilateral, OTC framework, the opacity and complexity of the network of transactions makes it extremely difficult to do this.

Having multiple CCPs for the same asset class, rather than one, would potentially mitigate systemic risk and encourage more competitive transaction costs. This, however, would be at the expense of having suboptimal netting efficiency, operational efficiency and would likely be more costly to support. The same applies for regional separation of clearing solutions. Furthermore, at present, there is no common framework that applies across CCPs. There is a plan for the global regulators to provide guidelines via the International Organisation of Securities Commissions (IOSCO); however, we would not envisage formulation of these any time soon. Consequently, multiple CCP solutions would bear a significant amount of basis risk between the CCPs.

Another complex consideration is the effect of segregated clearing for different asset classes. For instance, Duffie and Zhu argue[25] that in certain circumstances the collateral efficiency gained from multilateral netting via the introduction of clearing solely for one asset class, say CDS, can be more than offset by the loss of existing bilateral netting benefits across multiple asset classes.

Product viability for central clearing is also an important issue. Liquidity must be sufficient enough to allow high-quality, daily pricing for all cleared products so that a suitable risk model and suitable margining can be implemented. In addition, the cleared product should be standardised to the greatest possible degree. Not only does this support liquidity but it also increases netting opportunities. One of the key motivations behind the standardisation of CDS[26] we have seen in 2009 was preparation for central clearing.

Illiquid or bespoke deals are not suitable for central clearing. As an extreme example, consider the typical monoline wraps of super senior CDOs, which were arranged in CDS format. The insurer would sell protection against losses on the underlying CDO. These were

[25] See "Does a Central Clearing Counterparty Reduce Counterparty Risk?" Duffie and Zhu, 2009.
[26] See *European CDS market changes*, Barclays Capital, 15 June 2009.

large, bespoke transactions with no market for offsetting trades. There would be no advantage in centrally clearing such positions. The transaction would only serve to impose a counterparty risk burden on the CCP.

Even for a less extreme example, such as an illiquid but standard CDS trade, there is little gain to be made through clearing. By its very nature, the netting benefits would be limited, and it would be difficult to achieve reliable daily pricing for margin purposes. Furthermore, the resulting transfer of risk to the CCP would increase the overall, centralised counterparty risk. For these reasons, it is critical that sensibly-defined eligibility criteria are specified to identify contracts suitable for central clearing. This is particularly the case if they are to be used in conjunction with regulatory incentives, such as punitive capital charges for eligible trades that are not cleared. It is in nobody's interest to force unsuitable or illiquid contracts through central clearing.

Despite all of these issues, there is a clear need to improve transparency for both liquid and illiquid transactions. This can be partly achieved through strict warehousing of trade data, such as the CDS and index trade data currently reported to the DTCC[27]. Detailed deal information can be made fully available to regulators while at the same time respecting participant confidentiality.

For liquid transactions, the use of central clearing improves transparency of risk through trade netting and regular marking to market. It can also provide some measurement and control over counterparty risk. Resulting centralised systemic risk can be mitigated by adequate capitalisation. Even if the establishment of central clearing for liquid credit derivatives is more collateral-intensive in the short term, which may arise from the decomposition of existing cross asset class, bilateral netting, it is a necessary stepping stone towards a more efficient clearing solution (for example, incorporating netting across asset classes through the same CCP).

European clearing of credit default swaps

Addressing the transparency and counterparty risk issues facing the credit derivative market is a top priority for regulators and market participants alike. The wrong-way risk highlighted earlier, typical in credit derivative contracts, is a particular concern because it leads to contagion risk, which can result in a domino effect, near-simultaneous failure of multiple counterparties.

A broad, global effort is well underway to put in place central clearing solutions for eligible credit derivative transactions and for all market participants. In the first half of 2009, the North American and European CDS market was transformed, via standardisation of the contract and its trading conventions. These changes were designed to enhance product fungibility and reduce legal uncertainty so that the greatest possible benefit could be extracted from central clearing.

Clearing has already begun for CDX and iTraxx indices. Thirteen clearing members (CMs) of ICE Trust US and Europe have cleared more than $3trn of index trades to date. Selected liquid single-name CDS are due to start clearing imminently, subject to regulatory approval. The North American industry has committed to the Fed to initiate client clearing by no later than 15 December 2009 and, although progress in Europe has been behind that in North America, this date is also regarded as the deadline for Europe.

[27] See *DTCC Data Show Corporate CDS Fears Overblown*, 6 November 2008 and http://www.dtcc.com/products/derivserv/data/index.php

In the US there are two primary candidates to clear client trades by this date. These are CME and ICE Trust US. In the *US Credit Alpha*, 9 October 2009, these two providers were compared in the context of the main factors that will affect clients' choice of clearing provider: operational efficiency, legal certainty, margin costs and transaction costs. Below, we summarise the status of the main contenders in Europe, with regards to the provision of European central clearing.

Clearnet SA

Clearnet is planning to launch a CDS clearing offering in December 2009, with the first phase covering iTraxx European indices. Single-names and US indices are planned for the first half of 2010.

CME

In the US, CME is one of the frontrunners for client clearing of CDS, along with ICE Trust US. One of its advantages is that trades are cleared through a Futures Commission Merchant (FCM). Thus, provided that CDS is treated under the Commodity Exchange Act, CME in the US offers a solid and tested legal framework. It is not clear that the same protection would be afforded in Europe.

CME has the advantage of being a large, well-established US clearinghouse, with a great deal of expertise. Additionally, given the broader set of asset classes cleared by CME, there is a greater possibility of cross asset class netting. However, although CME is launching a European clearing solution, it is in its early stages and still requires European regulatory approval to act as a CCP.

Eurex

Eurex Credit Clear, Eurex Clearing's OTC clearing solution for CDS, was operationally ready by 27 July 2009 and cleared its first trade on 30 July. However, at the time of writing, it had only cleared five transactions, and is therefore in need of substantial further testing and market support.

ICE Europe

Operationally, ICE Trust is the most advanced, having cleared over $3trn of CDX and iTraxx index trades globally this year, across a broad base of dealers. It is ready to clear single-name trades, subject to regulatory approval. The ICE model for client clearing in Europe requires further analysis, although it is expected to be broadly the same as in the US. This is a new model, which has not been tested in a default scenario.

In summary

Over the past year, a lot of progress has been made towards clearing solutions for CDS. There is still a long way to go, and there is certainly the absence of a perfect solution at present. Each clearing contender has individual advantages and disadvantages. ICE risk systems have been tested through a large number of cleared, dealer index trades, but their model for client clearing is new and untested. CME is an experienced clearinghouse with an established legal framework for client clearing in the US. In addition, it offers the possibility of cross asset class netting. However, they are at an early stage in Europe, and it is not clear the same legal certainty would apply there. Eurex has been operational since July, and the EC appears to support a regional solution, which may permit it better regulatory oversight, although so far Eurex has received little dealer support.

Ultimately, we believe the ideal solution would be a minimal number of adequately capitalised, global CCPs, with the broadest possible set of cleared asset classes, so as to maximise the netting benefit. Multiple CCPs may offer the benefits of competition but a standardised framework would be critical. Clearly, this could not all be achieved overnight, though a pragmatic compromise is needed in the interim.

REFERENCES

Useful references

Readers may find the following additional references useful.

International Swaps and Derivatives Association (ISDA)

2003 ISDA Credit Derivatives Definitions – credit definitions used with CDS trade confirmations.

2009 ISDA Credit Derivatives Determinations Committees and Auction Settlement Supplement to the 2003 ISDA Credit Derivatives Definitions – changes to the credit definitions associated with the Big Bang.

2009 ISDA Credit Derivatives Determinations Committees, Auction Settlement and Restructuring Supplement to the 2003 ISDA Credit Derivatives Definitions – incorporates changes associated with the Small Bang.

ISDA CDS Standard Model - *http://www.cdsmodel.com/cdsmodel/* - the standard model used by convention for CDS valuation and for converting between spread and upfront quotes.

Markit

Credit Event Auction Primer – a description of the CDS auction process and several examples.

Barclays Capital

Thomson – Small Bang put to the test, 14 August 2009 – analysis of the Thomson restructuring event following its announcement.

Thomson Auction: Autopsy, 30 October – analysis of the Thomson auction results.

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