Deutsche Bank Research

Credit default swaps

December 21, 2009

Heading towards a more stable system

The use of credit default swaps (CDSs) has become increasingly popular over time. Between 2002 and 2007, gross notional amounts outstanding grew from below USD 2 trillion to nearly USD 60 trillion.

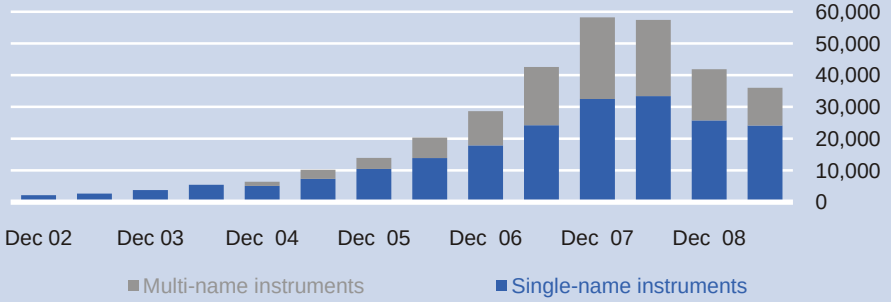
The recent crisis has revealed several shortcomings in CDS market practices and structure. Lack of information on the whereabouts of open positions as well as on the extent of economic risk borne by the financial sector are partly to blame for the heavy reactions observed during the crisis. In addition, management of counterparty risk has proved insufficient, as has in some instances the settlement of contracts following a credit event.

Past problems should not distract from the potential benefits of these instruments. In particular, CDSs help complete markets, as they provide an effective means to hedge and trade credit risk. CDSs allow financial institutions to better manage their exposures, and investors benefit from an enhanced investment universe. In addition, CDS spreads provide a valuable market-based assessment of credit conditions.

Currently, the CDS market is transforming into a more stable system. Various private-led measures are being put in place that help enhance market transparency and mitigate operational and systemic risk. In particular, central counterparties have started to operate, which will eventually lead to an improved management of individual as well as system-wide risks.

Meanwhile, regulation should be designed with caution and be restricted to averting clear market failures. Regulators should avoid choking the market for bespoke credit derivatives, as many end-users are highly dependent on tailor-made solutions. From an analytical point of view, it has yet to be established under which conditions CDS trading – as opposed to hedging – does more harm than good, and whether central trading – in addition to central clearing – is required to achieve systemic stability.

From nought to sixty in 5 years
Gross notional amount outstanding, USD bn.



Sources: BIS (2009), ISDA (2009)

The author thanks Anja Baum for outstanding research assistance including the preparation of a first draft of this paper.

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Introduction

The years preceding the crisis saw a rapid rise in the use of credit default swaps (CDSs), i.e. financial instruments to hedge and trade credit risk. The strong growth of this market is largely the consequence of financial institutions' desire to better manage credit risk and of traders to gain exposure to the credit markets via arm's length financial transactions.

At the peak, gross notional amounts outstanding had reached an impressive USD 58 trillion (June 2007, BIS data), which compares to a notional value of debt securities outstanding worldwide of USD 80 trillion at the time. Such dizzying numbers – in addition to the interconnectedness of large market participants – have fuelled concerns that a collapse of a major player would have devastating effects for the financial sector as a whole. The issue of interconnectedness and, hence, the potential for contagion played a role in the decision to grant public assistance to AIG. Prior to the crisis AIG had accumulated considerable CDS positions – in both gross and net terms – that threatened to drag down other institutions.

The collapse of Lehman finally confronted market participants and supervisors with the failure of a relevant CDS counterparty that was also an important reference entity. Market reactions were heavy, owing to the fuzziness of information on actual credit exposures in a market where trading takes place over-the-counter (OTC). Skimming through the fallout it became soon clear that CDS net exposure referenced to Lehman was a mere fraction of the total amount outstanding, and that potential losses linked to Lehman as a reference entity had largely been overstated. In fact, trade replacement costs for Lehman counterparts turned out to be more substantial than credit losses induced by CDSs written on Lehman Brothers.

In response to the financial crisis, regulators and industry bodies called for greater transparency and additional measures to contain contagion effects once an important player fails. To date, there has been an extensive debate on the issues of standardisation, multilateral netting and introduction of a central counterparty. Meanwhile, measures are being put in place – led by the private sector thus far – which aim to enhance stability and efficiency of the market. Many of the measures, whether proposed or already implemented, will entail a move away from the current OTC model towards a more exchange-like structure.

Besides some sensible analysis and constructive proposals, there has been much confusion in public debate about the role CDSs played during the crisis. Observers tended to overstate the potential evil emanating from such instruments. This study tries to shed light on the actual merits and threats of CDSs. It explores specific weaknesses with regard to current market practice and structure, and possible ways to overcome them.

In this study, we argue that past problems should not distract from the wider economic benefits these instruments bring, and that the recent crisis may serve as a catalyst for the market to grow out of its adolescence and become more stable. Before turning to the implications for financial regulation, we provide a brief overview of the size, structure, and scope of the market and review the principles that govern the use of CDSs.

CDS premium

The CDS premium is calculated to cover the expected loss of the reference entity. There are two main parameters that determine the expected loss and hence the CDS premium: (i) The probability of default (PD), and (ii) the recovery rate (RR):

*CDS premium = PD * (1-RR)*

Assuming a recovery rate of zero, a 1% default probability translates into a 100 basis points annual premium. Although the premium is calculated on an annual basis, it is usually paid in quarterly terms. Thus, a protection buyer of a CDS contract with notional value of USD 1m (and an agreed premium of 100 basis points) has to pay a quarterly amount of USD 25,000 to insure against default of the reference entity.

Credit events

Bankruptcy: relevant only for corporate entities.

Obligation acceleration: obligation becomes due and payable before its normal expiration date.

Obligation default: refers to a technical default, such as violation of a bond covenant.

Failure to pay: failure of the reference entity to make any due payments.

Repudiation/Moratorium: provides for compensation after specified actions of a government (e.g. delay in payment).

Restructuring: reduction and renegotiation of delinquent debts in order to improve or restore liquidity. In 2009, US contracts eliminated restructuring as a potential trigger event.

Source: http://www.isda.org/

CDS settlement

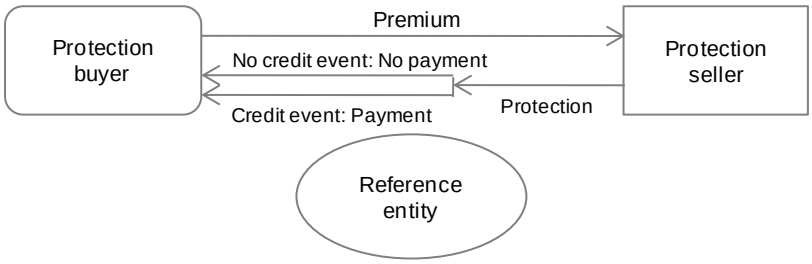
The settlement of a CDS contract comes at the very end of its life-span. Only those contracts are settled where the credit event triggers a compensation payment, others simply expire.

Protection buyer and seller usually agree upon the type of settlement up-front. If physical settlement is agreed, the protection buyer has to deliver the underlying bond in exchange for compensation. If cash settlement is agreed, the protection buyer receives the difference between the bond value at the time of settlement and the bond's nominal value in cash.

Until 2005, physical settlement was the most commonly used form, with a share of 73% by the end of that year. Cash settlement accounted for 23%, and only 3% of contracts were settled by fixed amount (BBA, 2004 and 2006). Meanwhile, cash settlement is becoming more widely used due to the incorporation of auction settlement procedures in standard CDS contracts.

How do CDSs work?

A (single name) credit default swap (CDS) allows the contracting partners to trade or hedge the risk that an underlying entity defaults – either a corporate or a sovereign borrower. There are two sides entering into the contract: The protection buyer pays a yearly premium until a pre-defined credit event occurs or until the contract matures. In return, the protection seller assumes the financial loss in case the underlying security defaults or the reference borrower becomes insolvent. In effect, a CDS contract resembles an insurance policy, where one side assumes the risk and the other pays an (insurance) premium. When entering the contract, protection buyer and seller agree upon a premium, which generally remains constant until the contract matures[1] and which compensates the protection seller for bearing the risk of a default (see box: CDS premium). The following stylized diagram summarises the mutual payment obligations.



As with every insurance policy, an integral part of the contract is the definition of the "insured event". In the case of credit default swaps, the contracts are conditioned on various credit events, such as the failure to pay, or bankruptcy (see box: Credit events). If the CDS is triggered the protection seller has the obligation to settle the contract, i.e. to pay the protection buyer the incurred loss (see box: CDS settlement). Ideally, the incurred loss can be calculated as the difference between the face value of the underlying security and the amount that can be recovered from the reference borrower.

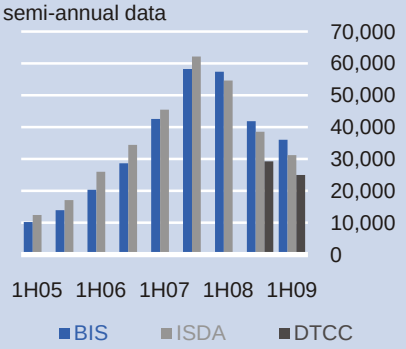
In practice though, it is difficult to predict the post-default recovery value at the time the contract is settled. And for a long time, physical settlement has been the primary choice to overcome this problem. With physical settlement, the protection buyer delivers the reference security or an equivalent one to the protection seller and in return receives the face value. The protection seller can then use the proceeds from selling the security or eventually claim the actual recovery value. Alternatively, the protection seller promises to pay the difference between the value of the underlying security at the time of settlement and the face value of the CDS contract.

The market at a glance

When credit default swaps were first introduced by the mid 1990s the new products fell on fertile ground. Already since the early 1980s, banks were laying-off parts of their credit risk by means of securitisation and later ad hoc derivatives technology. During the 1990s, strong competitive pressures and rising insolvency numbers,

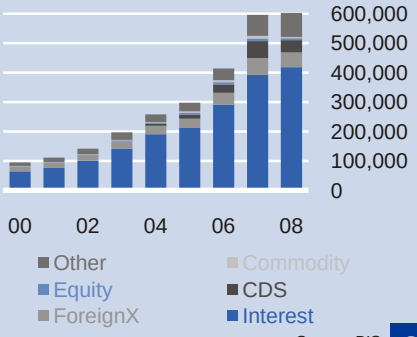
[1] One exception is a constant maturity CDS, for which the credit spread is reset periodically to the current market level.

The market for CDSs
USD bn, gross notional amounts, semi-annual data



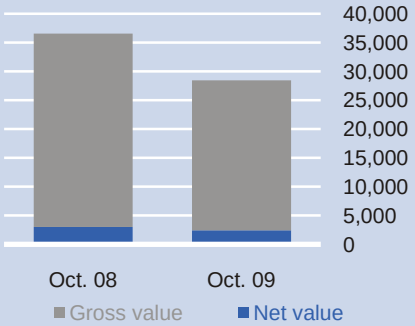
Sources: BIS, ISDA, DTCC **1**

The OTC derivatives market
USD bn, gross notional amounts, annual data



Source: BIS **2**

CDS gross vs. net values
USD bn, gross and net notional amounts



Source: DTCC **3**

Gross notional value is the sum of CDS contracts bought (or equivalently sold) across all counterparties, where each trade is counted once.

Net notional value is calculated as the sum of net protection bought (or equivalently sold) across all counterparties. Net protection bought is evaluated at the level of individual counterparties, where protection sold will be offset by protection bought for the same reference entity.

including Enron and Worldcom, forced banks to manage their credit portfolios more actively. In addition, regulatory changes such as the introduction of the more risk-sensitive Basel II framework spurred the development of tools for a more active management of risk and capital. To this end, CDSs offered various extensions to existing risk management tools. Notably, CDSs allowed credit risk to be hedged separately from interest rate risk. Unlike securitisation, CDSs required no prefunding on the part of the protection seller. Moreover, the protection buyer could maintain an existing credit portfolio – including customer relationships – while changing the portfolio's risk profile. While in the early days of the market, CDSs were used primarily for hedging purposes, soon trading in the newly established instruments became equally important. As the market matured, banks, hedge funds and asset managers increasingly used CDSs to take positions in default risk, thereby providing additional impetus to market growth.

More recently, CDS were tested by the collapse of important market participants and the failure of relevant reference entities. Following the financial crisis, CDSs came under heightened scrutiny regarding threats to the stability of the financial system. At the time the crisis hit, the opaqueness of the market and the sheer volume of CDSs outstanding contributed to the unease felt by market participants, regulators, and the wider public.

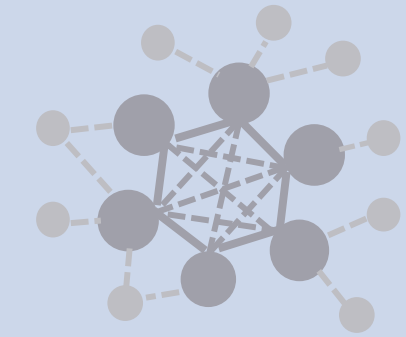
Size and relevance of the CDS market[2]

Measured in gross terms the market is large – and prior to the crisis, the rise of the CDSs market had been remarkable. Growing popularity of CDSs followed a general trend of mounting volumes in the OTC derivatives market. Swaps, options and forwards had been used to hedge interest rate, foreign exchange, and market risk for quite a while before CDSs entered the stage. When volume peaked in 2007, CDSs gross notional amount outstanding had reached a notable USD 58 trillion (BIS data) – which compares to the notional value of debt securities outstanding at that time of USD 80 trillion worldwide (IMF, 2008).

Although large in absolute terms, the size of the CDS market may not be as huge as these numbers suggest. CDSs remain a small segment of the USD 600 trillion OTC derivatives market, constituting less than ten percent of the total volume. Prior to the crisis, credit default swaps had been catching up relative to the overall OTC derivatives market, until by the end of 2007 rapid growth of CDSs came to a halt. By mid-2009, CDS gross volumes outstanding fell to an estimated USD 30 trillion (down from USD 58 trillion at the peak 2007), reflecting to a large extent the multilateral "trade compression", a practice which reduces gross exposure while leaving the net risk position of a financial institution unchanged. Reduced activity in the market for structured credit, such as synthetic CDOs, and the non-prolongation of terminated contracts also contributed to suppress volumes.

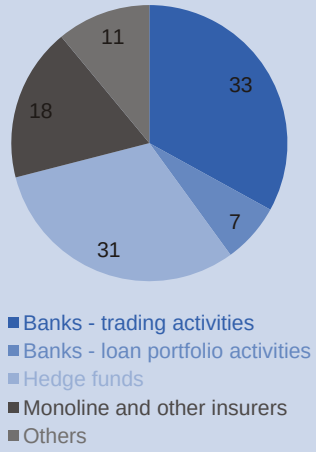
[2] The actual size of the credit derivatives market is difficult to estimate since most products are traded over-the-counter and data providers use different sampling and collection methods. There are three main data sources: (i) the BIS, which conducts a semi-annual as well as a more comprehensive triennial survey among national central banks; (ii) the International Swaps and Derivatives Association (ISDA) with its semi-annual market survey; and (iii) the Depository Trust & Clearing Corporation (DTCC), which collects data in gross and net terms from its warehouse.

CDSs – A dealer market



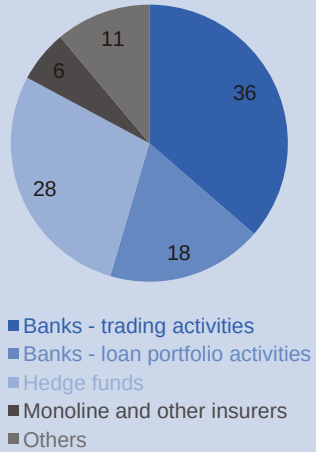
Source: ECB (2009) 4

Who sells credit protection?
Estimated market share for the year 2008 (%)



Source: BBA (2006) 5

Who buys credit protection?
Estimated market share for the year 2008 (%)



Source: BBA (2006) 6

Using net instead of gross values, the relevance of the CDS market in terms of risk transfer appears even smaller, as gross numbers tend to overstate credit risk borne by the financial sector substantially. According to Depository Trust & Clearing Corporation (DTCC) data, net exposures constitute less than one tenth of gross exposures (see figure 3).[3] Net values are available from the DTCC since October 2008 and better reflect aggregate credit risk borne by financial institutions. We will elaborate on the differences between gross and net numbers in a later section.

Major players in the CDS market

In contrast to publicly traded securities, OTC derivatives are almost exclusively traded bilaterally through a network of (private) dealers – usually amongst a group of major banks and securities houses.[4] Dealers stand ready to trade and take positions in various underlying risks, while maintaining a limited net exposure.[5] Market concentration among dealers is high and may have increased as a consequence of major participants exiting the market, such as Lehman Brothers, Merrill Lynch, and Bear Stearns. According to a Fitch (2009) survey – conducted among 26 banks which play a major role in the CDS market – the 5 largest members of this group were responsible for 88% of the total notional amount bought and sold. In the same vein, data from the DTCC data warehouse states that almost 50% of the total notional amount sold may be attributable to the top five dealers (as of April 2009).

Apart from their role as dealers, banks use CDSs mainly for managing their own loan portfolios. For instance, a smaller commercial bank may buy credit protection from a CDS dealer in order to hedge its exposure to a certain corporate borrower. Banks, securities houses, hedge funds and other institutional traders use CDSs also for proprietary trading purposes. Besides banks and security houses, hedge funds constitute a major force in the CDS market. Between 2004 and 2006, hedge funds doubled their market share, with 30% of volume traded overall becoming the second largest group in the market (BBA, 2006).

In contrast to banks and hedge funds, which can be found on both sides of the market, (monoline) insurers such as Ambac or MBIA and large CDS sellers such as AIG provide credit protection but have limited activities in the buy side of the market.[6] Following the insurance principle and taking advantage of their own high ratings, these institutions established portfolios of credit risks, in which losses produced by one contract would be compensated by premiums earned with other contracts. What appeared a viable business model during tranquil times proved particularly vulnerable in the course of the crisis. During the crisis, default risk increased simultaneously for a large number of entities, leaving protection sellers with highly correlated exposures. While being active primarily on one side of the market, monoline insurers accumulated relatively

[3] The DTCC universe is restricted to CDS index transactions and single-name transactions for the 1,000 most common reference entities. The data can be accessed at: http://www.dtcc.com/products/derivserv/data

[4] According to BIS data, some 85% of derivatives contracts overall are traded over-the-counter. This structure is even more pronounced in the case of the CDS market, where exchange-based trading up to date is nearly non-existent.

[5] The ratio of dealer to non-dealer activity cannot be easily gauged, as there is no common definition of a dealer or non-dealer entity and different sources use different sampling methods.

[6] In 2007, activities in the CDS market were often conducted outside of regulated insurance operations.

CDS products

Credit default swaps can come in various forms. **Single-name CDSs** account for the traditional and most common form of CDSs. They are referenced to an individual corporate or sovereign borrower.

Index CDSs are the key product among multi-names. Index CDSs use an index of debtors as reference entity, incorporating up to 125 corporate entities. If a firm in the index defaults, the protection buyer is compensated for the loss and the CDS notional amount is reduced by the defaulting firm's pro rata share.

Tranched index CDSs are referenced to a specific segment of the index's loss distribution. Typically, a tranche will be exposed only to portfolio losses that fall into a medium range of possible losses, e.g. between 3 and 7 percent. Portfolio losses below 3 percent will then be borne by more the junior tranches, while losses exceeding 7 percent will be borne by tranches that are more senior.

Sources: DBR, Amato & Gyntelberg (2005), Kiff et al. (2009)

CDS indices

CDSs linked to indices of corporate debtors have become increasingly popular during the past years. Important indices include the North American CDX index and the European iTraxx index families.

The CDX (US) includes the most liquid names covering North American Investment Grade, High Yield, and Emerging Markets single name credit default swaps.

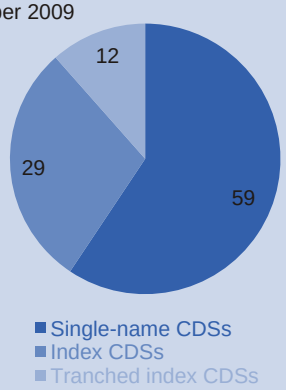
The iTraxx (Europe) index covers a basket of the most liquid names outside the US, covering Europe, Asia, Australia and Japan.

Other indices include LCDX (US), LevX (Europe), ABX (US), CMBX(US), MCDSX (US), and SOvX.

Sources: DBR, ECB (2009)

Shares of major CDS products

Share of CDSs covered by DTCC, October 2009



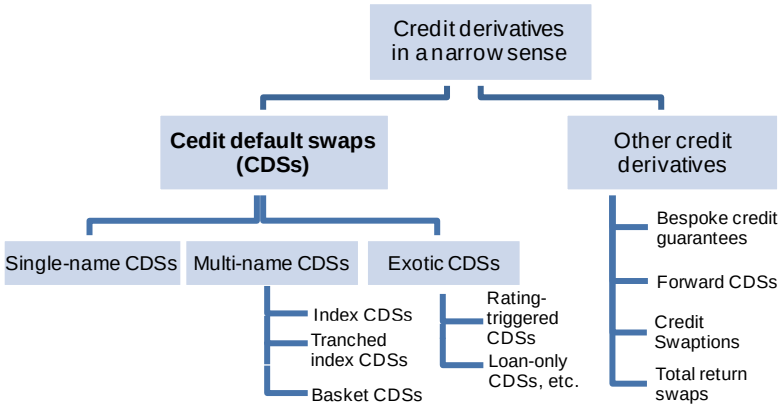
Source: DTCC data, DB Research calculations 7

large amounts of net exposures. By the end of 2007, AIG, MBIA and Ambac, which are among the largest players in this field, accounted for roughly USD 1,050 bn of credit protection sold.[7]

Various forms of CDSs and other credit derivatives

Credit default swaps can come in various forms depending on the underlying reference entity and any other varying contractual definitions. The two most commonly used groups include CDSs based on single-name corporate or sovereign borrowers, and CDSs referenced to various entities (multi-name CDSs). Single-name and multi-name CDSs constitute also the dominant form of "credit derivatives" – the wider category to which CDSs belong. According to the BIS Triennial Survey (2007), single and multi-name CDSs add up to about 88% of the overall credit derivatives market. A survey conducted by the British Bankers Association (BBA, 2006) finds that 63% of credit derivatives are either single-name or index products.

While single-name contracts account for the majority of all trades, multi-name contracts have become almost as popular during recent years. The rapid growth of this market segment is due to index trades being used increasingly for trading purposes as well as for proxy hedges.[8]



Besides plain CDSs, such as single-name or index CDSs, more sophisticated products exist. Credit derivatives include also funded and unfunded synthetic collateralized debt obligations (CDOs) offering tranched claims to a portfolio of CDSs, or in the form of tranched index CDSs on a CDS index. Following the crisis, demand for the more complex structures, such as CDOs on CDOs – often called CDOs-squared – appear to have ceased (Fitch, 2009). By contrast, the simpler tranched index CDSs continue to be widely used. According to DTCC numbers from October 2009, tranched index CDSs account for a significant share of the credit derivatives market representing 12% in volume terms.

In addition to the CDS "spot market" there is also a market for options and forwards written on CDSs. Options on CDSs, so called Credit Swaptions, give the buyer the right but not the obligation to receive or sell protection for a predetermined premium, whereas

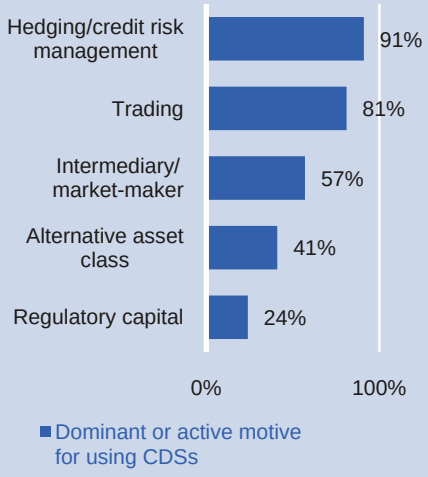
[7] A large fraction of protection sold comprised guarantees to structured investment vehicles, such as CLOs, CDOs or other ABS, which do not show up in the common CDS statistics provided by the BIS, ISDA or DTCC.

[8] Proxy hedging refers to the practice of buying protection for a reference entity whose default risk is closely correlated to the risk in question, for which a direct hedge in turn is not readily available.

CDS forwards oblige the parties to buy or sell CDS protection in future at a certain price. Finally, there exists a significant fraction of bespoke credit derivatives which does not show up in the common CDS statistics. This group comprises guarantees written on bank credit portfolios, but also guarantees to structured investment vehicles, such as CLOs, CDOs or other ABSs.

The economics of CDSs revisited

Motives for using CDSs
Percentage share of global banks, survey data



Source: Fitch Ratings (2009), own calculations 8

This section provides a quick review of the theoretical underpinnings governing the use of CDSs. For obvious reasons, the financial crisis has shifted the focus of public debate onto the risks rather than the benefits of using CDSs. While many of the potential drawbacks had already been discussed in academic work prior to the crisis, some became evident only during this very period. Giving proper recognition to the lessons learned we deem it worth recalling the economic benefits of CDSs, which led to the widespread acceptance of these instruments in the first place.

CDSs as a risk management tool

Suppose a sound and prosperous corporate borrower wishes to take out a loan with its local bank. The bank, however, has already large exposures to this borrower or the industry in question and does not want to further expand its loan book, as this would mean increasing concentration risk. One way to avoid concentration risk and nevertheless grant the loan is to buy credit protection via a CDS. Such a form of hedging enables the bank to pass on its credit risk to another bank, which may not be able to directly do business with the corporate borrower but wishes to gain exposure. By offering CDS protection, it nevertheless becomes exposed to the credit risk of the corporate borrower. All three parties involved, the bank granting the loan, the bank providing protection and the borrower may benefit from such a transaction.

CDSs complement traditional hedging methods

Compared to traditional hedging methods such as portfolio diversification, asset securitisation or outright loan sales, CDSs do not require the protection buyer and the seller to adjust the underlying loan portfolios. Instead, credit risk exposure can be managed by arm's length transactions at relatively low cost, leaving the bank-customer relationships unaffected.[9] Moreover, the protection buyer can use CDSs to free regulatory capital. By buying CDS protection, credit risk of the reference entity is replaced by the risk of the CDS counterparty failing. If this means a true reduction in risk exposure, less capital will be committed to the loan, which in turn frees capital for other productive investments.

CDSs as a trading instrument

Investors are better able to gain access to credit risk

The buyer of credit risk protection does not necessarily need to be exposed to the underlying risk when entering into a CDS contract. CDS may also be used for pure trading purposes, where traders try to exploit possible mispricing between different asset classes or take open positions if they believe the market will evolve in a certain direction. Similarly, sellers of credit protection are able to gain access to the credit market via an arm's length financial transaction. By using CDSs, they do not have to prefund their exposure (except

[9] This does not take into account moral hazard, which possibly leads to reduced screening and monitoring efforts on the part of the protection buyer. (Franke and Krahnen, 2009).

for the posting of collateral) and do not bear interest rate risk generally associated with the purchase of bonds or the extension of loans.

Trading increases market liquidity

Through trading, the CDS market generally becomes more liquid, improving not only the chances of protection buyers and sellers finding a contract partner, but also enhancing pricing efficiency. On the other hand, it has been argued that excessive trading may distort the pricing mechanism and reverse causality by forcing corporate or sovereign borrowers to pay excessively high rates on their debt. A later section will look into this argument in more detail.

CDS spreads as a measure of credit risk

In an ideal world, CDS spreads and risk premia in the bond market should show similar behaviour due to the integration of both markets via the possibility of arbitrage. Given risk premia from bond yields, little should be learned from CDS spreads. In practice though, the two indicators reveal significant differences for various reasons. First, bond yields are influenced by many other factors apart from credit risk, notably interest rate risk and liquidity risk, which require distinct assumptions before their implied probabilities of default can be extracted. Likewise, CDS spreads do not easily translate into default probabilities, due to uncertainties concerning recovery values[10], counterparty risk or the pricing of specific contractual details. Moreover, CDSs allow credit risk to be separated from interest rate risk, thereby excluding one source of uncertainty in the underlying pricing mechanism.

CDS and bond spreads complement each other

Hence, the two instruments provide for two complementary sources of information. A number of studies conclude that on balance CDS spreads display the more favourable characteristics as a market indicator of distress. Based on rigorous empirical analysis, these studies find that CDS spreads tend to lead the signals derived from bond markets.[11] For riskier credit, CDSs seem to be more liquid than their underlying reference entities, as indicated by lower bid-ask spreads in the CDS market.[12] In addition, anecdotic evidence suggests that CDS trading tends to continue during periods of distress, in times when liquidity in bond markets may be severely restricted.[13]

CDS spreads are widely used as a metric to assess credit risk

Due to their favourable characteristics, CDS spreads have gained widespread acceptance as an important indicator of distress. Other examples include the prices charged for government guarantees for debt issues of banks hit by the financial crisis or the rates demanded for corporate credit lines, both of which have been directly linked to CDS spreads. Likewise, rating agencies use information derived from CDS prices to calculate “market implied ratings”. Thus in practice, CDS spreads serve as an important source of information for private banks, central banks, supervisors and international organisations alike.

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[10] For possible pitfalls in using fixed rate recovery assumption see Singh and Spackman (2009).

[11] Blanco, Brennan and Marsh (2005) find that price discovery takes place primarily in the CDS market. Hull, Predescu and White (2004) find that the derivatives market tends to anticipate future rating events, with either credit spread changes or credit spread levels providing helpful information in estimating the probability of negative credit rating changes. Zhu (2006) suggests that in the long run credit risks are equally priced between the two markets. Yet in the short run, the derivatives market tends to lead the cash market. Longstaff et al. (2003) as well as Alexopulou (2009) obtain similar results.

[12] See Kiff et al. (2009).

[13] See Becker (2009).

CDSs as a means of allocating risks more efficiently

In theory, CDSs help to spread risks more efficiently, …

The traditional view states that CDSs help to shift risks from those who hold highly concentrated portfolios to those who benefit from taking on additional exposure. As a result, risks are distributed across institutions and countries leaving the individual institution better diversified and thus more robust to the failure of an individual borrower.[14] For instance, during the years 2001 and 2002, when a high number of corporate bankruptcies threatened to strain the financial sector, CDSs turned out to be a mitigating factor. In the case of Enron, Swissair and Argentina CDSs helped to ease the strains put on the financial system.[15] To the extent that the protection sellers were able to assume the exposure at a lower cost than the original lender (because of a differently structured credit portfolio) the overall costs of bearing the risk was reduced. Thus, by enhancing risk distribution within and outside the financial system, the use of CDSs potentially reduces borrowing costs and increases credit supply for corporate and sovereign debtors.[16]

Possible externalities from the CDS market

… in practice though, additional conditions need to be met

During the crisis of 2007-2009 it became clear that the mere existence of a CDS market was not a sufficient condition for achieving a more stable financial system. There are several reasons for this. First, CDSs may have contributed to an alignment of risk profiles across financial institutions, thereby increasing the institutions' vulnerability to common (systemic) shocks. Second, as the cases of AIG and monoline insurers have shown, credit risks may have piled up in certain parts of the financial system, that did not have adequate organisational or financial capacities to deal with those risks. Finally, by increasing counterparty risk, while at the same time leaving market participants largely uniformed about this risk, CDSs may have constituted a further channel for spill-over effects possibly adding to the system's vulnerability. As the crisis demonstrated, the full benefits of enhanced risk diversification cannot be reaped until the deficiencies mentioned have been rectified. Current regulatory and industry initiatives thus try to establish the means necessary to minimise possible externalities of the CDS market. We will discuss the implications for financial regulation in a later section.

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[14] This argument does not necessarily extend to the overall riskiness of a bank, as it assumes that banks hold constant their risk appetite and do not take on more risk as a consequence of having access to credit insurance. For instance, Instefjord (2005) finds that banks with access to a richer set of credit derivatives tend to be more aggressive in taking on risk. In a similar vein, Hänsel and Krahnen (2007) suggest that credit securitisation goes hand-in-hand with an increase in the risk appetite of the issuing bank.

[15] See Effenberger (2004).

[16] Empirical evidence is mixed with regard to the effect of CDSs on the cost and availability of corporate loans. For instance, Hirtle (2009) finds a small positive effect on the supply of newly negotiated loans to large corporates. The impact is primarily on lending conditions rather than loan volume. Ashcraft and Santos (2007) find a small positive effect of the use of CDSs on corporate borrowing costs, for transparent firms, while finding a negative effect for risky and opaque firms. The authors argue that this result is most likely due to reduced incentives to screen and monitor credit risks once the lender has bought credit protection.

Top 5 CDS dealers

USD bn, CDS notional amounts bought and sold, 31 March 2009

J.P. Morgan	**7,502**
Goldman Sachs	**6,600**
Morgan Stanley	**6,293**
Deutsche Bank[1]	**6,191**
Barclays Group[1]	**6,033**

[1] Data as of 31 December 2008.

Sources: ECB (2009), 10-Q SEC filings

Counterparty risk and systemic stability

CDS were invented to hedge and trade credit risk. The idea is fairly simple: One side pays the other for assuming the risk that an underlying entity fails. In principle, this allows hedging against credit risk on one side and participating in the credit business by means of an arm's length financial transaction on the other side of the market. However, credit risk is not the only factor governing the use of CDSs. The fact that at least two parties enter a CDS contract introduces another dimension of risk, i.e. that of a counterparty failing to honour its obligations.

To begin with, we would like to dispense with a general misconception that if one counterparty fails, the other has to bear a substantial loss: This is *not* generally the case, as long as the surviving party has the chance to seek coverage with or provide protection to an alternative partner at similar conditions. Only if there is a joint default of both the underlying reference entity as well as the protection seller, is the party that has bought protection potentially left with an uncovered loss (not including offsetting collateral positions). This case highlights the necessity to distinguish between credit and counterparty risk. There can be a materialisation of either credit or counterparty risk in isolation or a joint occurrence. The following table provides an overview of the main incidents and their possible consequences with respect to default of the reference entity and/or the contractual parties.

Credit and counterparty risk

Reference entity	Protection buyer	Protection seller	Consequences
×			**Orderly settlement:** The protection seller provides and the protection buyer receives compensation.
	×		**Replacement:** The protection seller loses the premiums outstanding; the protection buyer loses coverage.
		×	The respective surviving partner may replace the contract, possibly at a higher cost. In constrained markets, it may be difficult to find a replacement at an adequate price.
×		×	**Uncovered loss:** The protection buyer loses protection and bears a loss if exposed to the reference entity. In the run-up to a default, credit risk may adversely impact on counterparty risk.

× = default

Source: DB Research 9

Before turning to the severe – but remotely possible – case of a simultaneous default of both the reference entity and the protection seller, we consider the more benign cases where either one of the contracting parties defaults, but the reference entity remains intact. In this case, for the respective contractual counterparty, economic risk is confined to the replacement cost of the existing contract. Potential losses for the parties involved may still be considerable if the CDS contract has a high replacement value and the surviving

party cannot off-set its own liabilities vis-à-vis the defaulting counterparty.

Market value as measure of counterparty risk

Upon conclusion of the contract, a CDS usually has a market value close to zero, that is, the (present value of the) premiums are calculated to match the (present value of the) expected losses. Over time, a positive market value for one of the partners will result if the risk of default of the underlying entity deviates from the agreed risk premium. A CDS will then have a positive value to one of the contracting parties – and a negative value of the same magnitude to the other. In recent times, aggregate gross market value has grown considerably, from USD 2 bn in 2007 to more than USD 5.5 bn by the end of 2008. The steep increase over the past years depicted by figure 11 mirrors to a large extent the rise in the underlying credit risks since 2007. Although market value is rising much faster than gross notional value (which has actually been declining since the beginning of 2008) it still accounts for less 20% of gross notional volume.

Compared to CDS notional values, the gross market value of a CDS contract is generally viewed as a more informative measure with regard to counterparty exposure, because it better reflects the costs associated with replacing the contract if the counterparty fails. However, there are several issues that limit the informational value of the data available. For instance, gross market value disregards the possibility of mutual netting in the event of a contracting party failing. Moreover, the measure generally does not consider collateral postings or other liquidation assets that lower the amount at stake. In effect actual counterparty exposure will be less than the gross numbers suggest. Finally, compared to other derivative instruments (e.g. interest rate swaps) CDSs face a relatively large jump risk. Due to the possibility of credit quality deteriorating all of a sudden, actual market value of a contract outstanding can increase (or decrease) relatively rapidly. In case of a looming default of the reference entity, market value will then jump to the amount of the expected loss.

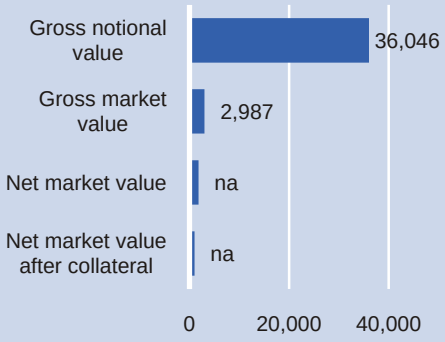
Of course, counterparty risk will also be determined by the ease of finding an adequate replacement for a lapsed contract. The drop-out of Lehman Brothers as a contractual partner provides a case in point. In the midst of the crisis, former business partners of Lehman's found it difficult to replace their contracts, as some of the dealers were restrained in their ability to take on additional risk themselves.

Interaction of credit and counterparty risk

Although they represent two distinct analytical concepts, counterparty risk and credit risk of the reference entity are not independent of each other. This is due to credit risk – by the very nature of a CDS contract – affecting the two contractual parties asymmetrically. A rise in credit risk of the underlying entity will lead to a reduction of the CDS's market value for the protection seller, while increasing it for the protection buyer. In effect, the protection buyer is left with a larger amount at stake, while the probability of its counterparty to fail has risen.

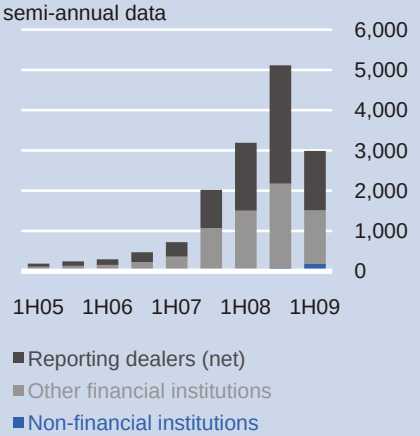
In addition to this direct channel of credit risk impacting on counterparty risk, there is an indirect channel through the obligation to post collateral, i.e. to fulfil margin requirements. Margin requirements are intended to reduce the very risk that a default of the parties poses to his or her counterparty. The protection seller will have to post additional collateral if either its own rating or the rating

Measures of counterparty exposure
USD bn, June 2009



Sources: DB Research, BIS **10**

CDS gross market values
USD bn, gross market values, semi-annual data



Source: BIS **11**

Margin requirements

In order to reduce counterparty risk, CDS contracts generally oblige the protection seller to post collateral (margining).

According to ISDA standards, margin requirements are risk sensitive. That is, they are high if the reference entity's default risk is high and low otherwise. Likewise, a highly rated protection seller has to post less collateral compared to one with a low rating.

Since both default risk and counterparty risk vary over time, margin requirements will be adjusted on a regular basis. Additional payments will be necessary if counterparty or credit risk increases. Likewise, payoffs will be due if risk decreases.

To the extent that the protection seller faces counterparty risk (i.e. the contract holds a positive market value for the protection seller) the protection buyer may likewise be obliged to post collateral.

of the reference entity declines. For the buyer of CDS protection such a mechanism makes perfect sense. Because if default is nearing – of either the reference entity or the contractual partner – it wants to be sure that eventual claims will be honoured. On the other hand, for the protection seller this can mean that rising margin requirements eventually eat up existing liquidity buffers.

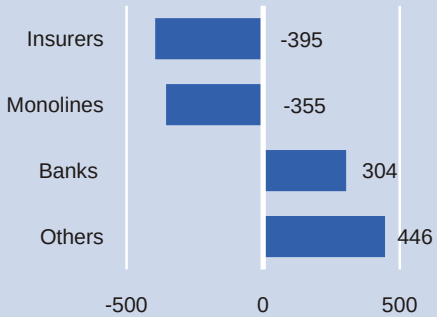
The case of AIG provides a prominent example of credit risk adversely impacting on counterparty risk. Before September 2008, AIG had the fourth-highest rating (AA-) and according to ISDA standards had to post relatively little collateral. During that time AIG had sold CDSs referenced to a huge variety of different assets, among them, CDSs on CDOs that mostly consisted of US mortgage debt including subprime mortgages. When the US subprime crisis hit, AIG had to mark down its assets at the same time as it was marking up its liabilities to fulfil collateral claims. In September 2008 the rating agencies cut its credit rating and as a consequence AIG's counterparties demanded even more collateral. At one point, the collateral calls on CDSs exceeded AIG's ability to pay, with the company not being able to honour its contractual commitments to other financial partners either. Because AIG was not able to raise additional liquidity it had to turn to the US Federal Reserve Bank (Fed) for assistance. Finally, AIG was bailed out by the Fed not least due to the risk feared of a further spreading of problems to other institutions. Had AIG not been rescued, there would have been a joint default with Lehman, which actually defaulted the weekend before AIG was rescued. Participants that had previously bought protection from AIG would have been left with an uncovered exposure vis-à-vis Lehman.

Multiple transfer of credit risk

In the following, we would like to address another misconception regarding credit exposures linked to CDSs, notably that a large amount of gross notional value outstanding is equivalent to large credit risks borne by the financial sector. This is generally *not* the case to the extent that market participants further pass on the risk they assume, for instance in their role as CDS dealers. Gross notional volume thus reflects past trades but provides little informational value whatsoever concerning current credit risk borne by a financial institution. The more relevant measure of credit risk is net exposures, which generally constitutes a mere fraction of gross volumes outstanding.[17]

The implications of net versus gross exposures can best be visualized by a stylized example: Assume company B buys credit protection from dealer C, which hedges its exposures with dealer D, while D passes on the risk to monoline insurer E (*Case 1*). In this case three individual contracts have been written, yet, in economic terms, only one party – at the very end of the risk transfer chain – bears the risk that the underlying entity defaults. At the same time, aggregate gross notional value has been inflated to three times the aggregate net exposure. By contrast, consider *Case 2*, where there are two contracts, but neither of the protection selling parties passes on its risk to another company. Under these circumstances, net notional amount equals gross notional amount. Both C and E bear the economic risk that the reference entity defaults.

Who bears the credit risk?
USD bn, net protection bought by sector, December 2006



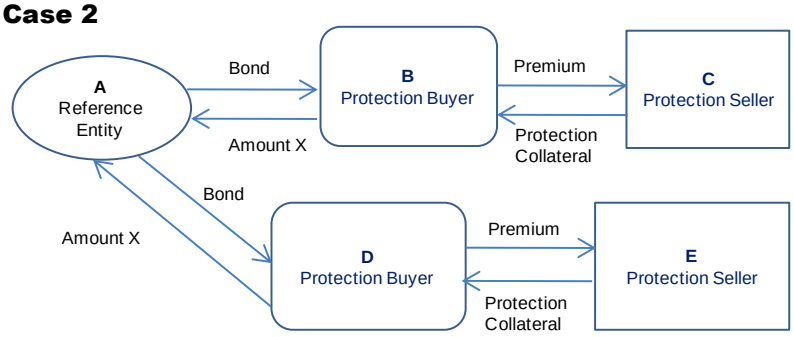
Sources: Fitch Ratings (2007), DB Research calculations

12

[17] The net numbers reported generally do not completely match the actual risk transfer, as the legal feasibility of netting as well as contractual differences, such as maturities or credit event definitions, are not properly taken into account (Kiff et al. 2009).

Case 1

Case 2



Our simple example demonstrates how gross numbers fail to gauge credit risk borne by financial institutions when risks are repeatedly transferred. Institutions which are active in the CDS market often maintain various contractual ties, which involve the buying and selling of credit protection referenced to several underlying entities. And in practice, credit risk transfer arrangements resemble complex webs rather than the linear chains described in our sample. But also within these webs the underlying principle of net credit exposure remains intact.

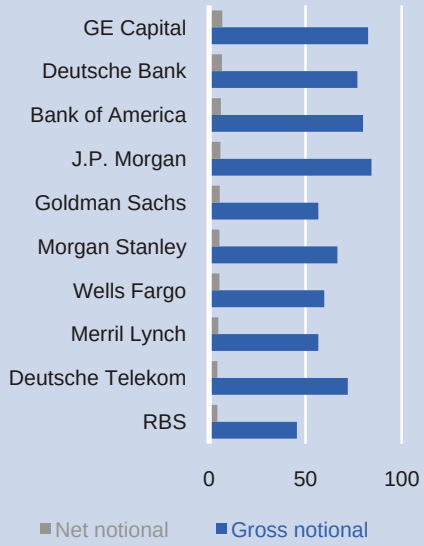
Implications for systemic stability

So far we have considered in isolation the role of multiple risk transfer with regard to *credit risk*. The question is how repeated transfer of credit risk affects *counterparty risk* and whether there is a "systemic" factor, which makes a long and complex risk transfer chain more risky than the sum of its parts. After all, each individual buyer or seller of protection is left with the risk that his or her partner defaults.

As noted earlier, the failure of one dealer within the risk transfer chain may not be much of a problem if another quickly assumes its role. But there may be a true systemic effect due to credit and counterparty risk interacting as described above. Here, the structure of the market plays a crucial role. Since many of the larger players serve both as counterparty as well as a reference entity, there can be an intense interaction between counterparty and credit risk. At least six out of the top 10 corporate reference entities are in the corresponding group of top CDS dealers (see figure 13). Thus, once a member of this group fails, the others will be affected through both counterparty as well as credit exposure. In such a situation it will be difficult to find adequate replacements, since other dealers are likely to be affected too.[18]

Additional problems may arise if market participants grope in the dark as to how large exposures of their respective counterparties

Top 10 corporate reference entities
USD bn, ranked by net notional value, October 2009



Sources: DB Research, DTCC data 13

[18] In addition to credit risk impacting on counterparty risk, recent studies introduce the concept of "risk circularity" or "wrong-way risk", which refers to a situation where counterparty risk affects credit risk. The typical example involves a CDS referenced to a sovereign, which is written by an institution that itself enjoys implicit or explicit backing from the sovereign at hand (see ECB, 2009; and Duquerroy et al. 2009).

are. In extreme cases, difficulties in assessing counterparty risk may lead to the drying-up of formerly liquid markets or run-like phenomena. That is exactly what happened after the US subprime bubble burst, when European and US interbank markets collapsed.

Means of enhancing systemic stability

Up to this point, we have addressed the origins of systemic risk in CDS markets, with particular emphasis on the interactions between counterparty and credit risk. We will now turn to the means which possibly enhance systemic stability and avert some of the problems described above. Two mutually complementary approaches seem to emerge from the literature, and they have also found their way into the regulatory arena. On one hand, it is argued that enhanced transparency would lower the risk of excessive market reactions. On the other hand, there seems to be a case for reducing counterparty risk through mutual netting and central clearing. The following gives a selective introduction to these issues.

The case for enhanced transparency

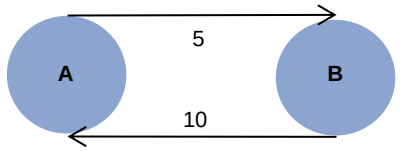
The failure of Lehman Brothers provided a vivid example of how insufficient transparency may lead to market reactions overshooting. Prior to Lehman's failure there was an estimated USD 100 bn to USD 600 bn of CDSs outstanding on Lehman debt. When Lehman collapsed on September 15, 2008, there was major uncertainty about how much net exposure existed and who was bearing the risk. Without sufficient cash to settle the contracts, it was feared that Lehman would drag down further institutions that had sold protection previously. Adding to the general uncertainty was the fact that Lehman served both as a reference entity as well as a trader of CDS contracts. Following Lehman's bankruptcy, world stock markets plummeted, and Lehman's sudden disappearance gave rise to an unprecedented confidence crisis in world financial markets, which in due course could only be resolved by massive state intervention.

Ultimately, consolidated data showed a gross volume of CDSs outstanding totalling USD 72 bn. Such information had only been released after Lehman's collapse.[19] It turned out that Lehman`s outstanding bond debt, totalling USD 150 bn, was much larger than CDS net exposures referenced to Lehman. The net exposure upon settlement was merely USD 5.2 bn (DTCC). Thereof, a large fraction had already been set aside in the form of collateral postings further lowering the amount that finally changed hands upon settlement. In fact, trade replacement costs for Lehman counterparts turned out to be more substantial than credit losses borne by those who had sold CDS protection on Lehman Brothers.

Of course, one can only speculate about how markets would have reacted if the total amount at risk was known beforehand. However, it seems that enhanced transparency can play a crucial role in guiding markets to take informed actions rather than acting in panic.

Bilateral closeout netting

Counterparty risk exists to the extent that an OTC contract has a positive replacement value. The stylized example below shows two contractual partners and their respective counterparty exposures.



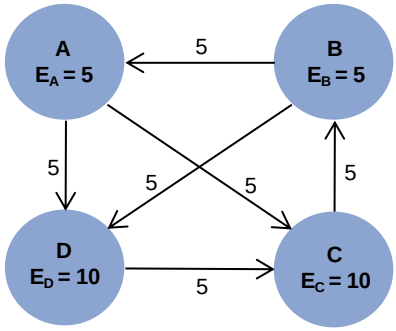
In this example, A loses USD 10 and B loses USD 5 if the other party fails, respectively. Bilateral closeout netting offsets the mutual claims in case one of the counterparty fails. If closeout netting is agreed, A loses USD 5 and B loses USD 0.

Source: IMF (2009) pp. 102-103

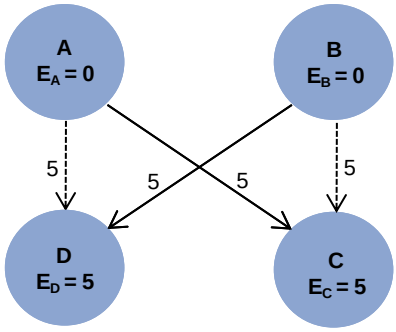
[19] Ever since, the DTCC has published data on individual reference entities, gross and net volumes of CDSs outstanding. The DTCC is a central repository unit, providing clearing and settlement services to its members. Unlike a central counterparty, the DTCC does not step in if one of the contractual parties fails.

Trade compression

The following example assumes that bilateral closeout netting is agreed among all four parties.



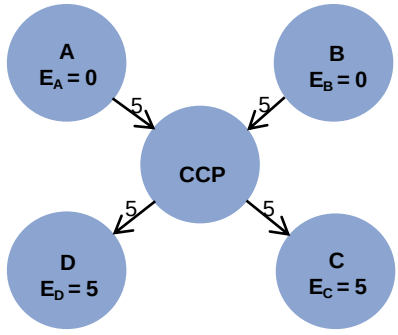
Counterparty risk can be further reduced if redundant trades are terminated. There are two possible solutions to this (solid and dotted lines respectively), which leave each A and B with zero counterparty exposure, and D and C with exposures of USD 5.



Source: IMF (2009) pp. 102-103

Central counterparty (CCP)

In the following example all trades go through the central counterparty (CCP). Again A and B have zero exposure, while D and C have an exposure of USD 5, respectively.



However, instead of being exposed directly to another market participant, D and C are exposed to the CCP.

Source: IMF (2009) pp. 102-103

The case for trade compression and centralised clearing

There are several ways to reduce counterparty risk in CDS markets. Common to many of them is the idea of minimising the number of redundant contracts, i.e. past trades that were made to reach a certain net risk position. Towards this end, third party operators such as TriOptima and CreditEx offer services to reduce outstanding trades, so called trade compression. In addition to calculating net risk positions, these companies assist their customers in actually closing redundant trades. With trade compression, participating traders provide detailed information on their specific positions, while the service provider figures out a set of trades that would be in the interest of all participating traders. Traders are then asked to accept the deal, which upon acceptance becomes compulsory for all parties. Only if all participating traders accept the proposed offer, will the trades be executed.

Such a form of multilateral consolidation is an effective instrument for coordinating actions of the participating members. It helps to reduce the number of outstanding contracts, reducing counterparty risk and bringing gross exposures closer to the net risk positions. The introduction of a central counterparty (CCP) takes the idea of mutual netting one step further. Here, a new player is introduced, that serves as a contractual partner to both parties entering into a CDS trade. While trading may still take place over-the-counter, i.e. finding a trading partner and agreeing upon conditions on a bilateral basis, the trade is then processed via the CCP. The CCP will step between the two trading parties, replacing the established trade with two matching contracts. In addition to providing mutual netting, the CCP substitutes bilateral counterparty risk for the risk that the central counterparty itself fails. Of course, this places the burden of counterparty risk management on the shoulders of the CCP and its members. For the CCP this means closely monitoring default risk of its trading members and setting adequate margin standards.

Possible means of reducing counterparty risk

Trade compression	Central counterparty
More than two market participants net and closeout their mutual exposures in order to eliminate redundant contracts and reduce counterparty risk.	An additional player is introduced, which guarantees fulfilment of the contract and stands ready to open or close positions.
Decentralised solution to netting and clearing, where trading takes place over-the-counter.	Centralised solution to netting and clearing, where trading may still take place over-the-counter.
Counterparty risk remains with the contractual partners.	CCP assumes counterparty risk.
Relatively low margin requirements, but possibly high capital charges.	Relatively high margin requirements, but possibly low capital changes.

Source: DB Research

The obvious advantages of a CCP in mitigating counterparty risk, however, come at a cost. Notably, market participants have to ensure an adequate capitalisation of such an institution to enable an absorption of potential losses – including eventual mutualisation of losses if a member of the clearing facility fails. In order to reduce counterparty risk, the CCP will need to demand adequate margins, ask for an ex-ante commitment to cover the costs if one of the clearing members fails, and be adequately capitalised. In effect,

overall costs may exceed those previously paid for bilateral processing of OTC contracts, and the CCP itself may become systemically relevant.

Finally, centralized clearing requires a certain degree of product standardisation. Although the major market participants have recently agreed to adhere to enhanced standards and increasingly use standardized products, also in future many customized contracts will not be suitable for clearing via a CCP. Many end-users are highly dependent on solutions tailored to their specific needs and would face significant costs if they were forced to use standardized products.[20]

CDS trading and price efficiency

Some commentators have called into question the use of CDSs for trading purposes as opposed to hedging. Opponents of CDS trading claim that hedging serves a useful economic purpose, notably to shield the lender from potential losses. Trading on the other hand potentially distorts markets, raises systemic risk and creates all kinds of negative externalities.[21]

In this context the term "naked CDS" has been coined, which refers to buying CDS by someone who neither owns the underlying bond nor is otherwise exposed to credit risk of the reference entity. Usually the buyer of naked CDS protection tries to exploit arbitrage opportunities, e.g. differences in risk pricing between the bond and the CDS market, or to take a position to benefit from a rise in credit risk. From an analytical point of view it is not clear whether selling protection without owning the underlying reference entity does more harm than good and it is worth examining the arguments for and against CDS trading more thoroughly.

Price efficiency

CDS trading has been blamed for distorting markets, …

Following the collapse of Lehman Brothers sovereign risk premia for many developed countries, including the US, Japan and members of the European Union, rose sharply between September 2008 and March 2009. Observers noted that the rise in sovereign spreads bore little relation to these countries' economic fundamentals and may have been the result of excessive trading.

… yet, price efficiency is difficult to judge

Speculative motives as well as proxy hedging have been blamed for apparently high sovereign spreads. Instead of directly hedging counterparty risk for the financial sector, investors may have preferred to (proxy) hedge by buying relatively cheaper protection on the respective sovereigns, thus driving the spreads up. Moreover, investors may have speculated that sovereigns would be affected via fiscal outlays or the granting of public guarantees to stabilise the banking system, leading to higher ex ante spreads.

It is not clear, however, whether the rise in CDS spreads was fundamentally warranted or the outcome of speculative forces given the information set at hand. The countries with high public debt-to-GDP ratios, large current account deficits and declining international cost competitiveness were the ones with the widest sovereign bond

[20] In several letters to members of the US Senate, the "Coalition for Derivatives End-Users" argued that they would be hard hit by centralised clearing being made mandatory.

[21] Among others, see Buiter (2009). Should you be able to sell what you do not own? Financial Times. March 16, 2009.

and CDS spreads. It appeared that the country-specific fiscal and external positions were the main drivers in the widening of sovereign bond and CDS spreads. In addition, to the extent that sovereigns were exposed to risks in the banking sector, e.g. in the case of Ireland, CDS spreads may have accurately reflected the hike in systemic risk and possible burdens created by government intervention.[22]

The question whether CDS trading leads to the mispricing of credit risk thus boils down to the more general dispute on how much faith should be put in the outcome of market processes. There are very few cases where in fact a clear link can be drawn from CDS trading to undesired effects in the market. In the following we will look at two distinct cases, notably physical settlement and the "empty creditor" problem.

CDS settlement effect on bond prices

The increasing use of CDSs for trading purposes has led to situations where the notional amount outstanding of the CDSs exceeded that of the underlying bond. For instance, at the beginning of 2009, CDS notional amount outstanding referenced to General Motors (GM) was about USD 65 bn, which compared to a face value of GM's debt outstanding of USD 45 bn.[23] Such a large volume of CDSs outstanding does not pose a problem per se as CDS contracts may coexist with the underlying reference entity.[24] However, if the CDS contract was made for trading purposes and physical settlement was agreed upon, then the protection buyer would need to find the (defaulted) bond on the market following the credit event. Unfortunately, with a high degree of trading, many contract partners will face the same challenge. Thus if the underlying entity defaults and physical settlement was agreed upon there can be a problem. Since there are fewer bonds than CDS contracts that need to be settled, protection buyers rush to get their hands on the bonds. Bond prices will be bid up due to the shortage in supply and bond prices will not reflect actual recovery rates leaving (naked) protection buyers with an uncovered loss.

This is what happened also in the case of Freddie Mac and Fannie Mae. In the course of the settlement process, bond prices indicated lower recovery rates on subordinated debt compared to senior debt, although recovery rates of senior debt should always be equal to or higher than that of junior or subordinated debt. One explanation was that there was high demand for subordinated debt, while many market participants chose to keep the bonds, which in turn forced higher prices (Fitch, 2009).

In the meantime, market participants recognised those problems and responded accordingly. The International Swaps and Derivatives Association (ISDA) established auction procedures designed to derive a fair settlement price and effectively settle large volumes of CDS contracts. The auctions aim to reveal true expectations with regard to the final workout price. To this end, CDS contractual partners sign-up to an ISDA protocol that defines a two-step auction procedure (see box: Cash auction settlement). Not least due to the increasing use of the auction settlement mechanism, settlement problems – as observed in the case of

ISDA documentation and settlement

Unlike equity shares or bonds, which are traded primarily on regulated exchanges, CDS are traded mainly over-the-counter (OTC). The contracting parties therefore have to agree upon the terms and conditions of the CDS individually – such as definitions of the credit events or settlement procedures. In order to facilitate documentation, and to avoid disputes as to whether a credit event had actually occurred and how a contract should best be settled, CDS contracting parties generally refer to the International Swaps and Derivatives Association (ISDA) Master Agreement. These general terms and conditions – established by the central industry body ISDA – were introduced in 1999 and have been continuously developed since then. A revised version of the agreement was released in 2003, while the latest amendments were made in 2009.

http://www.isda.org/

Cash auction settlement

The auction procedure aims at establishing a price that reflects the expected recovery value of the underlying bond.

In a first step, participants are asked to submit a bid price as well as an offer price at which they are willing to trade the bond. From these numbers the so called "inside market midpoint" is calculated, which is the mean of the best half, that is the highest bids and the lowest offers, respectively. Additional rules ensure that only reasonable quotes are taken into account. Participants also submit the amount they wish to buy or sell.

If bid and ask volumes match at the inside market midpoint, this becomes the final auction settlement price. Otherwise, a second stage is conducted, where auction participants (either the sell or buy side of the market) are asked to submit limit orders. The second stage quotes must lie within a band around the first stage price. The last quote used to match bid and ask volumes becomes the final price. All settlements arranged in the auction are then executed at this price.

Source: Helwege et al. (2009), DB Research

[22] See Becker (2009).
[23] See Helwege et al. (2009).
[24] In the case of weather derivatives, the underlying risk cannot even be traded on a spot market. Nonetheless, hedging and trading via weather derivatives is viable and commonly practiced.

Lehman and the aforementioned Freddie Mac and Fannie Mae – will in future become less of an issue.[25]

The "empty creditor" problem[26]

Bankruptcy codes assume that creditors always have an interest in keeping solvent firms out of bankruptcy. However, with claims being protected by CDSs this incentive diminishes. Opportunistic lenders who hold relatively large positions of CDS protection relative to debt (i.e. traders) may even benefit from a company declaring insolvency. In theory, such morally hazardous behaviour may be of major concern. In practice, though, problems seem to be limited to a few cases.[27]

For instance, in the case of Six Flags – a US theme park operator – creditors declined an offer that would have granted them an 85% equity stake, which was much less than the resulting share after Six Flag had filed for Chapter 11 bankruptcy protection. Similarly, in one of the most prominent cases – LyondellBasell – traders speculated on the filing for bankruptcy of the European parent company after its US subsidiary Lyondell Chemical Co filed for Chapter 11 bankruptcy protection in January 2009. The European parent decided not to do so, since the risk of liquidation following a bankruptcy filing under European law was deemed high. Many investors and CDS protection buyers (agreeing on cash settlement) reacted indignantly, and at least for some investors the reason might have been that a restructuring following Chapter 11 bankruptcy would have been a credit event triggering the CDS payments. Ultimately, LyondellBasell stopped interest payments in February and thereby triggered another form of credit event, for which protected creditors received roughly 98% of the face amount.

The "empty creditor" problem is not confined to CDSs

In all these cases trading was not the original sin. The real problem was that market participants were not informed about the economic interest borne by the institutions involved and that bankruptcy law made no distinction between "empty creditors" and creditors that had a genuine interest in keeping the firm a going concern. In the case of debt restructuring, a sensible step would be to ensure that the economic interest of all parties involved be disclosed and that "empty creditors" are prevented from acting against the interests of genuine debt holders. After all, the empty creditor problem is a more general one and not confined to CDSs in particular. There are in fact a number of strategies, other than using CDS, which allow traders to benefit from the demise of a company, such as buying equity put options or short-selling debt or equity securities.

Implications for financial regulation

The recent crisis has demonstrated that the mere existence of risk transfer instruments does not necessarily guarantee that the market works smoothly and efficiently, and that risks are allocated to those who are best able to bear them. As we highlighted above, further conditions need to be fulfilled in order to reap the economic benefits

[25] According to Fitch (2009) only 13% of survey respondents report that auction settlement prices were too high relative to final workout prices.
[26] The term "empty creditor" in the context of CDS was coined by Henry Hu (2009).
[27] Another issue discussed in this context is how to ensure the monitoring of the original borrower after a CDS protection has been bought. In case of a default the bank obtains compensation, leaving the bank indifferent to a failure of the borrower in the first place.

of enhanced risk diversification and allocation which potentially accompany the use of CDSs. Setting the right incentives, establishing a sound market infrastructure, and enhancing market transparency will be key in ensuring the integrity and stability of the CDS market going forward. As of now, a number of voluntary industry initiatives as well as regulatory proposals are on their way, aiming at these very goals.

EU and US legislators plan to tighten regulation

Following the collapse of Lehman Brothers, legislators in the US and the European Union are preparing regulatory reform to improve market structure and reduce systemic risk in the OTC derivatives market. The proposed legislation aims to enhance transparency and reduce counterparty risk through the introduction of central counterparties and making central clearing mandatory for CDSs. The current debate focuses on the issues of standardisation of OTC contracts, eligibility for central clearing, and the regulation of central counterparties.

Regulators plan to bring CDSs onto central trading and clearing platforms

More recently, EU and US legislators have called for mandatory central trading in addition to central clearing. EU and US official bodies plan to raise capital requirements for derivatives products that are either not centrally cleared and/or not centrally traded. While it is still open to which extent bespoke products will be forced onto central clearing and trading platforms, it seems certain that these products will face additional costs if current proposals are adopted.

In addition to tighter regulation for OTC products, limits on bank ownership of market infrastructure as well as the global number of CCPs, and in particular the jurisdiction under which they fall, are currently discussed, too.

Industry resolved to reducing documentation and settlement risk

Over the years, CDSs have become increasingly standardised thanks to voluntary industry initiatives. The standardisation of OTC contracts aims at reducing operational risks and increasing fungibility of these instruments. As far back as 1999, the central industry body, the International Swaps and Derivatives Association (ISDA), introduced a Master Agreement which established the terms and conditions of standard CDS contracts. Clear definitions of the credit events and settlement procedures were meant to avoid disputes as to whether a credit event had actually occurred or how a contract should best be settled.

Standardisation and settlement procedures have been improved

The latest amendments to this Master Agreement were introduced in 2009 with the so called “big bang” and “small bang” protocols, respectively. Both protocols “hard-wire” specific auction settlement terms to standard CDS documentation. While the “big bang” protocol refers to the default or bankruptcy of the underlying entity the “small bang” protocol refers to a restructuring credit event. Both help to determine a fair settlement value in case of a credit event by means of an auction. Before the new measures came into effect, settlement protocols were established on a case-by-case basis only after a credit event was identified. In addition to the settlement standards, market participants agreed on using only a handful of standardised coupon values for European- as well as US-referenced CDSs. Although standardisation will help facilitate central netting and clearing, it is generally not seen as a prerequisite for ensuring systemic stability.

Central data repositories help enhance market transparency

Typically, information on OTC trades is stored with the contracting parties and not centrally, as in the books of an exchange. By means of a central data repository, however, trading information can be stored centrally and consistently across all market participants. A central data repository will thereby help facilitate novation, mutual netting and trade compression among its members. Moreover, data repositories will also provide detailed information on market activity, quotes and exposures. Such information can be made available to enhance transparency for regulators, market participants as well as the broader public.

Trade repositories have contributed to enhance market transparency

Industry initiatives have led to the creation of central data repositories in the OTC derivatives market. Since October 2008, CDS net and gross values for individual reference entities have been available from the DTCC. Although not all contracts are eligible for storage, it is estimated that the DTCC covers 80-90% of the overall CDS volume traded.[28] The provisioning of such data already represents a great leap forward towards enhancing market transparency and stability.

Broad consensus on facilitating central clearing

There appears to be broad consensus among regulators and the industry: the US legislature and Administration, the European Commission as well as industry bodies, such as ISDA and SIFMA (Securities Industry and Financial Markets association), all welcomed the widespread facilitation of central counterparties (CCPs). Indeed, there is a strong case for the establishment of central counterparties for standardised contracts, as they facilitate multilateral netting and clearing, reducing the number of redundant contracts outstanding and lowering overall counterparty exposure.

While OTC derivatives reforms are passing into law, private-led initiatives are already well underway towards centralised clearing. In the US a number of (standard) CDS contracts may already be traded and cleared via a central counterparty since March 2009. There, the most widely used platform is Intercontinental Exchange (ICE) Trust. More recently, by the end of July 2009, Eurex Credit Clear gained recognition from supervisory authorities in the UK and US SEC and has started to take up trading. Further central counterparties include LCH.Clearnet.SA and Chicago Mercantile Exchange Clearing (CME) which started to operate in December 2009.

Central counterparties (CCPs)

Clearing house	Products available
ICE Trust (US)	US indices
NYSE Liffe/BClear & LCH.Clearnet (US)	European indices
CME (US)	US & European indices, constituent single names
ICE Clear Europe (UK)	European indices, constituent single names
Eurex (DE)	European indices, constituent single names
LCH.Clearnet.SA (FR)	European indices, single names at a later stage.

Source: ECB (2009)

Introduction of a central counterparty poses new challenges

Notwithstanding the obvious benefits of a central counterparty, there are a number of challenges that come with it. Following regulatory proposals to make central clearing mandatory for products that are eligible for central clearing, the key questions are: who will be defining eligibility and which products will be eligible? Taking into account that many end-users are highly dependent on solutions tailored to their specific needs, any regulation regarding eligibility for central clearing should be designed with care in order not to choke the segment of bespoke contracts.

Further challenges arise as to how and by whom potential losses of a CCP are borne in the case of a member defaulting. Essentially, there are three lines of defence: in the first instance, collateral posted by the defaulting member will be realised. Thus, the

[28] See Kiff et al. (2009), p. 6.

robustness of the CCP crucially depends on its ability to adequately judge counterparty risk and set margins accordingly, the ability of the members to support the default process as well as the CCP's own capitalization. In order to ensure systemic stability it will be key to prevent regulatory arbitrage between jurisdictions and to avoid a race to the bottom regarding margin requirements and capitalization of competing CCPs. Ownership structure of a CCP matters, as the owners of a CCP ultimately have to step in if losses exceed the CCP's existing mutualisation arrangements.[29] Finally, there is the question of defining and establishing an optimal number of CCPs[30] and ensuring interoperability between the different clearing platforms.

No need to force CDS trading onto exchanges

Central clearing is more relevant than central trading for achieving systemic stability

Recently, the European Commission set out future policy actions that would force the OTC derivatives market into a more exchange-like structure. The proposed measures would call for standardised products to be centrally cleared and traded on exchanges or electronic trading platforms as defined by the Markets in Financial Instruments Directive (MiFID). Other contracts that are not suitable for exchange-based trading and/or clearing via a central counterparty (CCP) would require higher collateral and capital backing. The Commission's communication follows proposals made by the G20 and the US to "incentivise" banks to increasingly standardise and trade derivatives via electronic trading platforms. It adds to earlier communications in which centrally organised clearing via CCPs and the central collection of trade data were deemed the primary means to enhance systemic stability.

However, whether centralised trading will be needed in addition to centralised clearing to enhance market stability remains an open question. Increased market transparency, at least with respect to credit and counterparty exposure, can be achieved through the establishment of central counterparties or even central trade repositories. Multilateral netting as well as clearing also is not dependent on trades being executed via central trading platforms. Thus from a systemic point of view, the case is much weaker for centralized trading than for centralized clearing.[31]

Market participants would face considerable costs

Furthermore, the new rules would impose considerable costs on market participants – especially on those dependent on tailor-made solutions, as centralised trading would require a much higher degree of standardisation compared to centralised clearing.

Restrictions on CDS naked selling would be counterproductive

Although restricting naked selling would obviously eliminate the associated problems, it is not clear whether restrictions or outright bans should be the preferred means to address the shortcomings perceived in current market practice. It would be difficult to distinguish between hedging and trading activities as holding a bond, extending a loan, being exposed via counterparty risk or using CDSs as a proxy hedge all qualify as having an insurable interest. Further difficulties would arise with regard to the use of multi-name CDSs. How would insurable interest be determined if CDSs were

[29] In addition, there could be strong incentives from those dealers who hold a stake in central counterparties to make sure they are indeed efficient.
[30] For instance, Duffie and Zhu (2009) argue against a number of distinct new CCPs dedicated to credit default swaps.
[31] The FSA (2009) develops a similiar argument.

referenced to a basket or index unlikely to match the insurable interest of a single institution?

In addition to the operational challenges described above, restrictions on CDS trading are likely to reduce market efficiency. Trading ensures that markets are liquid and prices are updated on a frequent basis. With trading restricted, CDS markets would be shallower and probably more vulnerable to manipulation. After all, trading brings additional liquidity to the markets and helps to ensure the efficient processing of information. Those who wish to hedge can do so at a lower cost and are able to find contracting partners more easily if traders are present.

Address market failures rather than abolish (parts of) the market

Taking into account the difficulties and costs associated with restricting the CDS market, there are probably better ways to deal with the shortcomings perceived. Policies that aim at minimising negative externalities of CDS trading should identify and address the origins of market failures, rather than abolish (parts of) the market.

Conclusions

Prior to the crisis, markets made increasingly use of CDSs to hedge and trade credit risk. Between 2005 and 2007 notional volume outstanding rose from slightly more than USD 10,000 bn to almost USD 60,000 bn (BIS data). Although notional volumes have declined since the 2007 peak, the data shows that even in the midst of the crisis and thereafter CDSs continued to be used widely.

The experience gathered during the crisis significantly contributed to a better understanding of the market for credit default swaps. On the one hand, it became clear that notional volumes outstanding greatly exaggerated credit risk borne by the financial sector as a whole. On the other hand, systemic risk due to the feedback between credit and counterparty risk to a large extent seem to have escaped the attention of risk managers and supervisors alike. The lessons learned from the crisis now open up the opportunity of averting the previous pitfalls and establishing a more stable system going forward.

Against this backdrop, industry initiatives go hand in hand with regulatory proposals in their goals of promoting market infrastructure and reduce systemic risk. CDS markets are now moving from a decentralized towards a more centralized structure, as more and more contracts go through trade compression cycles and become centrally cleared. The widespread use of central counterparties and trade repositories is expected to enhance market transparency. Market participants are left with lower exposures vis-à-vis their respective counterparties, overall gross volume outstanding is reduced, and both private and public sector institutions are gaining better insights into exposures outstanding, leaving the market more robust for withstanding potential future shocks.

While the market is heading towards a more centrally organized system, it should be kept in mind that in future, too, there will be a substantial demand for tailor-made solutions. Derivatives end-users would suffer disproportionately if some of the regulatory measures intended to limit the use of bespoke contracts were to be implemented. In particular, there seems to be no convincing case why mandatory central trading in addition to central clearing should be necessary to reduce systemic risk. In addition to placing

additional burdens on non-standardised contracts it would do little to enhance the stability of the system.

In the meantime, a number of challenges need to be addressed if a larger fraction of OTC contracts are to be cleared via a central counterparty. While several CCPs have already picked up operations, there are a number of issues unresolved: Who will be responsible for naming the contracts eligible for clearing via a CCP? How will possible losses from a member defaulting be mutualised? What will be the ownership structures of CCPs? And how is it to be ensured that CCPs operate internationally on a level playing field? These are some of the questions that need to be answered if central clearing is to be made mandatory.

To conclude, setting the right incentives, establishing a sound market infrastructure, and enhancing market transparency will be key in ensuring integrity and stability of the CDS market going forward. Private sector as well as regulatory initiatives should go hand-in-hand in tackling the shortcomings identified. Only then will CDSs be able to contribute to the efficiency and stability of financial markets.

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Printed by: HST Offsetdruck Schadt & Tetzlaff GbR, Dieburg

ISSN Print: 1612-314X / ISSN Internet and e-mail: 1612-3158