Credit default swaps and financial stability

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Credit default swaps (CDSs), initially intended as instruments for hedging and managing credit risk, have been pinpointed during the recent crisis as being detrimental to financial stability. We argue that the impact of credit default swap markets on financial stability crucially depends on clearing mechanisms and capital and liquidity requirements for large protection sellers. In particular, the culprits are not so much speculative or "naked" credit default swaps but inadequate risk management and supervision of protection sellers. When protection sellers are inadequately capitalised, OTC (over-the-counter) CDS markets may act as channels for contagion and systemic risk. On the other hand, a CDS market where all major dealers participate in a central clearing facility with adequate reserves can actually contribute to mitigating systemic risk. In the latter case, a key element is the risk management of the central counterparties, for which we outline some recommendations.

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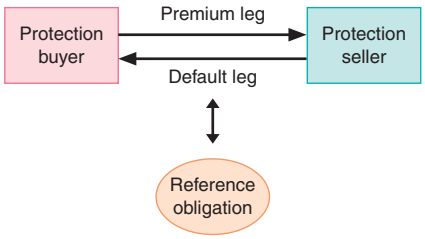
Credit default swaps, introduced in 1997 by JPMorgan, have become the most common form of credit derivative, totaling USD 64 trillion of notional value in 2008. With the onset of the financial crisis, this notional volume went down to around USD 38 trillion in the first half of 2009 but remains large. These are gross notional figures; according to BIS estimates, net exposure of major CDS dealers represents USD 2.9 trillion in June 2009.[1]

Sometimes described in the press as "complex financial instruments", credit default swaps are, in fact, the simplest of all credit derivatives. A credit default swap (CDS) is a contract between two parties, the *protection buyer* and a *protection seller*, whereby the protection buyer is compensated for the loss generated by a *credit event* in a reference instrument. The credit event can be the default of the reference entity, lack of payment of a coupon or other corporate events defined in the contract. In return the protection buyer pays a premium, equal to an annual percentage X of the notional, to the protection seller. The premium X, quoted in basis points or percentage points of the notional, is called the CDS spread. This spread is paid (semi)annually or quarterly in arrears until either maturity is reached or default occurs, at which point the protection seller pays the protection buyer the face value of the reference asset minus its post-default market value, through physical or cash settlement. Thus, the protection buyer is protected against losses in case the reference entity defaults. If the buyer owns the reference security, the CDS acts as a hedge against default: such 'insurance against default' was the initial motivation for introducing credit default swaps.

Chart 1
Structure of cash flows in a credit default swap (CDS)



However, unlike insurance contracts, credit default swaps do not require exposure to the underlying credit risk: a CDS may be used to gain a synthetic exposure to the credit risk of a firm. Compared to the strategy of holding (or shorting) the corresponding bond, the CDS strategy leads to the same exposure but only requires a small amount of capital at inception, equal to the collateral or margin posted with the counterparty. Also, in instances where the underlying bond may be difficult to short, the redit default swap enables to take a speculative short position that benefits from a deterioration of the issuer's creditworthiness. The sheer volume of the CDS market indicates that a substantial portion of contracts are speculative; in principle, the outstanding notional of credit default swaps may even become larger than the total debt of the reference entity.

1| A CONCENTRATED MARKET

Credit default swaps are over-the-counter (OTC) derivatives: they are not exchange-traded. The CDS market is a dealer market where a few major institutions control an overwhelming proportion of the volume and post quotes for protection premiums on various reference entities. The 10 largest dealers account for 90% of trading volume by gross notional amounts. Concentration is even higher in the US market, where the five biggest commercial banks account for more than 90% of gross notionals.[1] An estimated 30% of global activity is generated by JPMorgan alone.

This concentration reached a maximum with AIG. On September 30th 2008, the aggregate net notional amount of credit derivatives sold by AIG was USD 372 billion. This staggering amount was almost double the aggregate net notional amount sold by all other major dealers combined at the end of October 2008.[1] These high levels of concentration have raised legitimate concern among regulators about counterparty risk in the CDS market: in such a situation, the default of a major dealer may have a large impact on the rest of the market.

1 *See European central bank (2009).*

Chart 2
Survival probabilities implied by CDS spreads on Lehman Brothers on September 8, 2008

(X axis: years)

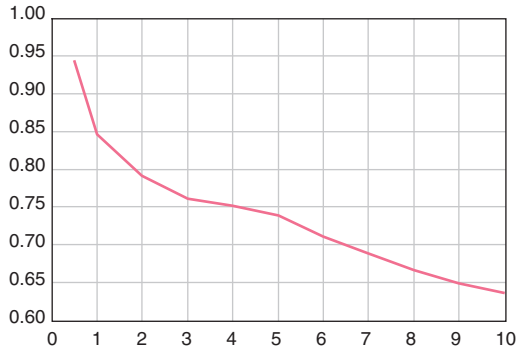
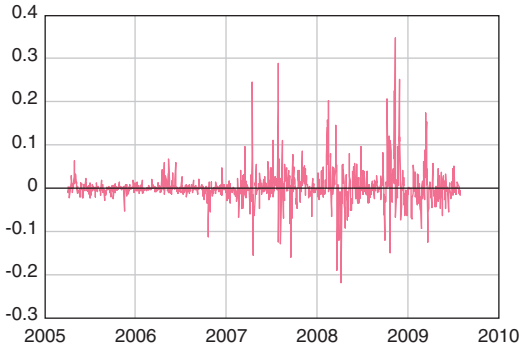


Chart 3
Daily returns of CDS spreads for CIGNA (CI), 2005-2010



Source: MarkIt Partners

2| CDS SPREADS AS SIGNALS ON CREDIT QUALITY

CDS markets have come to play an informational role in credit markets, where CDS spreads are widely regarded as a market consensus on the creditworthiness of the underlying – corporate or sovereign-entity. This is also reflected in the market practice of computing the *implied default probability* of an entity from its CDS spreads and using such default probabilities for the pricing of credit derivatives. Like implied volatility derived from option prices, such implied default probabilities do not necessarily contain any information about future defaults or the actual likelihood of the default of the reference entity, but simply convey a market consensus on the premium for default protection at various maturities. Chart 2 shows implied survival probabilities for Lehman Brothers implied from CDS quotes on September 8, 2008, shortly before Lehman's default. This example should temper any wild claims as to the "forward-looking" nature of the CDS spreads. Note also that the implied default probabilities and hazard rates depend on the assumption used for recovery rates, which are themselves subject to a large uncertainty. Nevertheless, CDS spreads are useful indicators of credit risk, especially in contexts where the underlying debt markets are less liquid.

3| RISK MANAGEMENT OF CDS POSITIONS

Day to day fluctuations in CDS spreads can be huge and tend to occur in sudden moves, usually associated with corporate events or macroeconomic news. Chart 3 shows the daily returns in the CDS spread of CIGNA Corp. from 2005 to 2009: note the large amplitude of daily returns, which can attain 40% especially on the upside. These large movements, which lead to "heavy tails" in the distribution of spread movements, are exacerbated by the relative *illiquidity* of many single name CDS contracts. Another concern is obviously the occurrence of the underlying credit event which results in large payouts, whose magnitude is linked to the recovery rate and difficult to determine in advance.

To provision for these risks, typically one or both parties to a CDS contract may post collateral and there may be margin calls requiring the osting of additional collateral during the lifetime of the contract, if the quoted spread of the CDS contract or the credit rating of one of the parties changes. Collateral has not been systematically required in OTC CDS transactions, and sudden deterioration of the underlying credit may generate large margin calls when the CDS spread undergoes a large move.

As with other OTC derivatives, credit default swaps are exposed to counterparty risk, which affects the level of CDS spreads. Counterparty risk exposure can be particularly large in a scenario where the protection seller and the underlying entity default together. This can happen for example if the protection seller has insufficient reserves to cover CDS payments. In this case, a protection buyer can incur substantial losses. The AIG fiasco in 2008 and the default of Lehman, a major CDS dealer, exacerbated the market perception of counterparty risk and distorted the level of CDS spreads in Fall 2008 and early 2009, stressing the importance of counterparty risk in the risk management of credit default swap portfolios. Concentration of the market on a few interconnected dealers amplifies the magnitude of this counterparty risk.

4| CDS MARKETS: CHANNELS FOR CONTAGION?

Credit default swaps have been repeatedly blamed for fomenting financial instability and generating systemic risk. The German financial authority BaFin, in its recent move to ban "naked" CDS trading, said CDS moves were jeopardising "the stability of the financial system as a whole".

Much of the blame has to do with the supposed role of speculative ("naked") credit default swaps in pushing up CDS spreads of entities in distress, thus making it harder for them to access the debt markets. Statesmen have been quoted as blaming CDS markets as responsible for the deterioration of their sovereign debt, the most recent example being Greece. Yet no empirical evidence has been offered to back such anecdotic claims. According to figures from the Depository Trust and Clearing Corporation (DTCC), CDS positions on Greece amounted to USD 9.2 billion (net) in March 2010, up from USD 7.4 billion in 2009, less than 2.5% of the Greek government bond market, which exceeds USD 400 billion. One might argue that it is a case of informational contagion, where CDS markets generate a panic in the debt market. In fact, in the case of Greece, CDS spreads have closely tracked bond spreads in 2010, showing no evidence of one leading the other in a significant way.

Finally, there is no evidence that BaFin's May 2010 ban on 'naked CDS' has had any stabilising effect on the sovereign debt market.

A more serious concern is the counterparty risk generated by the default of large protection sellers, as exemplified by the failure of AIG (to pay margin calls on its CDS positions). In a concentrated dealer market such as the CDS market, the default of a dealer can affect many market participants and generate domino effects and default contagion. Network models[2] may be used to provide insights on such contagion effects in CDS markets. In presence of a CDS market, the default of an entity incurs losses not only for its counterparties but also for protection sellers in credit default swaps written on this entity. If a CDS protection seller has insufficient reserves to cover CDS liabilities, the underlying credit event also results in the default of the protection seller, thus widening the scope for contagion. Using a network-based measure of systemic risk[3], Cont and Minca[2] show that a CDS market where protection sellers may lack liquidity for CDS default payments leads to an increase in default contagion and systemic risk.[2]

Interestingly, whether a CDS is 'speculative' or not is irrelevant here: this is determined by whether the *protection buyer* is exposed or not to the underlying bond, whereas counterparty default occurs if the *protection seller* lacks adequate reserves for paying the default leg of the CDS. A key issue therefore seems to be not the distinction between speculative and non-speculative CDS but the adequate management of counterparty risk in the CDS market.

5| CENTRAL CLEARING OF CREDIT DEFAULT SWAPS

Central counterparties (CCPs) have been proposed as a solution for mitigating counterparty risk and preventing default contagion in the CDS market. A clearinghouse (or central counterparty) acts as the buyer to every seller and seller to every buyer of protection, thereby isolating each participant from the default of other participants. Participants post collateral with the central counterparty and are subject to daily margin calls. This helps reduce losses in case of default

2 *See Cont and Minca (2010).*
3 *See Cont (2009).*

and mitigates counterparty risk. Also, management of collateral and margin calls by the CCP can help reduce operational risk in the CDS market.

A clearinghouse is not an exchange: prices are still negotiated over the counter and there is no auction mechanism for price fixing. However, for the purpose of marking positions and computing margins, clearinghouse participants are required to post quotes for all instruments being cleared, which leads to some degree of price transparency.

Currently CDS indices – CDX and ITRAXX – as well as their sub-indices (High Yield, High Vol) and single name constituents are being cleared by CCPs in the United States and Europe. ICE Trust, the largest clearinghouse for index and single name CDS, began operating in 2009 in the United States. Other clearinghouses for credit default swaps are CMDX, Eurex and LCH Clearnet.

6| Ensuring the stability of CCPs

Given their important role as a bulwark against counterparty risk and contagion, CCPs need to use stringent risk management procedures to ensure their own stability, including in stress scenarios when a large dealer may default.[4] Risk management of central counterparties is currently done at several levels:[5]

- Screening and monitoring of the credit risks of clearing members through membership requirements, notably based on minimum capital requirements on members.

- Margin requirements are used to absorb short term losses and first losses in case of the default of a clearing member. The horizon over which losses are considered is related to the anticipated time frame necessary for unwinding a position in the market under consideration. For CDS markets this corresponds to a a few days. Margin levels are adjusted daily through margin calls.

- Guaranty fund or clearing fund: large losses not covered by the margin are covered by a guaranty fund, to which clearing members contribute according to the risk of their position. By mutualising extreme risks, the guaranty fund contributes to the overall stability of the clearinghouse and reduces systemic risk by immunising each member from the default of others.

Margin requirements should be designed to cover short term losses, which may arise from CDS spread volatility or from losses due to the default of the underlying reference entity of the CDS ("jump-to-default"). CDS spreads are observed to be highly volatile and exhibit large fluctuations (Chart 3 provides an example) and margin levels should account for this "heavy-tailed" nature of the risk.

Computing appropriate jump-to-default requirements for clearing members should be based on *loss given default*, not on *expected loss* as is often done in current OTC margin agreements. For a stand-alone 'naked' single name CDS, this would lead to a large collateral requirement, which would strongly discourage the protection seller. For a CDS *portfolio*, however, it may be feasible to require that the margin covers the loss given a fixed number of defaults in the portfolio over the risk horizon (usually a few days). Current practice by regulators is to consider as an extreme but plausible scenario 2 or 3 defaults over 3 days in an index of hundred names.

Whereas margin concerns the risk of each clearing members portfolio, the guaranty fund addressed systemic risk faced by the CCP. Guaranty fund requirements should not be viewed as an additional margin: the guaranty fund's main role should be to mutualise extreme losses in excess of margin. Such extreme losses typically occur in the event of the default of a clearing member and arise from the cost of liquidating its position. The level of the guaranty fund should be fixed in order to cover liquidation costs in extreme but plausible scenarios. Currently IOSCO and BIS recommendations require a CCP to dispose of sufficient funds to cover losses due to default of any single clearing member, but regulators have considered in practice two or more dealer defaults in some cases.

Central counterparties should stress test their risk management system in order to assess the adequacy of the level of margin and guaranty fund requirements. The outcome of the stress test largely depends on the configuration of portfolios of clearing members: a market where most clearing

4 *See Bank for International Settlements (2004).*
5 *See Avellaneda, Cont and Zhang (2010).*

members/dealers have are large net protection buyers or sellers represents a different risk than a market where most clearing members have well-balanced long-short portfolios. Therefore a meaningful stress test needs to consider different portfolio configurations for clearing members and identify (plausible) worst case scenarios from the viewpoint of the central counterparty's risk. Such a stress testing approach, has been proposed in Avellaneda *et al.*:[6] the idea is to simulate plausible portfolio configurations for clearing members and consider, across the simulated scenarios, the cost of liquidating each dealers portfolios in case of their default. This cost, net of margin, determines the risk posed by the dealer to the CCP and its allocation to the guaranty fund should be determined accordingly.

Interestingly, the results in Avellaneda *et al.*[6] indicate that, in a clearing system where margin levels are set proportionally to the amplitude of short term losses of each member's portfolio, institutions whose default leads to the largest loss for the clearinghouse are those with well-balanced long/short positions with large notionals. As opposed to portfolios with large directional exposures, which result in a substantial margin requirement, such well-balanced portfolios will lead to smaller margin requirements thus the main part of the loss in case of liquidation flows to the guaranty fund. That such portfolios with low margin requirements may pose a large risk to the CCP, gives another reason why guaranty fund requirements should not be taken simply proportional to the margin level.

7| Is central clearing an efficient solution?

Duffie and Zhu[7] have argued that central clearing of a single class of OTC derivatives (such as credit default swaps) while leaving out other derivatives might be in fact inefficient in terms of the total amount of collateral required in the system. Similarly, Duffie and Zhu argue that having more than a single CCP is inefficient. The main argument is that hedging effects – for example between a bond position and a CDS hedging this bond position – which reduce collateral requirements in bilateral netting agreements, are not taken into account when moving the CDS to a central clearing facility which does not clear the corresponding bond position. This argues in favor of a joint clearing of CDSs and fixed income instruments. Joint clearing experiments are in fact under way in the fixed income market, where cross-margining agreements have been recently implemented between clearing facilities for cash instruments and fixed income derivatives. Such cross margin agreements will certainly lead to more efficient allocation of collateral but their implementation is not trivial: margin requirements across CCPs need to be harmonised and procedures for the use of guaranty funds in the event of a default of a joint clearing member need to carefully thought out in order to provide the right incentives to clearing members and avoid loopholes.

The extent to which Duffie and Zhu's arguments apply to CDS markets depends on the (long/short) symmetry – or lack thereof – between positions of dealers in CDSs and other OTC instruments – mainly swaps and debt instruments – which would enter netting agreements between counterparties. In absence of symmetry between CDSs and other positions, it is not clear why bilateral netting would result in less collateral.[8] Given that currently most dealers engage in 'index arbitrage' trades with long positions in CDS indices and short positions in the corresponding single name CDS, it seems that the major hedging effect to be accounted for is the hedge between a CDS index and its components. Some CDS clearinghouses, such as ICE Trust, already propose joint clearing of single name and index CDS ontracts, using a portfolio-based margining approach. This approach has the advantage of allocating lower collateral requirements to hedged positions, and encouraging dealers to clear a larger proportion of their CDS portfolios.

The analysis of Duffie and Zhu[7] is based on the total amount of collateral, not on a measure of systemic risk, and notably excludes analysis of default scenarios. However, what differentiates credit default swaps from other OTC derivatives such as interest rate swaps is precisely the binary nature of their payoff: while the mark to market value of a CDS position prior to default may be a small fraction of its notional, the actual exposure it generates upon default of the reference entity may represent a large fraction of the notional. Failing to account for this

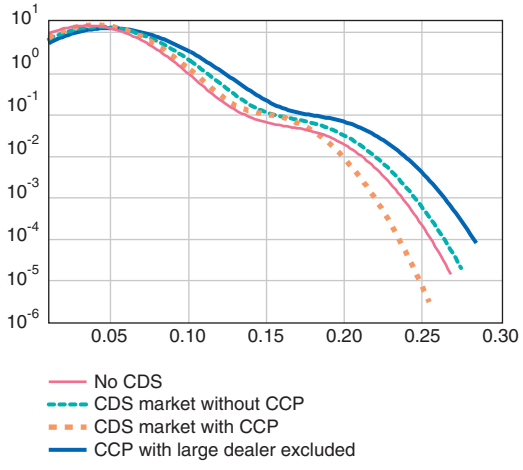
6 *See Avellaneda, Cont and Zhang (2010).*
7 *See Duffie and Zhu (2009).*
8 *See Cont and Minca (2010).*

jump-to-default risk leaves out the main component of the counterparty risk of a CDS. Using the Systemic Risk Index,[9,10] a network-based measure of systemic risk defined as the expected loss to counterparties when an institution defaults, Cont and Minca[11] argue that a centrally cleared CDS market reduces the systemic impact of large financial institutions, provided all large CDS dealers are members of the clearinghouse (see Chart 4). Note that these seemingly opposite findings are not contradictory: different metrics (collateral, systemic risk) are being used.

Independently from the efficiency in terms of collateral requirements, regulators may have other reasons for supporting the creation of independent CCPs under their jurisdiction, with cross margin agreements across CCPs, rather than a single transnational CCP. Having several CCPs also mitigates the moral hazard issue of having to deal with a unique CCP which would then become "too interconnected to fail". In a situation with more than one CCP (which is the most likely outcome) it is extremely important for regulators to ensure that all CCPs are held to the same standards in terms of capital requirements and risk management: the contrary would lead to regulatory arbitrage and concentration of risks in CCPs with lower margin and collateral requirements.

Chart 4
Distribution of the systemic risk index

(Y axis: proportion in network)



Note: Distribution of the systemic risk index[9] of financial institutions in a market without CDS (pink), with bilateral CDS trades (green), and centrally cleared CDS (orange). A centrally cleared CDS market which excludes one or more large dealers may actually lead to higher systemic risk than a market with no CCP (blue).
Source: Cont and Minca (2010).

9 *See Cont (2009).*
10 *See Cont and Moussa (2010).*
11 *See Cont and Minca (2010).*

8| ENHANCING THE EFFECTIVENESS OF CENTRAL CLEARING

Central clearing is only effective if a sizable fraction of trades are cleared by the CCP. Given that central clearing has a cost in terms of collateral, some market participants may not be willing to use this facility. If regulators view central clearing as a desirable solution, they should provide incentives to make central clearing an attractive solution for market participants.

An approach which is being increasingly considered by many regulators is to make central clearing mandatory for standardised contracts. Although it sounds like a tough measure, we doubt it would have any serious impact other than encouraging the emergence of a new market for hybrid structured products, where credit default swaps will be camouflaged as default payment clauses in fixed income or currency derivatives where their risks may be yet harder to track. Yet we note that a wide array of derivatives have been successfully cleared by CCPs for over two decades, without any instance of mandatory clearing. A more effective approach would be to impose prudential penalties in the form of higher capital and liquidity requirements for contracts which are not centrally cleared. Currently such penalties exist but, in many cases, are lower than the actual cost of central clearing. To avoid regulatory arbitrage, such requirements should not be limited to standardised contracts but also extended to exotic structures. A positive development is the commitment, in September 2009, of several major derivatives dealers to submit specified proportions of their eligible CDS trades to a clearinghouse.

9| TRANSPARENCY AND MONITORING OF SYSTEMIC RISK

Central clearing cannot be a universal solution for counterparty risk in CDS markets. A large portion of the CDS market is constituted of bespoke CDS contracts

which currently lack the standardisation and liquidity necessary for central clearing. Far from being anecdotic, such bespoke CDS contracts were in fact at the center of the AIG's failure. For such deals, even marking to market is an issue since there may be no reference market quote at a given time, leading to different views across counterparties on the level of margin calls. The CDS market has been dubbed one of the most opaque sectors of the financial market and there have been many calls for greater market transparency. There are two, very different, issues: transparency for the regulators and transparency for market participants.

Market transparency is, as always, a double-edged sword. A characteristic of the CDS market is the large degree of information asymmetry between a few dealers – who act as market makers – and other "buy-side" market participants. As in other dealer-based OTC markets, dealers make markets based on their information and would lose any incentive to do so in a situation of total transparency, where their information would cease to have any value, as in the classical analysis of Grossman and Stiglitz.[12] Not surprisingly, dealers have opposed exchange trading of CDS and a forced attempt to do so would simply reduce market activity. Private sector data providers such as MarkIt and data repositories such as DTCC have contributed to some degree of transparency in the CDS market, but their effectiveness is limited by the fact that participation of market participants is voluntary and not all trades are reported.

A totally different issue is the access of regulators to adequate information. To ensure adequate capital and liquidity requirements for large protection sellers, it is necessary to monitor large CDS exposures across main market participants,especially in the financial and insurance sectors. In the past, regulators and market observers have mainly used indicators based on market data, such as CDS spreads and bond spreads for monitoring such risks in the market. However, given the lack of transparency in the CDS market, it is not safe to assume that market levels of CDS spreads adequately reflect counterparty risk. Indeed, market indicators failed to signal the systemic risk posed by AIG, simply because market participants were not aware of the huge exposures lurking behind the scene. This assertion does not necessarily contradict the assumption of market efficiency, since counterparty exposures are not public information hence need not be correctly reflected in CDS spreads.

DTCC provides aggregate net notional data for single reference entities and has recently expressed willingness to provide such information to regulators upon request. By requiring systematic reporting of trades to such trade repositories, regulators could improve the coverage of the repositories. But such data are not detailed enough in order to assess counterparty exposures, which correspond to exposures net of collateral. In particular, an accurate assessment of counterparty exposures requires knowledge not only of CDS positions but also of exposures in the underlying debt instruments. A step forward would be for regulators to systematically collect such counterparty exposure data. An operational solution, short of having data on all transactions, is to expand the coverage of trade repositories by requiring mandatory reporting by market participants, using this data for counterparty risk monitoring by regulators and requesting complementary reporting from market participants on a case by case basis.

We have argued that the impact of credit default swap markets can contribute either positively or negatively to financial stability depending on how counterparty risk is managed in these markets. Whereas an unregulated CDS market where protection sellers may lack sufficient resources in liquidity and capital may amplify contagion, a centrally cleared CDS market where all major dealers participate in multilateral clearing can actually reduce systemic risk and enhance the hedging function of credit default swap markets.

Central counterparties provide market-based solutions for mitigating counterparty risk. But central clearing cannot be generalised to all categories of credit default swaps: a large proportion of the market remains non-standardised and unfit for central clearing. In this context, an important step would be for regulators to collect reliable data on counterparty exposures across dealers; mandatory reporting of trades to trade repositories could be a first step. Such exposure data could then be used to monitor counterparty risk in the CDS market and set appropriate liquidity and capital requirements for protection sellers.

12 *Grossman and Stiglitz (1980).*

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