Credit default swaps: what are the social benefits and costs?

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Credit default swaps (CDSs) are derivative contracts that allow agents to shift the risk of default on an underlying credit from a credit protection buyer to a credit protection seller. Like other derivatives they are standardised relative to the underlying cash markets and in this way can help promote market liquidity. This in turn can facilitate risk shifting and price discovery. In this way they may lead to accurate pricing of credit risk and ultimately to the reduced costs of borrowing. However, like other derivatives it is possible that CDS contracts could play a part in market manipulations, especially when the underlying cash market is not transparent. This is a potential cost of CDS trading that should be weighed against potential benefits of liquidity, risk shifting and price discovery. We discuss the balance of these trade-offs in the context of single-name corporate CDSs, index CDSs, sovereign CDSs and CDSs on structured credit product tranches. We also discuss other potential costs of CDS trading including that they "make selling short too cheap" and that they may create market instability by facilitating speculative attacks.

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1| VILLAIN OR SCAPEGOAT?

Since their introduction in the early 1990's the market for credit default swaps (CDSs) grew exponentially through 2007 after which it underwent a consolidation, declining by about 35% according to some measures of activity. The fact that the growth of this market and its subsequent decline seemed to coincide with the boom and then bust of the credit market generally has not gone unnoticed. On the contrary. There have been many strident voices arguing that CDSs have been part and parcel of the excesses on financial markets, that they contributed directly to the severity of the crisis, and that bringing CDSs under strict regulatory control or possibly banning them altogether is a necessary step to avoiding crises in the future.

The purpose of this paper is to discuss the development of default swaps within the broader literature on similar financial instruments and to assess their *social* benefits and costs. Our framework admits the possibility that benefits may exceed the cost as well has the possibility that they do not. We try to identify characteristics that could tip the balance either one way or the other. We then discuss those characteristics within the specific contexts of four major categories of CDS contracts – single name corporate CDS, index corporate CDS, sovereign CDS and CDS written on tranches of structured credit products. Finally we discuss whether the CDS market might serve a useful purpose as a very direct input into future macro prudential regulations.

2| CDSs ARE DERIVATIVE CONTRACTS

While CDSs differ from futures, forwards and options in some respects they are nevertheless derivative contracts and share many of the same characteristics as those derivative contracts which have long been an integral part of our modern financial system. In particular, the potential social benefits of risk sharing and price discovery that a well-designed and well-functioning futures or option market can provide, apply as well to the CDSs. The private costs of derivatives are the tangible costs of developing, operating and regulating a derivatives market that are reflected in direct and indirect (e.g., bid/ask spread) costs of transacting incurred by participants. More controversially, various social costs beyond these private costs have been ascribed to derivatives markets from time to time. These include possible manipulations or possibly discouraging real investment by increasing the volatility of the underlying cash market.

The CDS market is still relatively young and very little research has been done specifically assessing the costs and benefits in this market. In contrast, there is a large literature on the costs and benefits of futures and options. The public assessment of the balance of costs and benefits is implicitly reflected in the range of regulations that have been applied to these markets both through self-regulation by industry participants and by public authorities.

Since early days of the development of organised derivatives markets they have been viewed with suspicion. Nevertheless, they have proved to serve legitimate commercial purposes so that all but the most die-hard critics have recognised that they may be beneficial when used by qualified practitioners.[1] Defenders of derivatives markets point out that these markets serve the purposes of allowing risk shifting and price discovery. What are the *social benefits* of risk shifting and price discovery?[2] If derivative contracts allow an agent such as a producer to hedge the risk of cash market price fluctuations this may reduce the risk premium that the produce will apply in making investment decisions. This in turn will encourage production and will lower costs to consumers of the associated end products. Price discovery operates by giving an incentive to agents to become better forecasters of market conditions in the future and in this way will aid in allocating resources to the most valuable uses. For example, if in the future there will be an increase in demand that will lead to a price increase, then speculators who buy derivatives contracts now will bid up their prices in anticipation of that demand increase. Producers in turn will use these derivatives prices in making their production decisions and will increase their planned production in response to

1 *There is equally a clear consensus that derivatives contracts can be subject to abusive miss-selling. This is the basis for a number of legal protections which prevent their use by retail investors unless they demonstrate knowledge of the risks involved and the financial capacity to deal with those risks.*
2 *For a fuller discussion, see, for example among many others, Anderson (R.W.) and Danthine (J.-P.) (1983).*

higher derivatives prices. In this way production is guided to the markets where demand is greatest.

On the cost side, speaking broadly, there is widespread recognition that derivative contracts can give rise to market manipulations, especially when the market environment is not sufficiently transparent.[3] Market squeezes occur when agents are able to exploit informational advantage on cash market by trading on the derivative market which because of anonymity will not fully reflect the underlying cash market conditions as seen by informed agents. Corners occur when agents with established derivative positions may have incentive to distort the price in the underlying cash market temporarily. A tendency to manipulations of either sort damages the integrity of the market and can undermine the benefits of the market used for legitimate purposes. This assessment has given rise to a number of rules and laws aimed at making manipulations less likely to occur and punishing perpetrators when they occur. In some markets problems generated by a very non-transparent cash market have meant that risk of manipulations leads to shutting down derivatives trading. Usually, the market dies of natural causes as market participants simply turn away from the derivatives, but occasionally public authorities have assisted in bringing about their demise.[4]

The view that derivatives contracts increase price volatility is closely related to the view that derivative contracts invite excessive speculation because of their relatively greater liquidity and high degree of leverage that can be achieved. Furthermore, derivatives are criticised from time to time because they facilitate short-selling. While there are many observers who have never wavered in their belief that derivatives cause instability there is no convincing evidence that this is generally the case. The academic literature on speculation has not given a definitive answer to the question of whether speculation stabilises or destabilises cash markets.[5] Empirically there is very little convincing evidence that derivatives trading increases price volatility as a general matter. It is true that volatility around contract settlement dates does seem to induce associated instability in cash markets. Furthermore, price changes on derivatives markets often seem to lead changes on spot markets. But this seems to be accounted for by the greater liquidity of derivatives. Finally, if the underlying cash market is an oligopoly, the introduction of derivatives trading might introduce greater competition and reduce price stickiness.[6]

It is significant that both the potential social benefits of derivatives and possibly their social costs depend largely on their liquidity. More liquid markets facilitate risk sharing and price discovery. But liquidity is an aid to speculation as well. If speculation is excessive, one might think that reducing liquidity would be a good thing.

The reason derivatives markets are often more liquid than the underlying cash markets is the fact that they are relatively standardised. If a contract design can be found that serves a wide range of users, then more agents will be on the market thus providing the important liquidity attributes of tightness (low bid/ask spreads), depth (ability to trade large quantities without having much price impact) and resilience (speed with which the market absorbs a large trade). In the case of exchange traded contracts, standardisation is achieved through the contract terms established by the exchange. In the case of over-the-counter (OTC) markets there are typically market standards established by professional organisations such as the International Swap Dealers Association (ISDA). For many derivatives users there is a trade-off between standardisation and having a closer link to the specific segment of the cash market where the participant is active. When the derivative is too distant from the agent's cash market then there will be a poor correlation between the derivative and cash market. The resulting "basis risk" will undermine the use of the derivative for hedging purposes.[7] The difficulty of anticipating which contracts will attract a critical mass of participants means that exchanges regularly

3 *For the pioneering analysis of derivatives manipulations based on asymmetric information see, Kyle (A.) (1984).*
4 *Curbing manipulations was the main regulatory intent of the Commodity Exchange Act 1936 which is still the foundation of derivatives regulation in the United States. See Anderson (R.W.) (1984).*
5 *Conditions under which speculation on futures markets can stabilise cash markets are given in Danthine (J.-P.) (1978). Conditions when the opposite holds are given in Guesnerie (R.) and Rochet (J.-C.) (1993).*
6 *Slade (M.) (1991).*
7 *For an analysis of this issue see, Duffie (D.) and Jackson (M.O.) (1989).*

introduce new derivative contracts which ultimately fail. The greater flexibility of OTC contracts (as well as the development of electronic trading platforms) has been the basis of the boom of those markets relative to traditional exchange trade instruments since the mid-1990s.[8]

The other key feature of derivatives is the ability to achieve a high degree of leverage. This is a consequence of the fact that since derivatives contracts set out the price and other terms for transactions taking place in the future, they can be priced so as to require no initial transfer of cash between buyers and sellers. Subsequently, when underlying cash market prices and other conditions (such as volatility) change the value of the already established derivative contract will change leaving the buyer either with a gain or loss (and the seller with the compensating loss or gain). Thus in principle, the degree of risk that can be taken on in a derivative contract relative to initial outlay can be infinite. In practice, this is bounded by the amounts of security that are typically required (e.g., in the form of posted margins) in order to control counterparty risk, i.e., the risk that the party faced with an unrealised loss will default on contractual commitments. However, often the amounts of capital needed support a derivative trade will be relatively low either because the agent is considered a good credit risk or because margins are marked-to-market as prices evolve.

How do these observations about derivatives in general apply to CDS markets? The answer will depend to a great extent upon the nature of the underlying credit risk that is being exchanged in the swap contract. In our discussion we will focus on (a) single name corporate CDSs, (b) index products, (c) sovereign CDSs and (d) CDSs based on structured credit products. We start with single-name corporate CDSs because they are relatively simple contracts, are very widely used, and illustrate many of the basic characteristics shared with CDSs on other forms of credit.

3| SINGLE NAME CORPORATE CDSs

The default swap market grew up in the 1990s in response to the need of banks and other lenders to hedge the risk that corporate clients might default on their loan or bond obligations. In the swap the credit protection buyer (say, bank A) pays the credit protection seller (say, hedge fund B) a periodic price of protection against default on a particular corporation (say, corporation C). The periodic payment is expressed as a contract coupon, called the spread, times the notional amount of the contract. If C defaults prior to the maturity of the swap, A delivers to B any note from a list of eligible notes issued by C, and in return B pays A par. Thus, upon default the credit protection buyer receives a net value equal to par minus the recovery value of the security. That is, it receives the loss given default (LGD).

This is a relatively simple security. Its cash flows strongly resemble those of an insurance policy taken out against the risk of default of corporation C. The spread times the notional amount is analogous to an insurance premium and the net value received by the protection buyer resembles the payment of an insurance claim. It is important however to recognise that the CDS is a derivative contract and not an insurance contract. In particular, unlike an insurance contract there is no obligation that the credit protection buyer has an "insured interest". This makes CDSs attractive to a wide variety of users who wish to exchange risks associated with a possible default of a particular corporation. It may be that the protection buyer already possesses a note that is deliverable on the contract and wants to lay off that risk. But it may be that the protection buyer is exposed to risk of default in another way and wants to lay off that risk, perhaps imperfectly, in buying a CDS. For example, the protection buyer may own a non-deliverable note on the same name. Or it may be a bank with a loan outstanding to that name. Or it may have guaranteed loans. Or it may

8 *See, Anderson (R.W.) and McKay (K.) (2008).*

be long shares in the underlying company. Or it may own the obligations issued by a subsidiary of the underlying name. Normally, any of these agents would stand to lose money in the event of default of the underlying name. They may find buying CDS protection is a relatively cost effective way to hedge their risk even if the protection obtained is not perfect. They may be willing to take on basis risk in return for gaining the advantages of CDS contract. As with other derivatives, those advantages are liquidity and competition among sellers, both of which contribute to making CDS markets relatively cheap.

The fact that CDSs on corporate debt could be attractive to a variety of agents formed the basis of the development of a liquid market. However, at its inception CDS trading developed as an OTC contract that was a relatively natural outgrowth of existing swap contracts. The main innovation was to make the exchange of notes at par contingent on a "credit event." It took some time to settle on an acceptable definition of what constituted a credit event. The market only took off when standards for this and other CDS terms were agreed among market participants. These standards were codified in the 2003 ISDA Credit Derivatives Definitions which established credit events as (a) bankruptcy, (b) failure to pay on one or more obligations following any applicable grace period, (c) restructuring of any of a number of contract terms (e.g., reduction of interest or principal, postponement of payment, contractual subordination), (d) moratorium, and (e) payment acceleration on obligations due to violation of restrictive covenants. Once genuine liquidity arrived on the market between 2001 and 2003, CDS contracts transformed the practice of credit risk management profoundly. The number of names for which it was possible to obtain firm dealer quotes to buy or sell CDS contracts with 1, 3 and 5 years maturity grew enormously. This made it feasible to employ dynamic hedging strategies. Also, the quoted CDS spread became the standard pricing reference. This was used in monitoring credit risk exposures and in loan pricing. Arguably, the decline in the credit spreads through the end of 2006 at least partially reflected structural benefits from the development of a more liquid, competitive market for credit.

It is worth emphasising that, by their nature, single name corporate CDS contracts are based on a relatively transparent underlying market. Companies issuing traded notes are almost always listed corporations required to file audited financial reports and to meet listing standards. Often they are followed by security analysts. Typically, they are covered by rating agencies as well. Furthermore, agents with privileged information are prevented from exploiting this advantage by insider trading laws.

All of these factors tend to reduce the chance of market manipulations. However, early experience with CDS contracts following credit events showed that the standard physical delivery settlement procedure could give rise to short squeezes. This arose because of the often fragmented, illiquid nature of the underlying cash market for notes and bonds. In particular, in case of default a credit protection buyer who did not already possess a deliverable note would need to buy one on the cash market. If few such notes were available for sale because most were in the hands of long-term investors, then the price could easily rise thus eliminating much of the effective credit protection that had been sought in buying the CDSs. As in other physical delivery derivatives contracts a partial remedy to this problem was to increase the deliverable supply by expanding the list of acceptable notes. Again as in the case of other physical delivery derivative contracts, this created a delivery option in this case accruing to the credit protection buyer. Uncertainty about which security would be cheapest to deliver in case of default created an added difficulty in valuation and tended to contribute to basis risk for participants. More recently, market participants have agreed an auction procedure that allows for the cash settlement of most contracts, while still allowing for physical settlement when mutually agreed by buyers and sellers. This seems to have significantly reduced the susceptibility of CDSs to short squeeze problems.

Another problem that has come to light in the CDS market, although it applies to interest rate swaps and other OTC derivatives as well, is that over time through the dynamics of trading derivative positions are added which are aimed at offsetting the economic effect of an earlier trade but leave the agent with two contracts. Both involve counterparty risk, and if they do not have exactly matching terms, then periodic cash flows will not be exactly offsetting. The latter problem has been dealt with through the introduction in 2009 of a market convention to always use standard contractual coupons

(e.g., 100 basis points – bps – or 500 bps in North America) and standard dates (the 20th of March, June, September and December). The accumulation of counterparty risk can be avoided if initial contracts are cancelled rather than offset with a new contract. There have been industry efforts to increase the use of contract cancellation in bilateral OTC contracts, and this has been facilitated by the increasing standardisation of contract terms.

There is a widespread recognition that the counterparty risk in OTC derivatives is potentially a major problem and that industry efforts to reduce it in the context of bilateral settlement are not likely to deal with the problem satisfactorily. This is the basis of the current major push to establish multilateral settlement through central counterparties (CCPs) as the industry norm for most CDS contracts. This is the agreed intent of the major market participants, and it is likely to be backed by force of law through new legislation in Europe and the United States. While the operating details (and costs) differ across CCPs the principles are by now widely understood. When a swap trade is agreed between a buyer and seller, it is then cleared through a CCP which becomes the counterparty to each leg of the trade. In the case of default by one side, e.g., the seller, the CCP absorbs the loss and continues to honor its obligations to the buyer. The CCP keeps the risk of any default at low levels through its system of margins. And the solvency of the CCP itself is assured by setting margins at adequate levels relative to the underlying risks.

It should be emphasised that a CCP is not the same thing as a derivatives exchange and that using CCPs is compatible with continuing to negotiate CDS contracts in a dealer based OTC market. It seems clear that if CCP clearing becomes the industry norm this could deal quite effectively with most problems of counterparty risk and that this would facilitate the smooth functioning of a liquid CDS market.

There still remains strong current of opinion which advocates the further step of forcing CDS trading onto recognised derivatives exchanges. What are the arguments in favor such a requirement? One argument is that a dealer based CDS market is less efficient than would be an exchange and that dealers derive oligopolistic profits that could be eliminated by competition on an exchange. While dealing with this argument would take us off our main subject, it is worth making two points. First, this is an argument that would seem to apply to OTC derivatives markets in general and to have nothing particularly to do with the specifics of CDS contracts. Second, the relative advantages and disadvantages of alternative forms of market organisation have been debated in the literature on financial market microstructure without coming to any very settled prescription as to the best market form.

What of the argument that is sometimes heard that CDS contracts make "shorting" credit too cheap? This lies behind the call for banning " naked shorts," that is buying CDS protection when the agent does not own the underlying credit. First, it should be noted that the matter of whether buying CDS credit protection is cheap or dear is determined in the market. For example, at the time of this writing the price of buying CDS protection on an investment grade name is on average 120 bps. Thus, if one assumes a recovery rate of 40% which is a fairly standard assumption for corporate bonds, for USD 120,000 per year one can buy the chance of receiving USD 6 million on a face value of USD 10 million. Is that cheap or dear? If one were to assume the one year probability of default is 0.163% which coincides with the historical average over 1970-2008 for corporate bonds rated Baa by Moody's, this translates into an expected payment of USD 9,780 far less than the direct cost of protection. In fact, the probability of default implied by the current price is approximately 2%, that is, higher than the historical average by a factor of 12. Presumably many agents might not consider this very cheap. In fact, similar, but much more refined, calculations along these lines have led many economists to conclude that it is a puzzle that cost of credit protection in CDS is so high on average.[9]

A second observation is that the idea that CDS makes short selling cheap is a repeat of the oft heard complaint levelled against derivatives in general. There is nothing particular about CDS that makes the argument either more or less compelling than for derivatives in general. The fact that the argument has not held sway in derivative markets generally, suggests that unless some further evidence comes forward there is a presumption that this does not

9 *Saita (L.) (2006).*

constitute a basis for shutting down these types of trades. Finally, it should be noted that a practical matter an effective ban on naked shorts would in all likelihood eliminate the attractiveness of the market for the whole range of cross hedging purposes where establishing that protection buyers have a material hedging interest would significantly increase the costs of transacting. The resulting loss of liquidity would in turn increase the costs of hedging, both in terms of bid/ask spread and in terms of average risk premium, even for agents holding the specific claims underlying the CDS.

Finally, it has sometimes been argued that single name CDS contracts may have an adverse effect on lenders. A mild version of this criticism is that if a bank hedges the risk on a loan granted to a corporation, then it will no longer have the incentive to monitor the firm after the loan is made nor to maintain high underwriting standards. On strictly theoretical grounds, this criticism may have some merit. Banks may be particularly eager to hedge credit risk on a name when the financial condition of the firm is poor. Sellers of credit protection will take into account this possible private information and will command a higher spread as a result. The equilibrium that emerges in the face of such private information may be better or worse with CDS trading than without.[10] However, when there is an established banking relationship, reputational considerations serve to mitigate problems of inefficient monitoring.[11] Thus there is no general result that would distinguish clearly between good and bad forms of risk transfer by banks which monitor borrowers.

A more extreme version of this criticism is that the bank which purchased CDS protection on a firm may have the incentive to withdraw credit the firm and thus provoke a default by a distressed firm. Behavior of this sort may well be found to be illegal. The applicable laws vary across jurisdictions. For example, in English Common Law countries, if a bank were judged to induce the bankruptcy of a firm because it stood to gain on the CDS contracts this could be deemed a violation of the loan agreement depending upon specific terms set out in the contract.

4| CDS CONTRACTS ON INDICES

As the market for single name CDS contracts developed, it became obvious that such contracts had one major drawback for a bank or other financial institution managing a portfolio of credit risks. To reduce overall exposure to *systematic* sources of credit risk it was necessary to buy a portfolio of single name CDS contracts. This involved considerable time and transactions costs. Furthermore, if single name CDS spreads priced both systematic and idiosyncratic risks, this strategy would be costly in that it did not take into consideration any of the gains from diversification. The response to these problems was to develop CDS contracts based on indices, somewhat analogously to derivatives on stock indices that have been popular since the early 1980's.

CDS contracts on credit indices have been successfully introduced for North American credits (CBX contracts) and European credits (iTraxx contracts). There are a wide variety of contracts that have been developed differing with respect to the specific index that is used. However, they all follow the same basic template. A given CDS contract is based on a specific portfolio of credits and calling for protection over a given time horizon at initiation, 5-years being the most popular. At its inception the new contract becomes the "on-the-run" contract in a series of similar contracts. The contract is "rolled" from time to time, with the initiation of a new on-the-run contract based on a new portfolio of credits but designed to capture the same segment of the credit risk market as others in the same series (e.g., North American, investment grade, senior credits). The older contracts in the series are "off-the-run" contracts.

The spread on an index CDS is set in the market by supply and demand in a manner similar to single-name CDS. CDS calls for a payment of a contract coupon periodically by the credit protection buyer. At the time of purchase the credit protection buyer pays to or receives from the seller an up-front payment depending upon whether the market spread is above or below the contract rate. Later if the market spread has risen the credit

10 *Morrison (A) (2005) ; Chiesa (G.) (2008).*
11 *Parlour (C.) and Winton (A.) (2008).*

protection buyer is in the money on the contract and can monetise this gain, e.g., by making an offsetting trade. The contract is based on notional amount that is fixed in the initial contract but which is reduced subsequently as credit events on the underlying portfolio occur. For example, suppose the initial contract is for a notional of USD 50 million and is composed of 100 names. The protection buyer pays the contract spread on USD 50 million so long as no credit event has occurred. If one of underlying names incurs a credit event, then the protection buyer delivers a note on that name in the amount of USD 500,000 (= notional/number of credits) for which it receives par. Subsequently, the notional on the contract has been reduced to USD 49.5 million and involves 99 names. The protection buyer now pays a reduced amount for the credit protection because the notional amount of the contract has been reduced. Upon the next credit event the process is repeated and the notional is reduced by 1/99, and so on until all names default or, as is more likely, the expiry of the contract.

It should be noted that the market spread on an index CDS is not the same as the theoretical value of the index of the underlying CDS spreads. The basis of the index CDS equals its market quoted spread minus the underlying theoretical value.[12] In principle, arbitrage should assure a tight relation between the market spread and its corresponding theoretical value. However, in practice transactions costs and market thinness can result in substantial fluctuations of the basis.

One of the main benefits of index CDSs over single name CDSs is that they are attractive to a wider range of potential participants than those seeking to exchange risks on a single name. This tends to promote their greater liquidity. This in turn enhances their attractiveness for the purposes of risk shifting and price discovery. The greater liquidity of index CDSs is reflected in the fact that the market spread of an index product often leads its theoretical value. Furthermore, by design index CDSs are aimed at transferring systematic risk that lenders cannot otherwise control through screening or monitoring. This tends to improve the efficiency of intermediation.[13]

Another advantage of index CDSs is that they are less prone to problems of manipulations. As with single-name contracts, they are based on listed names about which considerable information circulates in financial markets. However, unlike single-name CDSs, since they are based on a broad portfolio, there is relatively little incentive to attempt to exploit informational advantage that an agent may have on some narrow segment of the credit market. Furthermore, by the nature of the way credit events are treated in index CDSs, any improvements in the underlying single name CDSs that come from the introduction of auction settlement also aid in reducing possible manipulation problems for index CDSs.

If there is a significant problem with index CDS, it is basis risk. The constituent portfolio may differ significantly from a given hedger's own portfolio. Furthermore, as already discussed, the market spread of an index CDS can diverge at times from its own theoretical value. This was experienced by a number of banks during the crisis of 2007-2008 when the quality of their index hedges was found to deteriorate. However, it should be noted that basis risk is a cost of using index CDS that should be fully internalised by private agents when making their decision to use such contract.

5| SOVEREIGN CDSs

Formally, there is little difference between a single name corporate CDS and a CDS contract based on obligations issued by a sovereign entity. Since sovereign entities are not covered by bankruptcy laws applicable to corporations, bankruptcy is not credit event for sovereigns. However, the other forms of credit events including failure to pay or restructuring do apply to sovereign CDSs. Quotation and settlement procedures of single name corporate CDSs are applicable to sovereigns as well.

Sovereign debt is traded actively on global financial markets. The information that is available to participants in the sovereign CDS market will differ from case to case depending upon the sovereign entity in questions. Generally, one can expect the

12 *Note that "basis" is a context specific notion. The basis referred to here is not to be confused with the difference between the on-the-run spread and an off-the-run spread nor with the difference between an index CDS spread and a theoretical spread based on a hedger's own portfolio of credits. Traders refer to "my basis" as the price difference that they are following.*
13 *See Chiesa (G.) (2008).*

sovereign market be larger and more liquid than the corporate bond market (if it exists) for firms in that country. The larger the country and the more transparent and reliable the reporting on its fiscal condition we can expect a more liquid market. Of course, if the prospect of sovereign default is extremely remote there will be very little hedging demand and the market may be inactive. However, for active sovereign markets, liquidity and transparency are sufficient to mean that problems of short squeezes would not be a particular impediment to CDS trading.

All these observations suggest that when underlying sovereign debt is traded actively, a liquid CDS market can emerge which would serve the purposes of risk shifting and price discovery. If so over time it can be expected to help lower the costs of sovereign borrowing.

Despite these observations, sovereign CDS trading has attracted a number of vocal and influential critics, precisely because of its potential liquidity. The particular complaint is that it leaves sovereign borrowers open to speculative attacks because it facilitates short-selling through the purchase of credit protection in a CDS. How would such an attack work? This has been described in many models of financial crises. A basic scenario is as follows.

A government faced with a high current fiscal deficit, engages in a borrowing program by making a promise to reduce deficits in the future. In projecting these deficits it makes assumptions about growth of tax revenues and of the costs of borrowing. These two are interdependent. If the market believes the deficit projection, the borrowing costs will be moderate and the plan would be feasible. However, if the market does not believe the tax revenue projections, then the borrowing costs will be higher than projected, the deficit plan will be infeasible and the government will be forced to default or restructure its debt. Thus a crisis may arise in equilibrium as a self-fulfilling prophecy. As described there may be multiple equilibria. Recent models of crises based on global games show conditions on the information structure such that crises may emerge as a unique equilibrium.[14]

Now large sovereign defaults have occurred in the absence of active CDS trading. Both the Russian default of 1998 and the Argentine default of 2001 involved elements of a speculative attack – international investors abandoned the markets forcing a sharp increase in yields making it increasingly difficulty to roll-over maturing debt – but did not involve CDS trading in any major way. So if sovereign debt crises can arise in the absence of CDS trading, why is sovereign CDS trading itself so suspect?

The answer seems to be that it contributes to the liquidity of the market for sovereign debt and that is undesirable in itself. That is, they grease the wheels of capital flows when in fact it would be desirable to throw some grit into those wheels instead. Whether capital mobility is a good or bad thing is a broader question about which we have nothing to say here. However, it seems that sovereign borrowers welcome liquidity when it lowers their borrowing costs as was the case with a number of countries that have joined the Euro zone. To oppose liquidity in some markets and encourage it in others does seem rather inconsistent and self-defeating.

Another possible fear, which again just repeats a fear often expressed about derivatives generally, is that CDS trading may be so large as to swamp the underlying sovereign bond market and that this would somehow provoke a sovereign default. This argument has problems on several grounds. First, as has been pointed out recently in the context of the problems on Euro zone debt, it is not factually correct. The sovereign CDS market has been relatively small compared to the underlying debt markets.[15] Second, if the CDS market were to grow under pressure from speculators seeking to buy credit protection (naked shorts) they would have to be met by sellers of credit protection. Who would all those sellers be? It is likely that the CDS spread would rise and that the naked shorts would be forced to pay dear for their bets. (See the calculation for single name corporate CDSs above). Finally, if CDS open interest were very large compared to the underlying cash market, in the event of default, the settlement process (whether based on auction or otherwise) would force the CDS longs to buy the underlying cash instruments. This would bid their price up and would reduce the

14 *See Morris (S.) and Shin (H.-S.) (1998).*
15 *See Duffie (D.) (2010).*

net payments protection buyers receive. Thus there are clear market forces that would tend to keep the scale of CDS trading in reasonable proportion to the size of the underlying sovereign debt market.

Finally, would it be possible that a sovereign CDS conveys information that would lead to crisis? For example, could a rising CDS spread itself attract attention to the fiscal difficulties of a sovereign borrow and in this way raise borrowing costs? This argument does not seem very strong. As has been emphasised in the global games analyses of crises, the key ingredient to a give rise to crises is a degree of imperfect information among market participants about the underlying fundamentals of the market.[16] It is hard to see how the presence of CDS trading or its absence greatly affects the availability of information about the future fiscal health of a sovereign borrower. The key to seeing off an unwarranted speculative attack in a sovereign debt market is for the public authorities to provide information about a credible fiscal plan.

6| CDSs ON STRUCTURED PRODUCTS

Structured credit products such as collateralised debt obligations (CDOs) and collateralised loan obligations (CLOs) emerged in the 1980's borrowing techniques developed earlier in the securitisation of mortgage pools. From those beginnings the market grew strongly and a wide variety of different structures were introduced, the details of which were only really understood by a fairly narrow group of specialists. Later, after the introduction of CDS trading, it became fairly natural to begin to write CDS protection on securitisations. After all, a tranche of a securitisation is a fixed income instrument that is equivalent to a corporate bond in the sense that it pays coupon interest until maturity or until default occurs. The innovation proved successful and CDSs on securitisations were actively traded at least until the whole securitisation market collapsed in the crisis of 2007-2008. The fact that CDSs became linked to CDOs in people's minds probably explains why the CDS market earned the reputation for being complex; whereas, as we have seen, in its basic mechanics a CDS is rather simple. Indeed, CDSs often did play a role in resecuritisations, the so-called CDOs-squared, which came to epitomise the process of financial innovation run-amok.

A CDS contract on a securitised tranche is not inherently different from a CDS on an index of corporate names. There is an underlying reference portfolio of credits and the contracts calls for the credit protection buyer to pay coupon interest on the notional amount outstanding. The notional amount outstanding is reduced by credit events in the manner described above for index CDSs. The difference, however, is that the reduction of notional is applied only for certain range of losses. For example, a CDS on a mezzanine tranche of a structure may have a lower attachment point at 5% and an upper attachment point at 10% of losses. As losses on the underlying portfolio occurred affecting 0 to 5% of the credit, there would be no change of the notional on the CDSs. As losses would arise above the 5% threshold, the CDS protection buyer would be compensated for losses. The notional amount of the CDSs would be reduced until the threshold of 10% losses is reached at which point the CDS expires.

The complexity of a CDS on a tranche derives from the complexity and lack of transparency of the underlying structure. The securitisation process has always been a ratings based business, and this feature of the market was reinforced with the Basel II standards which gave credit ratings agencies (CRAs) a critical role in setting regulatory capital requirements. Ratings are meant to aggregate underlying information, and by their nature they transform information sensitive assets into information insensitive assets. The latter are attractive to investors precisely because they feel that they do not need to actively monitor the assets. In the fall-out of the crisis of 2007-2008,

16 *As phrased in Hyun Shin's summary of Morris and Shin 1998, "Information plays a very subtle role in speculative crises. What is important in staving off currency attacks is not the amount of information made available to the market, per se, but rather how public and transparent this information is. If market participants are well informed about the fundamentals, but they are unsure of the information received by other participants, and hence unsure of the beliefs held by others, speculative attacks may be triggered even though everyone knows that the fundamentals are sound. Our analysis highlights the importance of the transparency of the conduct of monetary policy and its dissemination to the public. If it is the case that the onset of currency crises may be precipitated by higher order beliefs, even though participants believe that the fundamentals are sound, then the policy instruments which will stabilize the market are those which aim to restore transparency to the situation, in an attempt to restore common knowledge of the fundamentals."*
http://www.nuff.ox.ac.uk/users/Shin/curr_abs.html

it became apparent that many securitisations were bought simply on the basis of their rating and that investors did not, and in most cases, *could not* learn much about the risk characteristics of the asset pool underlying the structure.

Thus unlike single name or index CDS based on underlying corporate borrowers, CDS contracts on securitisations were based on an opaque underlying cash instrument. This would seem to be a major impediment to the trading such instruments. Despite this fact, CDSs for securitisations developed on a large scale over time. Why? The answer is that they served a very useful function in the securitisation. Specifically, CDS could be used as a credit enhancement that would allow the super-senior tranche of a securitisation or resecuritisation to achieve the coveted triple-A rating. The sellers of CDS protection were often monoline insurers who would sometimes use such contracts as an alternative to the financial loss insurance policies that had long-been used as a credit enhancement in securitisations.

The advantage of monolines over other writers of CDS protection was that because of their triple-A rating they were able to command high spreads. We now see that this commercial advantage meant that until late 2006 they built up large positions in the fast growing ABS segments including those based on subprime mortgages. The fact that these contracts represented a very large implied exposure to the general level of the US property market went largely unnoticed until difficulties in that market emerged in mid-2007. It now seems clear that the lack of transparency of the underlying asset markets and the complexity of the structure in which CDSs were just one component part contributed to the failure of the market participants to understand the nature of the economic risks they had taken on.

Now even sophisticated investors have largely lost their appetite for the risks of complex financial structures. The securitisation industry has been greatly reduced as a result. It may take a long time before the market strengthens. If and when it does, probably investors will be wiser in their risk assessments. They will probably demand better information about risks and greater returns for bearing them. However, the experience of securitisations has proved to be an object lesson in the limits of *caveat emptor* in the face of financial innovation. This has led some to call for a more active public regulation of such innovations. There is some precedence for such regulations. The Commodity Futures Trading Commission has long had responsibility for vetting new products proposed for trading on derivatives exchanges in the United States. In retrospect, it does appear that the balance of benefits in risk sharing and price discovery provided by tranche CDSs versus their costs quite likely were negative. Whether or not a regulator would have been able to assess this clearly *ex ante* may be open to debate. However, if, in the future, innovation in CDS trading is brought under regulatory oversight, the analysis that we have provided gives some guidance on how it should be done. The primary question to be answered by all concerned is whether the underlying cash market is sufficiently transparent so as to allow risks to be assessed by both buyers and seller of credit protection on these instruments.

7| CAN CDS MARKETS PROVIDE INFORMATION TO GUIDE PUBLIC POLICY?

We have argued that like other derivatives CDS contracts serve a social purpose as an aggregator of information of diverse market participants. In this price discovery role they can help to guide resources toward investments that are best on a risk adjusted basis. This informational function is carried out naturally in the private market without the direct involvement of any public sector agent. Now the question arises whether in addition to this function, CDS contracts can be of more direct use to public authorities. In particular, can CDS contracts convey information to regulators that *they would not otherwise have* and thereby help them to better implement policy?

In particular, there have been several proposals to use CDSs spreads in developing new tools for macro-prudential regulation. Oliver Hart and Luigi Zingales have argued that CDS contracts written on banks could be used to monitor their solvency. An increase in the CDS spread would be a signal of a worsening in the financial position of the bank and thus might serve as a trigger for some form of corrective action. Huang, Zhou, and Zhu have developed a proposal for a regulatory capital surcharge that could be assessed on systemically important banks

that would incorporate information from the CDS market.[17] In particular, their capital charge would be implemented using the large banks' CDS spreads to identify their probability of default (PD) and high-frequency equity information would be used to estimate asset return correlations.

There are important reasons why such proposals may be misguided or at least premature, pending a better understanding of the behavior of pricing on the CDS market. In particular, CDS spreads cannot be taken in any direct manner as a proxy for the true probability of default of the name underlying the contract. Like prices of any financial asset, the market price of a CDS is based on the *risk neutralised* distribution of the underlying risk. At any given time, the CDS spread quoted on the market will be a composite of (1) the market's assessment of the physical default distribution (PD, LGD), (2) a risk premium reflecting the market price of default risk, (3) a bid/ask spread reflecting liquidity on the CDS market, (4) a discount reflecting the value of the delivery option on the CDS, and (5) a discount for the counterparty risk in the CDS. Thus changes over time observed in CDS spreads could reflect changes in any of these five factors. It would be an error to assume that factors (2)–(5) are constant and infer from an increase in spreads that the underlying name's probability of default necessarily had gone up.

In a recent study I have tried to see what are the dominant factors accounting for changes in spreads over time.[18] I estimate the risk neutral distribution of defaults using time series data on CDS spreads. I use estimates of the physical default distribution derived from default histories. Combining the two I identify the implied distribution of the market price of default risk. I find the volatility of the price of default risk dominates that of the physical default intensity by a factor of about 10. Thus changes in the CDS are more likely to reflect changes in the market's willingness to bear default risk on the name rather than changes in the solvency of that name. This suggests that the reliance upon CDS spreads for the purposes of macro-prudential regulation as in Huang *et al.* (2009) or as proposed by Hart and Zingales is likely to be misguided unless there is an adequate control for changes in spreads attributable purely to changes in the markets' pricing of credit risk.

This is not to say that public authorities should ignore CDS spreads. On the contrary, they probably should be monitoring spreads on banks as a supplement to their own information on bank solvency obtained through their normal surveillance activities. However, there is no reason at all to relax those surveillance activities because a CDS market exists. Indeed, in light of the recent crisis, it would seem important now more than ever that regulators reinforce the access to information and that they lead, rather than follow, the market.

17 *Huang (X.), Zhou (H.) and Zhu (H.) (2009).*
18 *See Anderson (R.) (2009).*

We have emphasised that the credit default swap is a financial derivative contract similar to others that have long been an integral part of our financial system. The innovation in CDS trading was to make a commitment about a future transaction contingent on an uncertain event, namely, the default by the underlying credit. Like other derivatives it can provide significant social benefits in risk sharing and price discovery. However, these benefits can be undermined if the contract proves to be prone to manipulations or if it does not deal with counterparty risk adequately. In its first 15 years of development largely as an OTC market, the CDS market has gone through a number of refinements to deal with these potential problems. The risk of short squeezes appears to have been reduced significantly with the organisation of auctions for settlement following credit events. Standardisation of contract terms has facilitated contract cancellation which has helped to reduce problems of the accumulation of counterparty risks. The current push by industry and by regulators toward central counterparty clearing is likely to further reduce counterparty risks very considerably.

On balance it seems that the CDS market for corporate issuers, either of the single-name variety or when based on indices, has been favorable for the efficiency of credit markets. With their advent the business of credit risk management has been transformed to become much more market based. Lenders have a much better knowledge of the risks that they take on, and they have much greater scope for actively managing those risks.

We have identified two outstanding issues involving CDS contracts which are legitimately the subject of current policy debate. The first is whether by facilitating the trading of default risks, CDSs may make a market prone to speculative attacks on the underlying credit. This is probably the only major doubt one can have about the market for sovereign CDSs which otherwise is likely to provide the same efficiency benefits seen in trading corporate CDSs. We have argued that the heart of the problem of speculative attacks on sovereign borrowers is one of providing credible public information about the future solvency of the borrower. The presence or absence of CDS trading has little effect on this. The second outstanding policy issue is whether the market can be relied upon to foreclose the development of a CDS market when the underlying cash market is too opaque to permit the informed assessment of risks by buyers and sellers of credit protection. The example of CDS contracts on tranches of securitisations and the role played by such contracts in the ill-fated CDO-squared's leaves one with reasonable doubts on the question. The CDS contracts themselves were fairly simple but for a time they played an important role in the construction of very complex structures which exacerbated the important defects of the securitisation market including the excess trust put in external ratings and in the lack of transparency about the assets pools. A degree of regulatory oversight on the introduction of new CDS products might be justified to assure there is an adequate flow of information on underlying risks.

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