

REPORT ON SOVEREIGN CDS

CONTENTS

Executive summary	3
Introduction	6
1. The credit default swap market.....	7
1.1. What are CDS and how are they different from bonds?	7
1.2. How does a sovereign CDS work?	8
1.3. The CDS market size	10
1.4. Why are sovereign CDS used?	11
2. Factors influencing credit risk in sovereign bond and CDS markets	13
2.1. Fundamental factors.....	13
2.2. Impact of liquidity on sovereign bond and CDS markets.....	15
2.3. Other factors affecting sovereign bond and CDS markets.....	17
3. Interaction of sovereign CDS and bond markets.....	19
3.1. Theoretical links	19
3.2. Empirical findings – linkages between sovereign CDS and bond markets	21
4. The case of Greece	28
4.1. Developments in the sovereign bond and CDS markets.....	28
4.2. Structure of Greek sovereign CDS market	29
5. Regulatory measures	31
5.1. European Markets Infrastructure legislation.....	31
5.2. Short selling regulation.....	32
5.3. Revision of the Market Abuse Directive	37
5.4. Revision of the Market in Financial Instruments Directive (MiFID)	38
Annex 1: Sovereign debt restructuring and CDS	42
Annex 2: The no arbitrage relationship between CDS and asset swaps.....	44
Annex 3: Greek CDS spreads and issuance dates	45
References	46

EXECUTIVE SUMMARY

This report presents qualitative and quantitative analysis of the functioning of the sovereign credit default swap (CDS) market, which serves as a basis for discussing possible regulatory measures. An inter-service task force has been established to study the sovereign CDS market, further to the recent events in the sovereign bond markets of the euro-area Member States. The task force comprises staff from DG COMP, DG ECFIN, and DG MARKT.¹ The report represents the work accomplished as of the end of May 2010.

The sovereign CDS market is a relatively new and relatively small market (USD 2.2 trillion gross notional as value of end-May 2010) compared to about USD 14.5 trillion gross notional value of total CDS market. On European sovereign names, the net-outstanding amount is USD 200 bn, which represents only a fraction of the underlying cash bond markets. The sovereign CDS market is used by a wide range of market participants, including investment banks, hedge funds and traditional asset managers.

Pricing in sovereign bond and CDS markets is influenced by both fundamental and technical factors. In terms of fundamental factors, the deterioration of budget deficits, debt-to-GDP ratios, and the current accounts of several Member States have driven market developments. Regarding technical factors, the most important is the relative liquidity of the two markets. It is often said that the liquidity of the sovereign CDS market is greater compared to the cash bond market, and that this makes the CDS market a better and faster market for expressing views on sovereign credit risk. Other technical factors influencing the pricing mechanisms of the two markets are the general market conditions that have prevailed since the onset of the crisis and investors' higher preference for less risky and more liquid assets. Most of these factors have played a role in the substantial widening of spreads on Greek sovereign bonds and sovereign CDS, which has been observed since the end of 2009. Some of this widening in spreads may reflect a catch-up effect, with market participants realising that sovereign credit in Greece may have been under-priced for some time.

The interaction between the sovereign CDS and the underlying bond markets is complex. There is abundant research on the beneficial effects of such derivative markets for the economy. Their existence can increase the opportunity set of investors, which in turn can make markets more efficient, and lead to welfare gains. Furthermore, derivative securities are shown to be efficient and flexible instruments for controlling and allocating risks in a market-stabilising way. However, it is also possible that derivatives markets could interact adversely with the markets for underlying securities for several reasons, e.g. market frictions, the obscuring of price information due to new market participants, and possible market manipulation.

The empirical investigation that has been conducted by the task force on how the sovereign CDS and bond markets interact, provides no conclusive evidence that developments in the CDS market causes higher funding costs for Member States. The analysis makes use of data made available by Bloomberg, Markit and the BIS, and the dataset covers the period 2008 to the first quarter of 2010. First, the results show that there is no evidence of any obvious mis-pricing in the sovereign bond and CDS markets.

¹ The report has been drafted by Sarai Criado (MARKT), Laurent Degabriel (MARKT), Magdalena Lewandowska (ECFIN), Staffan Lindén (ECFIN), and Peer Ritter (MARKT).

Second, the CDS spreads for the more troubled countries seem to be low relative to the corresponding bond yield spreads, which implies that CDS spreads can hardly be considered to cause the high bond yields for these countries. Finally, the correlation analysis shows that changes in spreads in the two markets are mainly contemporaneous. The vast majority of countries show no lead or lag behaviour, and when series are not changing contemporaneously, CDS and bond markets are basically equally likely to lead or lag the other. Furthermore, these relationships have been broadly stable over time.

The sovereign CDS markets suffer from similar issues as most other derivative markets, especially the corporate CDS market. The areas in need of attention mainly concern counter-party risk and the lack of transparency for regulators. The legislation, which is currently being prepared on the infrastructure of derivative markets, will largely address these two issues. In this respect, it is worth noting that the existence of a trade repository does not solve all the outstanding issues related to regulators carrying out their supervision of systemic risks and ensuring orderly markets. For example, the DTCC data cannot be used for spotting market manipulation. This would require analysing the CDS trades in conjunction with similar data for the bond market, which is not readily available and makes the mission of any regulator who seeks to detect market manipulation in this field extremely difficult. A possible regulatory issue to be raised thus concerns the format, processing and availability of data stored by a trade repository.

It is evident that the sovereign CDS and bond markets interact in a complex way and trading in one market may potentially create momentum in the other market. This interaction, and the key role of these markets in the economies of Member States, might in particular justify measures to increase the transparency of both the sovereign CDS and bond markets. Indeed, sovereign bond markets would seem to be even more opaque than the sovereign CDS markets.

Accordingly, an appropriate targeted and proportionate regulatory response could comprise mandating the disclosure of short positions on bonds by market participants and empowering regulators with emergency powers to intervene in the event of market manipulation. Short positions in bonds would refer to positions taken directly by short selling bonds or indirectly by buying CDS without an underlying exposure. Empowering regulators with certain emergency measures would be justified by the ease with which leverage can be generated through sovereign CDS. These emergency powers could include various measures ranging from requiring market participants to disclose the reasons for using sovereign CDS, to imposing position limits. In view of the potential consequences for the liquidity of the sovereign CDS and bond markets, it would seem appropriate that any decision to apply a ban on naked positions should be only temporary. In terms of a legal instrument, an increase in disclosure requirements and the facilitation of emergency powers could be included in the legislative proposal on short selling due in the autumn.

Some additional and more structural measures could also be considered, such as requiring physical settlement or increased settlement discipline for sovereign CDS trades or mandating trading of sovereign CDS on exchanges or electronic venues. While the first measure would amount to a “soft” ban on naked positions (with negative implications for market liquidity), the second measure would ensure sufficient trade transparency for regulators and market participants. The mandating of trading could be included in the revision of MiFID scheduled for the beginning of 2011, while the appropriate legal instrument for imposing physical settlement or increased settlement discipline might be included in the envisaged regulation on Central Securities

Depositories this autumn would need to be considered. Furthermore, the lack of transparency of the bond market that both regulators and the public currently experience needs to be addressed. Within this context, the introduction of a similar system to that of the US TRACE system might be considered.

INTRODUCTION

Since the autumn of 2009, severe tensions have emerged in the sovereign debt markets of several Member States. In particular, the yield spreads and the default-insurance premiums (CDS spreads) for Greek sovereign debt have widened sharply. In late January 2010, claims of market manipulation or market abuse in the sovereign CDS market for Greece were made. On the basis of these claims the ECOFIN of 10 March 2010 requested the Commission to investigate the functioning of the sovereign CDS market in general and the Greek market in particular. To this end, the Commission has set up an inter-service task force, comprising staff from DG COMP, DG ECFIN, and DG MARKT.

This document presents the results of the task force analysis as of end of May 2010. The aim of the analysis has been twofold. First, it reviews the functioning of sovereign CDS market and analyses its link with the underlying bond market. Second, it considers various policy and regulatory options that could apply to the sovereign CDS market. The task force has not considered issues related to market abuse or market manipulation, which is the responsibility of national supervisors. In order to investigate any such allegations, the Committee of European Securities Regulators (CESR) has set up an Urgent Issue Group on the 15 February.

In terms of methodology, the task force has used quantitative data provided by the DTCC (on a confidential basis), Markit, Bloomberg and other market data providers. In addition, numerous contacts, either face-to-face or over-the-phone, have taken place with national regulators, academics, and market participants.

1. THE CREDIT DEFAULT SWAP MARKET

1.1. What are CDS and how are they different from bonds?

Credit Default Swaps (CDS) are financial instruments that transfer credit risk from one party to another. Credit risk arises from the possibility of default on a pre-agreed payment, and the purchase of CDS insures against the loss of the pre-agreed payment, thereby shifting the risk to the seller of the CDS. CDS markets are, therefore, important vehicles for the reallocation of risks on financial markets.

In a typical bond contract, the issuer agrees to pay the investor a regular fee (interest rate) in exchange for the principal amount, as well as to redeem the principal at the maturity of the contract. The investor is exposed to credit risk: buying a bond implies taking a position on the credit risk of the issuer. The investor has to fund his position, as it requires an initial outlay (i.e. handing the principal over to the issuer). If the issuer defaults, the bondholder's principal (and the interest that would accrue over the remaining time to maturity) is (partially) lost. The fact that bonds have to be funded by the investor implies two further types of risk: funding risk² and interest rate risk.³

An investor can also expose himself to credit risk by selling a CDS, but here no principal amount changes hands ex ante. In a CDS, the seller receives a fee (coupon payments) from the buyer, while his obligation materialises only in event of default, when he has to provide for the credit loss. The effect of selling a CDS is, therefore, similar to buying a bond; however the position taken through the bond has to be funded, while the same position through a CDS is largely un-funded (abstracting from collateral). This is often referred to as the built in leverage of derivatives⁴ and can mean that CDS may be a cheaper instrument than a bond for acquiring exposure to the same credit risk.

Table 1: Basic features of bond and CDS contracts

	Buyer	Seller
Bond	Pay principal, lost if default Exposed to credit risk ("long" on credit)	Pay interest (coupon) Return principal or default
CDS	Pay interest Receive in case of default ("short" on credit)	No principal, pay only if default Exposed to credit risk ("long" on credit)
Hedge	Buy a bond + buy a CDS	In the short term: sell the bond short and sell the CDS

An investor may wish to sell a bond, or buy a CDS, when he believes that the associated credit risk will rise. In this way, he eliminates or reduces his exposure to the credit risk. If an investor buys the CDS without prior exposure to the credit risk associated with the underlying bond, he is expecting, and potentially gaining from, the higher credit risk. Market parlance would call his position "short on credit" or as holding a "naked CDS".

² The funding risk is the risk attached to the provision of the initial cash outlay (the principal) for the lifetime of the bond. Funding risk arises when the cost of raising cash back rises above the current yield of the bond. Investors with high funding cost (e.g. with high leverage) may prefer the unfunded CDS to the bond.

³ Interest rate risk arises if the bond has a fixed-rate coupon. If the market interest rate increases, the price of the bond will fall.

⁴ This applies also for other derivatives: one may compare buying currency upfront versus acquiring it through a call in which only the premium of the call needs to be paid by the buyer of the call.

Therefore, sovereign CDS provide a straightforward vehicle for reflecting negative views of evolving credit risk in market positions. Prior to CDS markets, this was more difficult to do in the case of sovereign credit, as most investors cannot physically short⁵ government bonds. Hence, these CDS markets have emerged as a highly visible bellwether of a country's perceived credit risk.

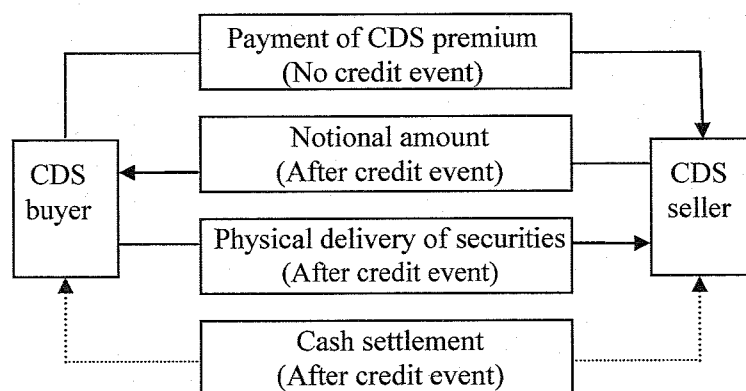
1.2. How does a sovereign CDS work?

*Basic features*⁶

Credit default swaps are over-the-counter (OTC) products and are quoted in basis points per year. A CDS price indicates the cost per year to either buy or sell exposure to the possibility of a default or restructuring. Therefore, a buyer incurs a yearly cost for holding a CDS contract.

The *seller* of a CDS receives periodic payments (premium), but bears the risk of capital losses in the event of default. The *buyer* pays the premium, but will receive a payment equivalent to the losses suffered by bond-holders in the event of default or restructuring. If there is no credit event over the life of the contract, the CDS premium is the only cash flow exchanged. However, upon a credit event, the seller compensates the buyer for the loss on the underlying debt (par minus the recovery value). (See Graph 1)

Graph 1: Basic CDS overview



The general terms of a CDS contract are laid down in documentation using standard forms most often promulgated by the International Swaps and Derivatives Association (ISDA). The economic terms of an individual contract are set out in the Confirmation document that specifies (among other things) the reference obligation, which needs to be affected by the credit event. For Western European sovereigns this is "borrowed money", i.e. any financial debt issued by a sovereign state (wider than bonds and loans). The encompassing definition of the reference obligation is moving the CDS away from being

⁵ To short the bond one needs to sell the bond that one does not actually own and with the proceeds from the sell enter in a reverse repo on the same bond.

⁶ The general terms of a CDS contract are laid down in documentation, which is widely used in the market, the most common being the ISDA Definitions.

a pure insurance instrument on a specific bond issue. A credit event on a subset of the reference obligations would imply a credit event for all the other obligations as well.

Local banks tend not to sell CDS in their respective sovereign CDS (i.e. a US bank will be likely not to trade US sovereign CDS) so as to avoid a double exposure to a sovereign credit event via their CDS contracts and their holdings of the underlying bonds. (OK?).

Sovereign CDS are usually denominated in a different currency than the currency of the underlying bond⁷, since in the event of default it is also likely that a currency crisis would unfold. If the CDS contracts were to be denominated in the same currency as the bond, the recovered value would be significantly distorted by exchange rate fluctuations. Thus, the market convention is to trade European sovereign CDS in USD (and US CDS in EUR). For euro-area Members States, however, the euro may still maintain its value even if one participating Member State were to default. Therefore, some market participants quote euro-area sovereign CDS in euro as well. Nevertheless, the most liquid CDS contracts for euro-denominated debt are the contracts specified in USD.

What triggers a payment?

The sovereign CDS contract is triggered when a credit event occurs. There are three credit events for sovereign CDS.⁸

The credit events are:

1. **Failure to pay** – a sovereign misses a payment of interest or principal on an obligation, beyond any grace period allowed on the obligation indenture⁹ (not more than 30 calendar days).
2. **Restructuring**¹⁰ – a sovereign alters the principal amount, coupon, currency, maturity, or the ranking in priority of repayment of an obligation as a consequence of deterioration in creditworthiness or its financial condition.
3. **Repudiation/Moratorium** – a sovereign refuses to honour its obligations and declares a moratorium and acts accordingly. This particular credit event will only trigger payment under the CDS contract if it is accompanied by an actual failure to pay or restructuring.

What happens after a credit event has taken place?

The investor who has bought a CDS contract is entitled to receive a payment equivalent to the face value of the bond, less any amount recovered from the bond obligation.

In the event of a default, the payment made (under cash settlement) by the seller equals:

$$\text{Net notional value} \times (1 - \text{recovery rate (\% of a reference obligation)})$$

⁷ This distortion of the knock-on currency devaluation is the main difference between sovereign CDS and corporate CDS (there is no currency impact in a typical corporate bond default).

⁸ For the corporate CDS "bankruptcy" is an additional trigger (bankruptcy is a concept that legally applies only to a corporation).

⁹ Indenture - a written agreement between the issuer of a bond and his/her bondholders, usually specifying interest rate, maturity date, convertibility, and other terms.

¹⁰ see Appendix 1 for details on sovereign debt restructuring

There are two ways of settling a CDS contract in case of default. One involves the physical delivery of bonds in exchange for money – so called physical settlement. The other only involves the transferring of cash – so called cash settlement.

For example, a country misses a coupon payment on a bond with a face value of €100, and the bond's price fall to 20 cents per euro. In *physical settlement*, the seller of the CDS receives bonds for a nominal value of €100 for every €100 insured. In return, the buyer of the CDS receives €100 in cash. Thus the bondholder who has hedged his bond position with CDS gets back the full face value, even though the bond's value has fallen by 80%. In the case of a "naked CDS", i.e. if the protection buyer has been speculating or has sought a proximate hedge to cover indirect exposures, he can buy the distressed bond on the market for €20, and sell them for €100 to the protection seller.

Theoretically, compulsory physical settlement limits the total notional amount of outstanding CDS on a particular reference entity to the total par value of deliverable obligations. If the CDS notional amount would be higher, "naked" CDS buyers could never be sure that their CDS would pay out in case of a credit event. Physical settlement of CDS contracts can also heighten volatility in the underlying cash bond market. Relatively high CDS notional has sometimes resulted in what is called a "short squeezes", i.e. where the bond price is temporarily driven above the expected recovery. In such a situation, CDS buyers attempt to buy the underlying bonds in a state where markets are illiquid, which drives up the bond price. A short squeeze reduces the net CDS payout to the CDS buyer, if he has to acquire the bond in order to settle the CDS contract at the time of a credit event. However, it does not affect CDS buyers who already hold a deliverable obligation. As CDS buyers without a deliverable bond would have to acquire it from bondholders, a short squeeze is a transfer of wealth from CDS buyers without deliverable bonds to bondholders without CDS protection. CDS sellers (as long as they do not resell a delivered obligation) and CDS buyers who already hold the bonds would not be affected.

However, typically CDS contracts are *cash settled*, whereby an auction determines the market price for the distressed bond and thus the recovery value. In this case there is no transfer of bonds, and the seller of the CDS simply transfers to the buyer the difference in value between the nominal value of the bond and the distressed price. The main advantage of cash settlement is that it overcomes the possible situation of the underlying bond being illiquid and so reduces the potential for heightening market volatility.

1.3. The CDS market size

There are two basic measures of the CDS market size: (i) gross notional amount and (ii) net notional amount.

(i) gross notional amount

The gross notional amount (as reported for example by the BIS) is the total of the notional amounts of all transactions that have not yet matured, prior to taking into account all offsetting transactions between pairs of counterparties. Gross notional amounts thus represent a cumulative total of past transactions.

The major drawback of this measure is that it significantly overstates the size of the market. As the signature of a CDS contract binds both counterparties until the agreed

maturity, market participants basically have three choices when intending to increase or reduce their CDS exposures:

1. they can terminate the contract, provided the counterparty agrees to the early termination;
2. they can find a third party to replace them in the contract, provided the counterparty consents to the transfer of obligations (“novation”);
3. they can enter into offsetting transactions.

As the third solution is extensively used, the number of outstanding trades has surged, resulting in an increase in total gross notional amounts. Therefore, it is misleading to use the gross notional amount as an indicator of counterparty risks.

(ii) net notional value

The net notional value takes into account all offsetting transactions between pairs of counterparties (i.e. outstanding transactions relating to exactly the same reference entity). The net notional amount is the basis for calculating the net payment obligation in a credit event, and is thus a proxy for the contribution made by CDS to an institution’s risk exposure. It represents the maximum amount of funds that could theoretically be transferred from the sellers of protection to the buyers, assuming a zero recovery rate at default.

The net notional amount of CDS can exceed the notional amount of deliverable obligations, which implies that some CDS buyers would not hold deliverable obligations. This possibility is more often the case for corporate reference entities and currently does not apply to European sovereigns, as the size of European sovereign CDS market is still much smaller than the sovereign cash bond market.

At the end of May 2010, the gross notional amount of the total CDS market was USD 14.5 trillion¹¹, with about 2.1 million contracts outstanding. The sovereign CDS market, which includes both sovereign indices and sovereign single names, reached USD 2.2 trillion, with about 0.2 million contracts outstanding. The outstanding gross notional amount of the Itraxx Sovereign Index Western Europe¹² was USD 140 bn (and USD 10 bn in net terms). At the same time the outstanding amount of sovereign euro-area bonds was close to EUR 4.5 trillion.

Table 2: Size of the CDS market for selected euro area sovereign issuers (in USD bn)

	Gross notional amount	Net notional amount
Germany	75	14
France	58	11
Spain	104	14
Italy	222	23
Portugal	62	8

Source: DTCC

1.4. Why are sovereign CDS used?

Sovereign CDS can be used to hedge an existing government bond position against losses from a potential deterioration of the credit worthiness of the borrower, or to take exposure to sovereign risk and receive a return in exchange for that credit risk. Compared to traditional risk mitigation methods, such as portfolio diversification, asset

¹¹ This is significantly lower than USD 60 trillion recorded in 2007. The decline is due mainly to intensified netting in the wake of the financial crisis.

¹² The index comprises 15 tradable Western European names, equally weighted.

securitisation or outright sales, CDSs do not require the protection buyer and the seller to adjust their underlying portfolios. Instead, credit risk exposure can be managed at relatively low cost.

Like all derivatives, sovereign CDS can be used not only to hedge trading positions, but also to efficiently manage portfolios, or to take speculative or naked positions on the underlying markets ("naked" transactions). As the instruments are marked to market, profits and losses from movements in the CDS levels occur continuously. There is no need for a credit event, e.g. a default, for counterparts to either make profits or losses it is sufficient to have a movement in the market's perception of default risk.

In principle, the bond market can be used to take a similar speculative position as buying a CDS contract, i.e. a position that becomes profitable when credit risk increases. However, profiting from increased credit risk using a bond is somewhat more complicated, as it would involve short-selling the bond. Short-selling ("shorting") a bond is in many ways similar to short-selling an equity. A market participant would have to borrow the bond and sell it at the current market price in hope of being able to repurchase it later at a lower price. As the agent has to return the bond to the lender, he has committed to purchase the security at a later stage. This strategy pays off if the value of the bond declines until the position is closed, for example due to increased credit risk. Usually it is a broker who locates a lender, but this may not be easy, as the broker might not hold the bond in inventory and the bond might be illiquid. Moreover, the lender will charge a margin to the borrower.

It is also possible to short a bond without first borrowing it. Such a practice is often called "naked" (uncovered) short-selling. It is only possible to enter this strategy for a short period of time, namely the settlement period of a bond purchase, since on the settlement date the bond must be delivered or the trade will be considered "failed to deliver". In most European countries, bonds are settled three days after the transaction, which gives an uncovered short-seller of a bond only three days to locate the bond for delivery to the buyer. Exceeding that period would result in late delivery or a settlement failure. Accordingly, the short-selling of government bonds is not a very attractive investment strategy, particularly in relatively illiquid markets

Sovereign CDS can also be used as trading tools for exploiting arbitrage opportunities in government bond markets, i.e. benefiting from short-term price discrepancies between different instruments that provide similar economic positions. The range of these arbitrage trades is wide and they can be conducted using only CDS or combining CDS with other credit instruments.

Beside hedging, speculation and making arbitrage trades, CDS contracts can be used to free regulatory capital. By buying sovereign 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 investments. Finally, sovereign CDSs present a somewhat standardised instrument for studying and comparing credit risk across countries. It is difficult to distinguish between the different uses of CDS contracts (see ECB, 2009) from basic transaction data. Classifying CDS transactions into hedging or synthetic credit trading activity would require an identification of the nature of the underlying asset exposure and where the CDS was booked. It would therefore be better to regard banks' use of CDSs as part of a continuum, rather than as an "either ... or" situation.

2. FACTORS INFLUENCING CREDIT RISK IN SOVEREIGN BOND AND CDS MARKETS

A bond price is in general determined by the nominal interest rate, the issuer default probability (credit risk), and other fundamental and technical market factors relating to supply and demand, and liquidity. From an analytical perspective, it is difficult to separate the default probability from the other market factors since they are intertwined. This is also the case for CDS spreads that represent perceived default probability on the underlying instrument, but are also determined by other factors such as liquidity, funding cost, and counterparty risk. Bonds typically expose the investor to one or several of the following risks: interest rate risk, credit risk, liquidity risk, call and prepayment risk, exchange rate risk, and inflation risk. CDS are designed to reflect pure credit risk of the issuer of the underlying bond and serve as a tool that allows transferring the credit risk of the bondholder to another market participant. However, it should be kept in mind that all other risks embedded in the bond stay with the bondholder, and are subject to change, thus impacting the bond yield. Thus, a strict comparison of developments in sovereign bond and CDS markets should focus on credit risk.

There are three types of credit risk in a bond: (i) default risk, (ii) credit spread risk and (iii) downgrade risk. The default risk is defined as the probability that the bond issuer fails to meet the obligations either on coupon payments or repayment of principal at maturity. Credit spread risk is the risk based on the price performance of the bond and is defined by the probability that the market value of the bond will decline more than the value of other comparable quality bonds. Downgrade risk reflects the possibility of a downgrade by a credit rating agency, which most likely will imply a decline in price.¹³

The credit quality of a sovereign issuer is usually determined by the rating provided by credit rating agencies. However, market participants also tend to follow a broad set of indicators that give a picture of the financial situation of the issuer, also in comparison to its peers. Changes in perceived credit quality of a bond issuer, irrespective of its rating, influence the CDS price, as well as the portion of the bond yield related to credit risk.

2.1. Fundamental factors

The main fundamental factors used for the assessment of the credit quality of a sovereign issuer are: the budget deficit, the debt-to-GDP ratio and the current account. Each of these factors has influence the evolution in sovereign quality among EU Member States since the onset of the financial crisis.

Government deficit

The deterioration of fiscal positions in Europe (and elsewhere), which are due to the financial rescue packages and the operation of automatic stabilisers, raised concerns in financial markets about the sustainability of public finances. Graph 2 presents general government deficits for selected euro area countries. For all countries, the fiscal position deteriorated over the last three years, for some countries significantly so (e.g. Greece, Ireland and Spain).

¹³ Fabozzi, F.J (2007), Fixed income analysis, John Wiley&Sons

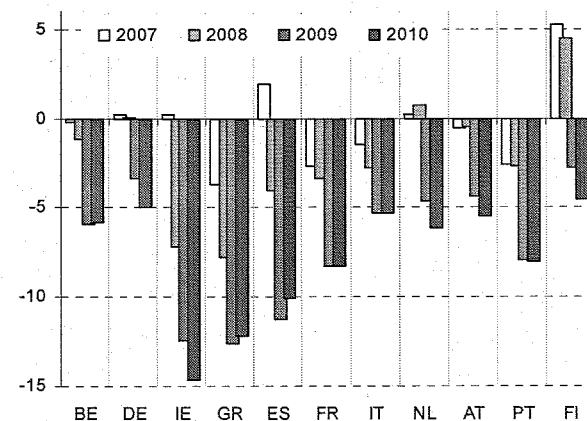
Market participants tend to follow information about government budget deficits very closely, as it is a relatively simple measure of credit quality. Moreover, the evolution of the deficit can be tracked on a regular basis. .

The correlation between the average level of sovereign CDS spreads in the second half of 2009 and the forecast for the budget deficit in 2010 (Graph 3) is relatively strong. This suggests that the perceived credit risk increased in response to, or at least in line with, the rising government deficits and debt levels.

Government debt

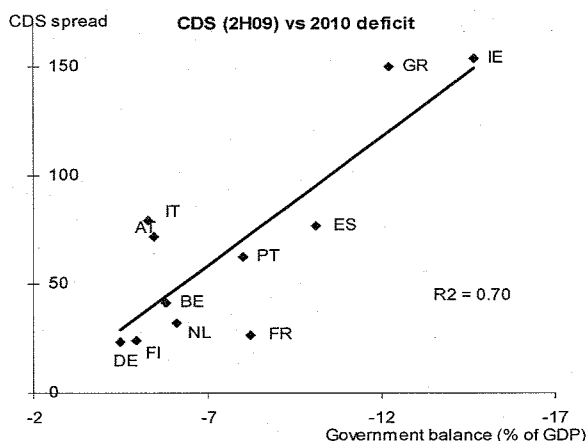
Another measure of the credit quality of an issuer and indicator of the probability of default is the relative size of general government debt in relation to domestic economic output, i.e. the debt-to-GDP ratio. In general, a higher ratio implies a higher probability of encountering difficulties with servicing the debt, and as a result, lowers sovereign credit quality. Graph 4 illustrates the build-up of general government debt in selected euro area countries. The debt ratio in 2009 was above 100% in Greece and Italy. The Graph also shows the sharp increase of the ratio in Ireland over the last three years.

Graph 2: General government balance (% of GDP)



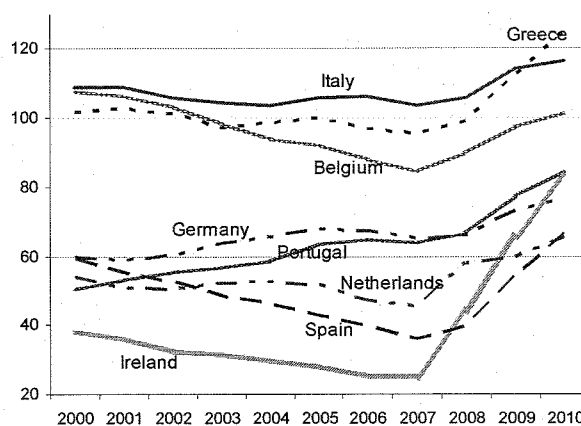
Source: European Commission

Graph 3: Sovereign CDS and budget deficit forecast



Source: European Commission, own calculations

Graph 4: General government gross debt (in % of GDP)



Source: European Commission, own calculations

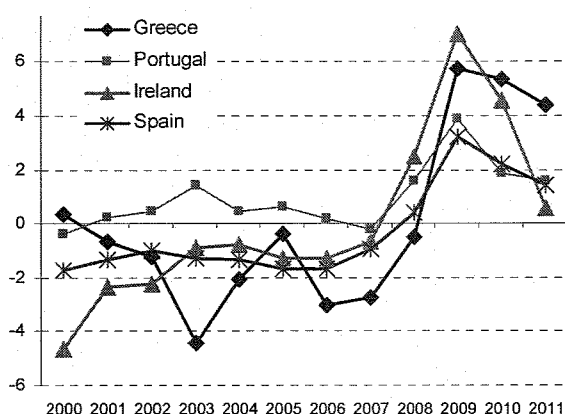
A high debt-to-GDP ratio contributes to the so-called snowball effect¹⁴, which provides an indication of the risk of a country experiencing an ever-increasing debt burden due to high interest rates payment and/or low GDP growth rates. This indicator, which captures

¹⁴ Snowball effect = $\frac{D_{t-1}}{Y_{t-1}} * \frac{i_t - y_t}{1 + y_t}$, where D is the stock of government debt, Y is the level of GDP, both measured in year t-1, i is the average interest payment on debt and y is the nominal GDP growth rate.

the evolution in underlying debt dynamics, clearly signals a deterioration in euro area government finances since 2007.

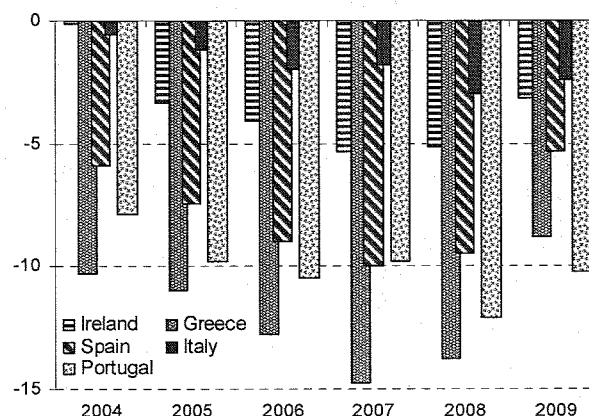
Graph 5 illustrates the snowball effect (i.e. increase in debt/GDP ratio) for selected euro-area Member States and shows how they all of them peaked in 2009 reflecting mostly the fall in GDP growth rate and in some case higher cost of debt servicing. The snowball effect should diminish in the following years mainly due to higher growth, as projected in the Commission forecast. However, due to the high stock of debt the decline for Greece will most likely be much slower than for other Member States.

Graph 5: Snowball effect for selected euro area members (in % of GDP)



Source: European Commission

Graph 6: Current account balance (in % of GDP)



Source: European Commission

Current account deficit

Wide current account deficits in several euro-area Member States have also heightened markets' perception of sovereign default risk. Countries with high current account deficits were considered as particularly vulnerable to reversals in international funding flows, implying pressure on economic activity and, by extension, budgetary performance. During the past five years, five euro-area Member States have been running significant current account deficits, i.e. were relatively dependent on external financing (see Graph 6). This suggests that the imbalances within the euro area are now playing a role in creating different market perceptions of sovereign credit risk across Member States.

All in all, the analysis of the fundamental factors shows that the differences in bond and CDS spreads across countries are justified. Government deficits, debt levels and current account deficits give a consistent picture of vulnerabilities. However, there are other factors that also influence the spreads, as discussed below.

2.2. Impact of liquidity on sovereign bond and CDS markets

A liquid market is characterised by a sufficient volume of buy and sell orders so that large-scale transactions do not affect market prices significantly. This allows participants to assess the market value of their positions and trade those positions easily. Factors that influence liquidity in sovereign bond markets include the issuing volume and the national issuing policy, as well as the existence of sufficiently liquid futures and repo markets that offer investors hedging and refinancing possibilities. In the euro area, only the German sovereign bond market has a liquid futures market.

Liquidity plays an important role in price discovery, as it allows the incorporation of new information in market prices sufficiently quickly. Blanco et al. (2003) investigating investment grade corporate CDS, finds that CDS spreads are usually more sensitive to changes in perceived default risk than the spreads on cash bonds. The authors speculate that price discovery occurs in the CDS market because of (micro) structural factors that make it the most convenient location for trading of credit risk, and because there are different participants in the cash and derivative market who trade for different reasons. A wide range of investors is present in cash bond markets, though to a large extent bonds are ultimately held in buy-and-hold portfolios of funded investors, such as insurance companies and pension funds. Conversely, more dynamic investors are often present in CDS markets, including hedge funds and proprietary trading desks, which can easily leverage their exposure due to the unfunded nature of derivatives.¹⁵

Blanco et al. (2003) support their analysis with the argument that shorting credit risk is more difficult in the cash market for bonds than in the CDS market. The repurchase agreement (repo) market for risky bonds is often illiquid. Even if a bond can be shorted on the repo market, the maturity of the agreement is usually very short, leaving the investor looking to short a bond for a long period of time exposed to changes in the repo rate. Credit derivatives, especially credit default swaps, allow investors to short credit risk over a long period of time at a known cost by buying protection.

However, empirical evidence does not support the theory that CDS markets tend to lead pricing in cash bond markets in all cases. Changes in the relative liquidity of bond and CDS markets may explain why there is no constant pattern of one market leading the other – the price discovery is taking place simply on the market where there is higher liquidity on a given day. This conclusion is supported by the findings of Levy (2009) whose empirical results strongly support the relevance of both counterparty risk and liquidity in the pricing of CDS contracts in emerging markets. He finds that illiquidity of CDS contracts has a positive effect on CDS premiums and counterparty risk has a negative effect on CDS premiums. Moreover, correcting for these two factors improves the estimates for the relation between a bond's yield spread relative to benchmark in the cash market and the corresponding CDS spread.

National sovereign bond markets in the euro area differ in terms of liquidity, with the markets for smaller issuers relatively illiquid. It is often argued that CDS markets are more liquid than some of the underlying cash bond markets in the euro area, particularly in times of market stress. Indeed, there are days when there are no trades on the cash markets of some euro-area Member States, making use of the CDS market an attractive way for an investor to change the exposure of his sovereign bond portfolio.

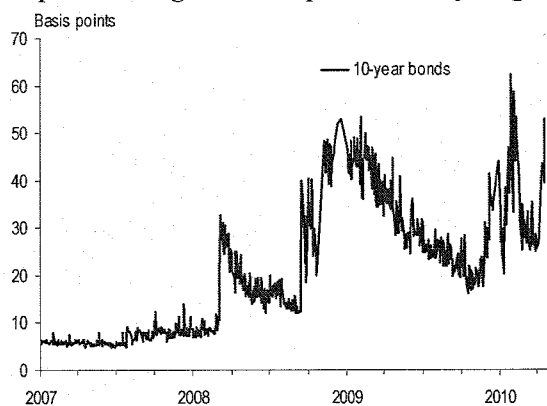
One measure of liquidity in a market is the bid-ask spread for the relevant instrument – the narrower the spread the more liquid the market. For the purpose of this analysis, Graph 7 compares the average bid-ask spreads in the sovereign bond market for eight euro-area Member States¹⁶ with that of the corresponding CDS market. Bid-ask spreads in the market for 10-year bonds (usually perceived as the most liquid maturity) began to widen in 2008. The situation improved slightly in the second half of 2009, before significantly deteriorating again in mid-November 2009, following the intensified

¹⁵ Different investor types are also subject to different regulatory frameworks and restrictions. The off-balance-sheet nature of CDS is an incentive for some types of investors to sell protection in derivatives markets rather than to buy cash bonds outright.

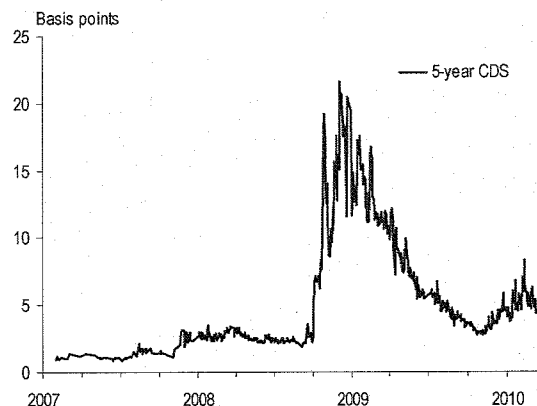
¹⁶ Belgium, Germany, Greece, France, Italy, Netherlands, Portugal, and Spain

concerns about fiscal sustainability in some Member States. The corresponding CDS bid-ask spreads (Graph 7, right panel) also began to widen in 2008, but were on a declining trend for the most of 2009, widening only slightly in the last quarter of 2009. The comparison between the two graphs suggests that in the last quarter of 2009 the CDS market was more liquid than the cash bond market.

Graph 7: Average bid-ask spread for 10-year government bond and 5-year CDS in euro area



Source: MTS¹⁷



Source: Markit

The relative liquidity in the sovereign bond and CDS markets at end-2009 could be explained by a simultaneous decline in turnover in the cash markets as credit risk increased and an associated higher demand for credit risk insurance. Since CDS enables investors to transfer the credit risk embedded in a fixed income security to another investor more easily than in the cash market, the demand for credit risk transfer is highest when and where there is highest risk i.e. on more volatile and less certain markets, making the market more liquid. (See Section 2.3)

Another factor that may be adding to higher liquidity of the CDS market compared to the cash market is the fact that there is no cash exchange and no funding risk in CDS transactions. This is particularly important for investors who are not able to borrow at repo levels. Moreover, some market participants may find it easier to obtain credit exposure by selling CDS than by buying the bond.

2.3. Other factors affecting sovereign bond and CDS markets

General market conditions

In times of heightened financial and economic uncertainty, investors tend to have a higher preference for less risky and more liquid assets. This leads to a higher premium for more risky assets as portfolio composition is adjusted to the desired new equilibrium (Favero et al. 2007, ECB 2009b). After the financial crisis started, capital markets became more volatile and general risk aversion increased.

The sovereign bond markets in the euro area have also been affected by higher risk aversion. As a result, investors began to discriminate more between issuers, which created a general widening of spreads in the euro area, albeit that the absolute level of

¹⁷ MTS is a market for the trading of fixed income securities in Europe. MTS has over 1200 participants throughout Europe, with average transaction volumes of up to 90 billion euros a day (single-counted).

yields remain generally quite low by historical standards. Barrios et al. (2009) found that domestic factors like liquidity and credit risk have become more important in the recent financial crisis in explaining yield differentials. More specifically, with respect to credit risk, the role played by macroeconomic fundamentals like fiscal and current account deficits (as discussed in Section 2.1) has been shown to increase with the level of general risk aversion. In particular, high debt countries, and countries with large current account deficits, are found to experience the highest bond yield increases, which is a consequence of deteriorating public finances. This may reflect market perceptions according to which countries with high current account deficit might experience difficulties to restore fiscal sustainability without compromising economic growth further.

Alexopoulou et al (2009) also finds that the period of financial market turmoil induced a significant shift in the way market participants priced credit risk in corporate sector and strengthened the leading role of the corporate CDS market in the price discovery process following the financial crisis.

Risk aversion

A simple and widely used measure of credit quality of an issuer is the rating provided by rating agencies. Overall, the rating is the most important single source of information on credit risk. Therefore, rating revisions, or announcements of intentions to do so, also tend to influence prices both of bonds and CDS contracts. This has been confirmed in a study by Aunon-Nerin et al (2002) who found that the strongest economic impact of changes in ratings occurs in sovereign CDS spreads. The results also confirm that the sovereign rating differences are larger (from a pricing point of view) than the corporate ones. Of course, credit ratings will reflect the fundamental factors discussed in Section 2.1.

In contrast, however, the ECB (2009) found discrepancies between sovereign CDS market-implied credit ratings (as provided by rating agencies) and actual default ratings, as in the corporate market. For example, the market-implied credit ratings derived from sovereign CDS spreads have diverged from standard credit ratings since the outbreak of the financial crisis, potentially indicating an increased probability of a credit rating downgrade. In other words, evidence suggests that credit rating agencies might have followed the evolution in CDS premia in determining the ratings of sovereigns.

Counterparty risk may equally affect the price of CDS contracts. Hull and White (2001) address this effect from a theoretical point of view, and based on simulations they determine conditions under which CDS prices are affected. They show how CDS prices are negatively affected by the existence of counterparty risk. While the seller's counterparty risk is fairly contained, the buyer faces greater uncertainty since, following a credit event, the difference between par and the recovery value of the defaulted asset is at stake, should the seller default on the back of the reference entity's credit event.

3. INTERACTION OF SOVEREIGN CDS AND BOND MARKETS

3.1. Theoretical links

In their seminal work, Black and Scholes (1973) assumed that derivatives are redundant assets and could thereby derive a pricing rule for derivative securities. This was done by applying a no-arbitrage argument and by constructing a dynamic hedge portfolio¹⁸. Since then academics have questioned the assumption of redundancy. Researchers recognise that financial markets are not complete.¹⁹ Therefore, introducing derivative securities could increase the opportunity set of investors, which in turn could make markets more efficient, lead to welfare effects, and make the derivatives market interact with the underlying securities market.

Price effects

The access to a developed CDS market allows investors to unload their risks without having to change their positions in the underlying bond. This implies reduced transaction costs and makes it possible to increase the investors' risk exposure in the underlying market, which should be beneficial both privately and to society.

To the degree that investors are better off by their increased opportunity set when CDS contracts are introduced, the additional trading possibilities reduce the investors' cost of capital and, ceteris paribus, increase the price of the underlying bond (i.e. the funding cost for sovereign states decrease). In a complete market, all assets are perfect substitutes, and contingent cash-flow claims can be duplicated by combining already existing assets. In a complete market, derivatives are, therefore, redundant assets. However, practical circumstances prevent the construction of such a complete market. For example, simple contracts may be difficult to write and carry out, e.g. contracts on future labour income. Further, transaction costs and regulations could make it difficult to construct new derivative securities for all possible outcomes. The introduction of CDS could therefore, in practice, contribute to making the bond market more complete.

A possible negative effect of trading CDS contracts could be that this trading diverts capital from the cash bond market to the derivative market. This could lead to a higher liquidity premium in the cash market, and therefore a higher required return and thus more "expensive" debt. However, credit default swaps are contracts between financial intermediaries, and are not issued by non-financial firms or sovereigns. At a national level, aggregated real asset value corresponds to the sum of aggregated equity, convertible instruments, and debt. Like any form of debt between financial intermediaries, CDS are not included in this balance. A holder of a CDS contract has claims corresponding to the other party's obligations. A seller of a CDS contract can be seen as a potential buyer of the bond, but has not yet bought it. Similarly, a buyer of a CDS contract can be seen as a potential seller of the underlying bond. Therefore it is not correct to say that selling a CDS represents a reduction in the total net demand for the bond. A more nuanced argument would be that the availability of a CDS market leads to a new equilibrium, whereby the total investment level could be either higher or lower.

¹⁸ A dynamic hedge portfolio is a risk-free portfolio that requires frequent adjustments to maintain the hedged position.

¹⁹ A model's markets are complete if agents can buy insurance contracts to protect them against any future time and state of the world.

Risk effects

Concerning the risk effects of introducing CDS contracts, trading in derivative contracts, especially in standardised contracts, can reveal information about the demand for financial insurance to the counterparty who supplies this insurance. According to one theory, the price variance in the underlying bond will decline when trade in standardised contracts is introduced, as opposed to the case when this demand for financial insurance is generated through dynamic trading strategies, i.e. re-balancing the portfolio between risky assets and risk-free lending/borrowing (see Grossman, 1988).

Market frictions and incomplete information about the fraction of portfolio managers that implement a dynamic hedging strategy can leave liquidity providers unprepared to meet the increased supply induced by the portfolio hedgers. This causes the bond price to be more volatile than it would have been if CDS contracts had been traded.

Liquidity providers must know the fraction of portfolio managers who decide to use dynamic hedging strategies to be able to make a correct capital allocation decision. In the absence of such perfect information, the liquidity providers will choose to provide an amount of capital that is optimal for some average level of volatility. This leads to situations in which the allocated capital is less than demanded in times of high volatility, and is in excess in times of low volatility. Therefore, the stabilising role of the liquidity providers will be undermined by imperfect information about the fraction of investors implementing dynamic hedging strategies.

In this situation a tradable CDS contract may have an important role to play. In the case that the portfolio insurers implement their strategies via the derivatives market, the price of the CDS will reveal the fraction of investors committed to dynamic hedging strategies. In the presence of real traded derivative contracts, the liquidity providers are informed about the fraction of portfolio insurers and thus can allocate their capital in an optimal and market-stabilising way, likely to reduce the total risk.

CDS trading could potentially also open up scope for a manipulation of prices, and this could lead to destabilisation. It is difficult to see how, but if it would be possible to implement a trading strategy that makes use of the fact that most derivatives are highly leveraged instruments, i.e. the value of a CDS changes relatively more than that of the underlying bond, volatility could increase. By trying to move the bond price, it might be possible to gain an additional return on a specific position in a CDS contract on that particular bond.

Existing academic literature

The existing literature on the interaction of CDS and bond markets focuses mainly on the pricing of risk and the role of both markets in price discovery. Furthermore, the vast majority of the research conducted is based on the corporate fixed income markets. However, there is an extensive parallel strand of literature dealing with the interaction between stock options and the underlying stocks (e.g. see Lindén (2010)).

For banks and other corporate issuers, the credit risk tends to be priced equally in the two markets in the long run (see Zhu (2004)). In other words, there is no arbitrage opportunity in the long run. However, in the short run, there is evidence of market inefficiency. The two markets exhibit substantial price discrepancies, which to a large extent are due to their different responses to changes in the credit quality of the reference

entities. Overall, the CDS market seems to lead the cash market in anticipating rating events and in price adjustment. The empirical findings also suggest that the relative importance of the two markets in price discovery can vary substantially across entities due to differences in liquidity.

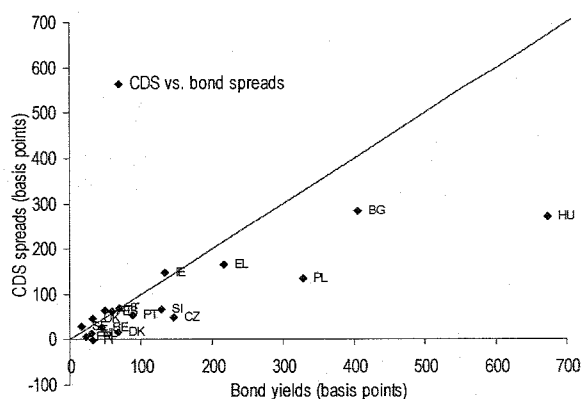
Buhler and Trapp (2008) attempt to estimate the credit risk component in corporate CDS premia and bond credit spreads. They find that the risk component is almost identical in both. Moreover, the period of the highest risk coincides with a period of low liquidity in the bond market.

3.2. Empirical findings – linkages between sovereign CDS and bond markets

Arbitrage conditions

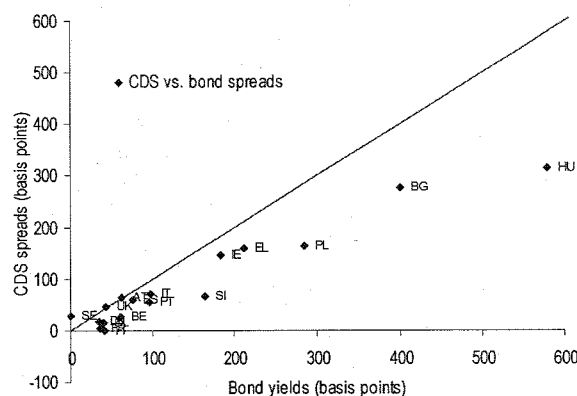
A first test of the efficiency of the CDS market is to compare the theoretically implied prices with the ones established on the market. As a default swap is a derivative product, its price can be theoretically derived through a no-arbitrage argument under the assumption that markets are connected without frictions. By forming a portfolio of a bond and the credit default swap for the same entity, an investor can eliminate most of the risks associated with the default on the bond. Approximately, if y is the yield to maturity on the bond and s is the CDS spread, the net annual return on the portfolio is $y - s$, i.e. the yield minus the insurance cost. In the absence of arbitrage opportunities this should be approximately equal to the risk free yield, r_f . The CDS spread s can thus be estimated to be equal to $y - r_f$.²⁰

Graph 8: 5-year – CDS spreads versus bond yields



Source: Bloomberg

Graph 9: 10-year – CDS spreads vs. bond yields



Source: Bloomberg

To avoid deciding on what risk free rate to use, the arbitrage condition can be specified relative to another country. In Graph 8 and Graph 9 the CDS spreads and the bond yields for the 5 and 10-year maturities are plotted for 18 EU countries relative to German spreads and yields. The 45-degree line constitutes the upper bound for what the CDS

²⁰ To reach this conclusion several simplifying assumptions have to be made, e.g. that the recovery rate of a defaulted bond is zero. A proper valuation of the CDS spread requires an estimate of the risk-neutral probability that the underlying bond will default at different future times and an estimate of the expected recovery rate in case of default. The simple case, where $s = y - r_f$, is an approximation of the true spread, and constitutes an upper bound for the spread. In this approximation a crucial assumption is that the recovery rate is zero in case of default.

spread should be. As long as the points are below the 45-degree line there is no evidence of any obvious mispricing. However, this representation of the market does not rule out that prices are manipulated; it just suggests that prices are contained within the theoretical bounds.

For both the 5- and 10-year maturities CDS spreads are within or very close to the no-arbitrage bounds. The spreads and the yields are calculated as averages over a period stretching from the beginning of 2009 to the first quarter of 2010. Overall, the picture is not changed by altering this time period. Only a few countries lie above the 45-degree line and these are in general countries in fairly good economic conditions. A divergence from the arbitrage bound can also be explained by recognising that Germany might not be the true risk free rate. In this case some countries could end up above the 45-degree line.

The graphs also show that CDS spreads for the more troubled countries are cheap relative to the bond spreads. This implies that CDS spreads can hardly be considered causing the high bond yields for these countries; however, this will be investigated further below. In fact, the insurance premiums, i.e. the CDS spreads, are well below the no-arbitrage bound for Greece and Portugal, and very close to the line for Ireland, Italy, and Spain.

This finding is consistent with sufficient supply of insurance being offered for troubled countries and that speculators act as insurance (liquidity) providers at a time of distress. This could be considered to be beneficial for the cost of funding sovereign deficits, because the insurance provided allow institutional investors to take on more debt, and thus keep the yields for troubled countries lower than otherwise would be possible. From this perspective the CDS market seems to facilitate risk sharing.

An alternative arbitrage condition that can be used for analysing the pricing interaction between the CDS and bond markets is called the CDS-bond basis (or simply the basis). The portfolio formed to derive the no-arbitrage rule is in this case more complicated. It involves combining the position of buying protection against default of a bond via a CDS contract and entering into an asset swap agreement²¹ where the fixed coupon payments of a bond are swapped against a stream of variable payments (a floating rate). The whole position is financed with a floating rate loan.

The resulting arbitrage condition – the CDS-bond basis – is nevertheless relatively simple; it is the CDS spread minus the asset-swap spread (Δ). Thus, the asset-swap spread is also an estimate of perceived credit risk, but it is priced on the bond market. The basis provides the link between the derivative market and the underlying bond market, and when the basis is zero the market is free of arbitrage opportunities. The basis, however, is rarely zero, and most often it is found to be positive, which reflects the extra costs for exploiting the possible arbitrage opportunity that a positive basis presents.

For properly analysing the CDS-bond basis both the CDS spreads and the asset-swap spreads are needed. The CDS spreads are relatively easy to obtain through various sources (e.g. Bloomberg as in the previous section). However, long time series for the asset-swap spreads seems to be less readily available. For the purpose of the following analysis (including correlation and Granger causality), the CDS spreads and the asset-

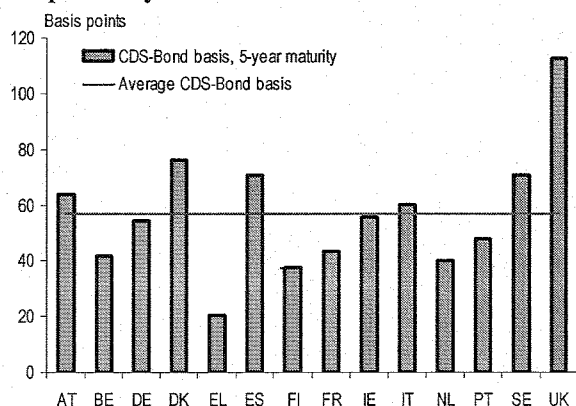
²¹ An asset swap is a derivative security that can be viewed as a portfolio consisting of a fixed-rate note and an interest-rate swap that pays a fixed amount and receives a floating amount to the stated maturity of the underlying fixed-rate note.

swap spreads were supplied by Markit and the Bank of International Settlement. Any analysis based on different data, e.g. approximating asset-swap spreads with sovereign yield spreads, could potentially give rise to different results and different conclusions.²²

The CDS-bond basis is in general positive, and is on average about 57 basis points for 5-year contracts and 37 basis points for 10-year contracts. Graph 10 and Graph 11 show the basis for 14 countries and the basis differs across countries and over time. From 2009 the average basis has varied between 55 and 114 basis points for the 5-year maturity and between -1 to 97 basis points for the 10-year maturity. These variations correspond to similar findings for corporate credit default swaps and bonds.

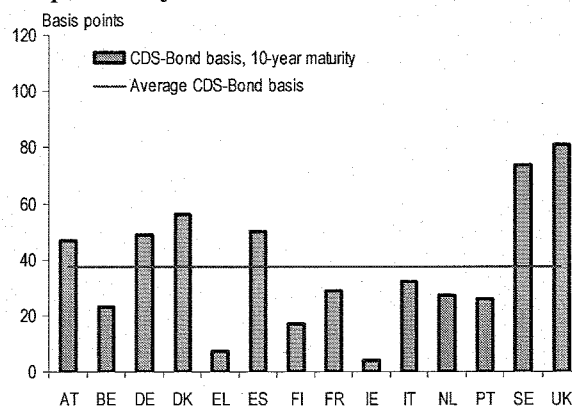
²² An alternative to using the asset-swap spread, but also less appropriate, is to use the spread between sovereign bond yields and the German yield, as in the analysis of the other arbitrage condition. If German yields are considered to be risk free, it is possibly a reasonable approximation, but there is still a risk of introducing German-specific effects into the analysis. If German bonds are not completely risk free, e.g. because Germany is taking on private sector risk and other sovereign risks, the analysis could also be affected and even flawed.

Graph 10: 5-year CDS-Bond basis



Source: BIS and MARKIT

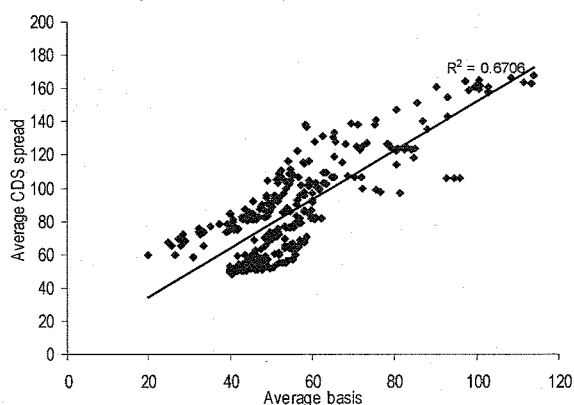
Graph 11: 10-year CDS-Bond basis



Source: BIS and MARKIT

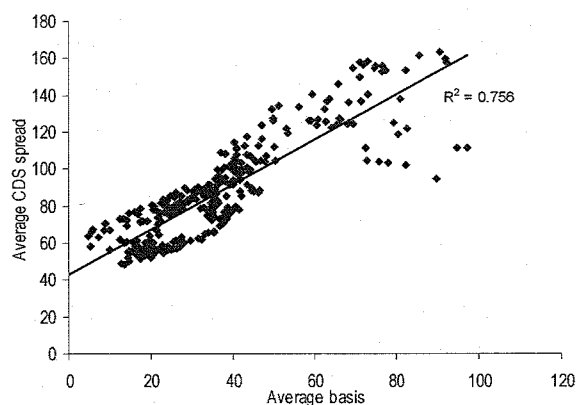
The average basis tends to vary with the developments on the credit markets; there is a positive correlation between the basis and the level of the CDS spreads. This implies that in periods when there is sell pressure on the credit markets, i.e. credit spreads widen, the basis tend to increase. This point is illustrated in Graph 12 and Graph 13, where the average basis is plotted against the average CDS premium. The graphs illustrate the significant correlation that amounts to 0.67 and 0.76.

Graph 12: CDS spread versus CDS-Bond basis, 5-year maturity



Source: BIS and MARKIT

Graph 13: CDS spread versus CDS-Bond basis, 10-year maturity



Source: BIS and MARKIT

It is plausible that the positive basis simply reflects the extra costs for exploiting the possible arbitrage opportunity that a positive basis presents. For a negative basis it is relatively easy to make the arbitrage. One just buys the bond and the CDS contract and waits for a risk free position giving a return above the risk free rate. Exploiting a positive basis involves shorting the bond, which is not easily done. In conjunction with the absence of arbitrage as illustrated in Graph 10 and Graph 11, a positive basis might just reflect the higher costs for short selling, or entering into a positive basis sale.

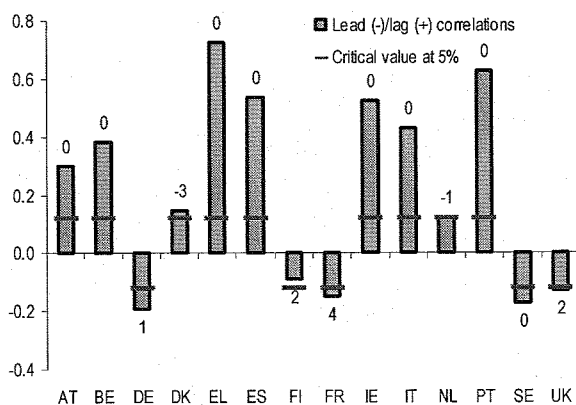
In general, there is no excess positive basis for the more exposed countries, their basis look normal, or show signs of efficiency. For Greece and Ireland the basis is very low and close to zero for the 10-year maturity, which could imply one of two things. Either the CDS markets are relatively efficient for Greece and Ireland, as they are heavily

scrutinised by market participants. Market makers are providing sufficient insurance and liquidity, while arbitrageurs exhaust any arbitrage opportunities, and thus making it easier for investors in Greek and Irish debt to off-load their credit risk. This would be beneficial to Greece, as it would allow them to borrow more cheaply. Alternatively, factors influencing the asset swap spread have become more important, making the spreads relatively higher. Such factors could be related to funding issues, e.g. higher funding costs could prompt investors in credit risk to obtain their exposure through selling CDS rather than acquiring it through an asset swap. This would drive the CDS-bond basis down. The lower basis could also reflect a higher counterparty risk faced by the protection buyer.

Correlation analysis

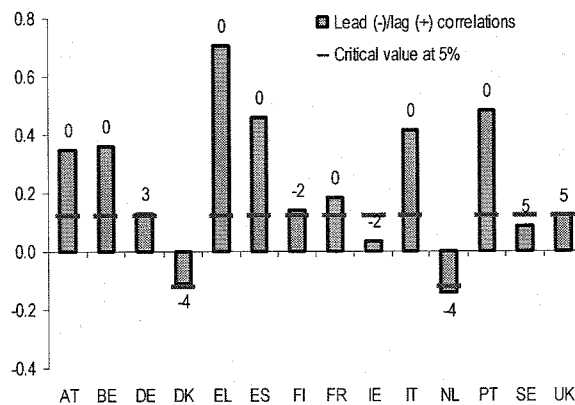
The auto-correlation between changes in the CDS spread and changes in the asset-swap spreads (ASW in the graphs) show whether price changes on one of the two markets – CDS or bond – precede the other. A significant leading property would indicate that price discovery occurs on that market. Graph 14 and Graph 15 show the auto-correlation between the changes in CDS spreads and asset-swap spreads, where the bars represent positive or negative correlation and the cross bars are the critical values for significant correlation. The numbers next to each bar states by how many days the markets is either leading or lagging the other. A negative number implies that the CDS market is leading the bond market and vice versa.

Graph 14: Correlation between changes in CDS spreads and changes in ASW spreads, 5-year maturity, 2009-2010



Source: BIS and MARKIT

Graph 15: Correlation between changes in CDS spreads and changes in ASW spreads, 5-year maturity, 2009-2010



Source: BIS and MARKIT

The links between the CDS and bond markets are strong and significant. The auto-correlation between changes in the CDS spreads and changes in the asset-swap spreads varies across countries, but are in general significant. For some countries, especially for the more troubled ones, the correlations are very high even after calculating the changes in spreads, which tends to introduce noise and decrease the correlation. Taking the average of changes in spreads across countries reduces the noise and shows that in general the correlation between the two markets is strong.

The correlation analysis shows that changes in spreads in the two markets are mainly contemporaneous. The vast majority of countries show no lead or lag behaviour, and when series are not changing contemporaneously, CDS and bond markets are basically equally likely to lead or lag the other. Furthermore, these relationships have been broadly

stable over time. This finding does not rule out that there exists a lead-lag relationship in intra-day trading. However, it is unclear what such a finding would imply.

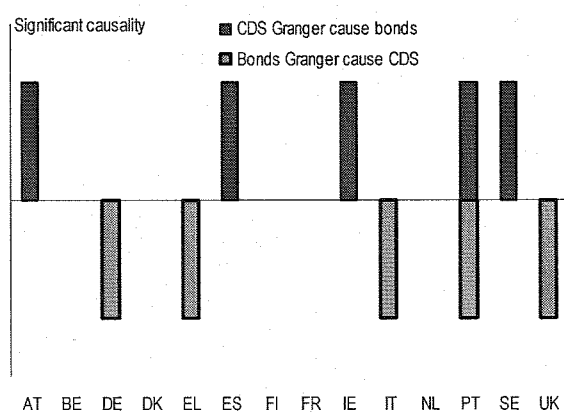
Granger causality and price discovery

Taking the analysis of price discovery one step further, Granger causality tests between changes in CDS spreads and changes in asset swap spreads also show where price discovery occurs. However, the Granger causality test focuses on the additional information that one market provides for the other. Graph 16 and Graph 17 show for which countries CDS and bond markets significantly cause the other. The implication of significant causality is that past information in, for example, the CDS premiums help explaining future changes in the asset swap spreads.

Price discovery is equally likely to occur on the CDS and bond markets. For the overall period (2008 to the first quarter of 2010), CDS markets seem to Granger cause bond markets more often at the 5-year maturity, while the reverse is true at the 10-year maturity. In the later period, 2009 to the first quarter of 2010 (shown in the graphs), fewer countries show any significant causality. Furthermore, there is a slight change towards bond markets becoming relatively more important in terms of price discovery.

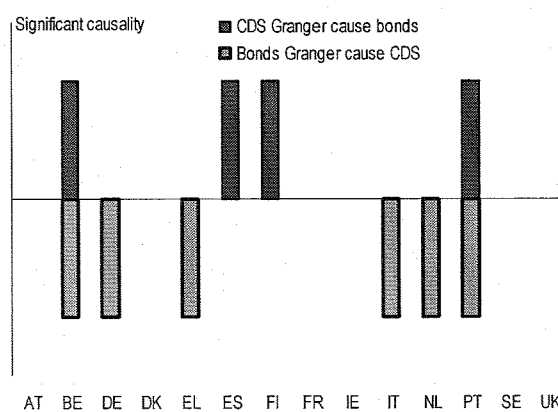
At the country level, no particular pattern emerges. For example, for the most economically troubled countries causality seems to run in either of the two directions. For Greece and Italy, the bond market seems to be the more important market, while for Spain and Ireland the CDS market is more important, and for Portugal it goes both ways. The significant causality found seems to be more randomly distributed than anything else, which is coherent with the contemporaneous relationship found in the previous section.

Graph 16: Granger causality tests for changes in CDS spreads and changes in bond yields, 5-year maturity, 2007-2010



Source: BIS and MARKIT

Graph 17: Granger causality tests for changes in CDS spreads and changes in bond yields, 5-year maturity, 2009-2010



Source: BIS and MARKIT

All in all, price discovery seems to occur simultaneously on the two markets. The analysis of the auto-correlations clearly showed this feature in the data, while the causality tests do not contradict this conclusion. In fact, the significant causality found is randomly distributed among countries, and more importantly the results are not stable enough, as they are sensitive to the model specification. However, this is consistent with a contemporaneous relationship between the two markets.

There are more appropriate ways of analysing credit risk price discovery, which studies the long term relationship between the CDS and the bond market. However, the methodology requires that the CDS-bond basis is sufficiently stable, or stationary as the statistical term is. This long term relationship justifies the use of a vector error correction model when analysing the interconnection between the two markets. Due to time and resource constraints, this type of analysis has not been performed, but the study would benefit from it. Nevertheless, the model requirement would limit the analysis to those countries that exhibit a stationary CDS-bond basis, which are far from all. The others would still have to be analysed using Granger causality tests.

4. THE CASE OF GREECE

4.1. Developments in the sovereign bond and CDS markets

For several years, many indicators have pointed to a difficult budgetary situation in Greece. Nevertheless, markets reacted to this information only to a limited degree. A prolonged period of low spreads relative to other euro-area Member States created the impression of a sufficiently contained situation, and a small additional yield on Greek bonds compensated for the higher risk due to relatively weak government finances.

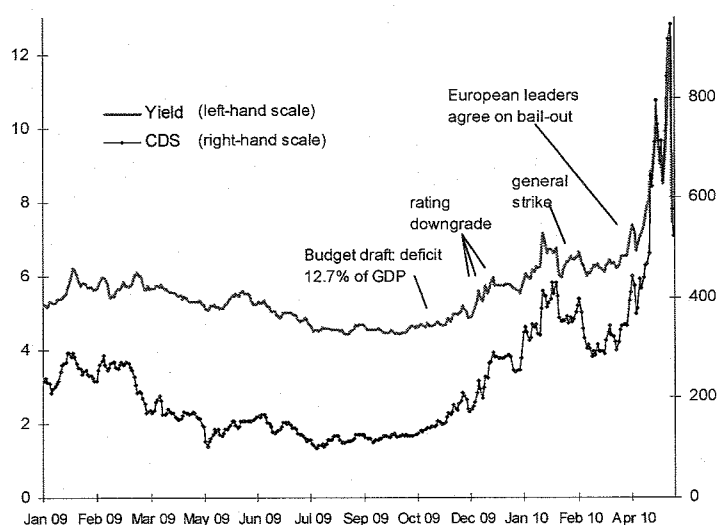
One possible explanation for this apparent absence of market discipline may be a general mispricing of risk. After years of financial innovations and products that were designed to diversify risk, investors were convinced that risk in the financial system had declined, so the price for taking risk also declined. After the market turbulence in mid-2007, investors began to revise their perception of underlying risk of various assets, a process which accelerated after the default of Lehman Brothers in September 2008. This reassessment of risk, and the ensuing correction in asset prices caused distress for many financial institutions and led to a massive transfer of risk from the financial sector to government via rescue packages, capital injections and guarantee programmes. The higher burden on government, aggravated by the effects of the crisis, eventually inspired market participants to look closer into public finances and their sustainability.

Moreover, the reliability of Greek government deficit and debt statistics has been subject to continuous attention for several years, notably by the Commission²³. As a result of the observed poor quality of Greek general government data, investors' trust in official figures has suffered (see Graphs in section 2.1).

The trigger for the widening of yield and CDS spreads was the announcement of the draft budget with a deficit of 12.7% of GDP, twice as

much as previously expected (see Graph 18). This fact made investors to look closer into the Greek budgetary situation and its economic implications. In December 2009; the three main credit rating agencies downgraded Greek sovereign debt.²⁴

Graph 18: Greek 10-year benchmark yield and CDS spreads



Source: Bloomberg

²³ Report on Greek Government Deficit and Debt Statistics, European Commission, Eurostat, January 2010

²⁴ Another technical factor that may have influenced Greek sovereign CDS prices is protection sought by banks involved in bonds syndication. Typically, banks want to hedge before the issuance and try to limit the concentration of their exposure during the issuance. This creates increased demand for credit risk protection and may temporarily drive the spreads high. Nevertheless, in the case of Greece, there is no evident link between bonds issuance periods and spike in Greek CDS spreads. See Appendix 3.

Table 3 displays the evolution of the "sustainability indicator" for Greece, published by the Commission each year with the assessment of the annual stability and convergence programme. The sustainability indicator provides an estimate of the primary budget balance (i.e. balance excluding debt-servicing costs) required to stabilise the general government debt-to-GDP ratio.

The IBP (initial budgetary position) would take the value zero if the structural primary balance in the starting year – maintained at this level over time – would be just sufficient to keep the debt-to-GDP ratio at its level of the starting year over the long term. For Greece starting from 2009, an IBP of 2.6% of GDP indicates the improvement in the structural primary balance from its current level required to keep the debt ratio unchanged.

The S2²⁵ indicator further includes the additional adjustment that would arise from the projected long-term increase in the cost of ageing, if the current social systems were kept unchanged. Overall, both indicators show that Greece has been at high risk in terms of long-term sustainability of its public finances for some time.

Table 3: Greece - Sustainability indicator (in % of GDP)

	2004	2005	2006	2007	2008	2009
IBP	n.a.	1.2	1.3	0.5	2.9	2.6
S2	10.4	8.9	n.a.	8.7	n.a.	14.1

Source: European Commission, various stability programme assessments; 2009: Sustainability Report 2009. For method, see Sustainability Report

4.2. Structure of Greek sovereign CDS market

Data limitations

The following analysis is based on data received from the DTCC and a few general comments are justified at this stage:

- The completeness of the DTCC data has not been verified. However, the presence of many small institutions in the data suggests that they are comprehensive.
- Data have been received only for Greece, Italy, Spain, Portugal and the Western European Sovereign Index. In the following sections of the analysis, only data on Greece are presented, as the data for the other countries still needs to be processed. However, in order to put the findings into perspective, a view on the other countries would be essential.
- No data on underlying bond positions have been received. Therefore, it is not possible to establish with certainty the holders of the underlying positions in Greek debt.
- In order to look at price reactions (the CDS spreads and the CDS-bond basis) to trading behaviour, daily data are needed. The DTCC was not able to provide data at a daily frequency. Instead, they have supplied the Commission with the weekly stock of all transactions that existed at the end of each week between 31/7/2009 and

²⁵ S2 is sum of the gap to the debt-stabilising primary balance and additional adjustment required to finance the increase in public expenditure due to ageing over an infinite horizon.

30/4/2010. It is possible to approximate the daily positions from these data, but it requires further data processing, which is time consuming.

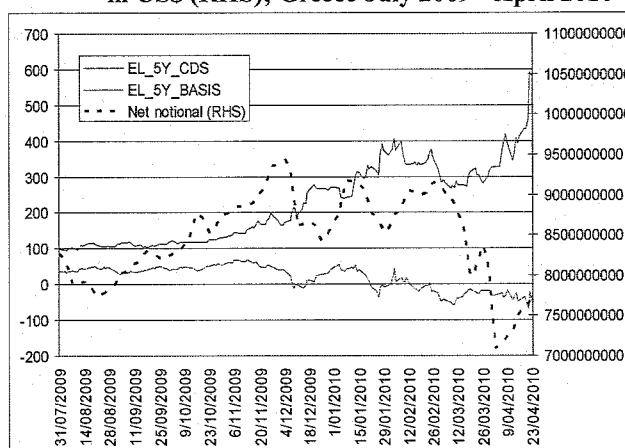
- The notional amounts are displayed in euro (except for Graph 19). Although about two-thirds of the contracts are denominated in USD, a conversion to euro has been made to reflect the risk from an EU perspective. USD-contracts were converted using the exchange rate at the end of April, thus avoiding changes in the notional due to the depreciation in the exchange rate.

CDS spread and net notional on Greece

The net notional amount outstanding is calculated as the difference between value of the outstanding contracts bought and sold by counterparty, and then summed up over all counterparties that are net buyers.²⁶ An increase in net notional is indicative of rising demand for credit risk protection on the underlying asset.

Graph 19 shows that the net notional amount of CDS on Greek sovereign bonds increased from August 2009 until March 2010, when it started to decline. The CDS spread has been rising over this whole period. The net notional amount of CDS bought corresponds to the maximum par value of Greek sovereign debt that could possibly be hedged in the market. As this ratio is very low, it suggests that CDS must have been used primarily for hedging, i.e. covering (partially) underlying risk. Unfortunately, it is not possible to confirm or refute this suggestion from the available data. However, it is worth noting that when the CDS spread was widening sharply after March 2010, the net notional of outstanding CDS might have been expected to increase in line with a likely increase in the demand for hedging. In fact, the net notional did not increase, although this may have been because of the growing attention of regulators on the CDS market.

Graph 19: CDS premium (LHS in basis points), CDS-bond basis (LHS in bps) and CDS net notional bought in US\$ (RHS); Greece July 2009 - April 2010



Source: DTCC and Markit

²⁶ See the appendix for a more detailed description of measures of the CDS market.

5. REGULATORY MEASURES

On 2 June 2010, the Commission reiterated its financial reform programme for the coming months. This programme is articulated around four main principles: enhanced transparency, effective supervision and enforcement, enhanced resilience and financial stability, and strengthened responsibility and consumer protection²⁷.

Within these four main principles, two of them are of particular importance for the sovereign CDS market:

- enhanced transparency which covers both the transparency to regulators and the transparency to market participants, the latter being split between pre and post trade transparency;
- strengthened responsibility and consumer protection that aims at curtailing excessive speculation and risky behaviour.

These two principles underlie Commission policy actions to ensure efficient, safe and sound derivatives markets, as outlined in the Communication of 20 October 2009.²⁸

5.1. European Markets Infrastructure legislation

The European Commission is preparing a new legislative proposal on the infrastructure for the OTC derivatives markets, which is scheduled for release in September 2010. As for all OTC markets, these measures will impact the CDS market and consist of two main lines of action: mandating central counterparty clearing and establishing trade repositories.

Mandating central counterparty clearing

CDS are characterised by significant counterparty risk for the CDS buyer as they exhibit an asymmetric payoff structure under which the seller might face a sudden large payout (jump-to-default). Moreover, other CDS market characteristics, such as high leverage and interconnectedness, provide powerful reasons for central clearing. Legislative measures to this end are well advanced both in the EU²⁹ and in the US. Although central clearing is not yet offered for single name sovereign CDS or for the sovereign CDS indices, some clearinghouses are preparing to offer such a service.

Central clearing per se does not limit market participants' ability to express a view on the credit risk of a sovereign by either buying or selling a CDS contract. However, higher collateral requirements on the CDS seller, especially on single name CDS, may increase the cost for CDS sellers and eventually push prices up and/or contribute to a decline in supply.

²⁷ See Communication of the European Commission "*Financial services: regulating for growth 2010-2011*", 2 June 2010

²⁸ See Communication of the European Commission "*A road map for ensuring efficient, safe and sound derivatives markets*", 20 October 2010

²⁹ Draft legislative proposal on European Infrastructure Markets expected to be presented by the EC in September 2010

Establishing trade repositories

Trade repositories are key in providing regulators with a complete overview of the derivatives market and therefore assisting them in monitoring systemic risks. At present, the CDS market already benefits from the services of a trade repository operated by the Depository Trust and Clearing Company (DTCC)³⁰, which claims to gather information on about 95% of CDS transactions.

Publicly available DTCC data are organised in three sections. The first section covers outstanding positions on the aggregate gross and net notional amounts (on a weekly basis), as well as the number of contracts, outstanding per 1000 largest reference entities and all CDS indices and index tranches. The gross notional for single reference name types (e.g. corporate: basic materials, utilities, financials etc, as well as sovereigns) is broken down into two types of market participants (dealer/non-dealer) and position bought and sold. Aggregates are also broken down by scheduled termination date and currency. The second section presents these data as changes compared with the previous week and the third section breaks the weekly changes down into transaction type, namely new trades, terminations and assignments. There is no public release of transaction prices.

For regulators, the data made available by DTCC can be substantially extended and refined; name of counterparties are, for instance, available and data can be made available daily. However, existing trade repositories have not been established for market surveillance operations. The data, which they store, do not meet the needs of supervisors in conducting market surveillance operations. For example, neither the time of the transaction nor the price of the trade is available to regulators.

Therefore, the scope, nature and format of data stored by DTCC will have to be closely studied by the supervisors if trade repositories are to be used by regulators for the performance of their duties in market surveillance.

5.2. Short selling regulation

As announced by Commissioner Barnier in his speech to the ECON committee on 4 May 2010³¹, the Commission is preparing a regulation on short selling of securities. This regulation is likely to cover equities, bonds and some credit derivatives, including sovereign CDS. A public consultation on this topic should begin in June 2010.

Any legislative proposal could address some issues of relevance to the sovereign CDS market by: (a) increasing the information available to supervisors and (b) allowing supervisors to restrict some market practices in case of needs.

The proposal could include

1. the obligation to disclose to regulators net short positions on sovereign bonds, including short positions coming from the use of sovereign CDS.
2. some emergency powers given to national regulators to request additional information from users of sovereign CDS on the reasons why they are using them.

³⁰ For further information, please see DTCC website:
<http://www.dtcc.com/products/derivserv/data/index.php>

³¹ See speech "Les priorités pour les services financiers pour l'année à venir" by Mr Barnier, 4 May 2010

Such two measures would provide regulators with substantially increased transparency not only on sovereign CDS trades but also on the underlying positions of the market operators in the bond markets or other financial markets. This would allow regulators to see how sovereign CDS are being used by market participants. For instance, this would allow them to see who is using sovereign CDS for hedging and who is using them for position taking. This would also enable supervisors to see what kinds of exposure are being hedged in sovereign CDS markets.

In addition, the proposal on short selling could also include emergency powers for supervisors, affording them the possibility to restrict the use of sovereign CDS in specific market conditions.

The nature of restrictions that could be imposed could vary depending on the circumstances. Two possible restrictions would be a ban on naked CDS or the mandating of physical settlement. These two options are discussed below.

Ban on naked CDS

A possible policy approach would be to ban naked sovereign CDS transactions, i.e. preventing market participants from buying a CDS on credit risk without exposure to the underlying credit risk. Such a ban would affect potential CDS buyers (CDS sellers are usually "naked" as they take on the credit exposure without permanently offsetting transactions in the cash market). The typical reasoning behind confining the purchase of sovereign CDS to hedging purposes is the following: if negative views on credit quality are more cheaply and easily expressed in the CDS market than in the cash bond market, due to higher liquidity of the latter (see Section 3.1), and the CDS market can influence the cash bond market, then such a measure might slow down a possible increase in the cost of borrowing for the sovereign in question.

- Such a possible ban raises two main questions: (i) would hedgers be able to find enough trading partners if buying CDS would only be restricted to hedging? and (ii) would such a ban have negative repercussions on the bond market?

According to several academics, prohibiting naked positions in credit default swaps could dramatically impact the market³². If the CDS market is reduced to hedgers only, market liquidity is likely to drop substantially.

Normally, market makers have a balanced position as they earn on receiving the bid-ask spread. The liquidity argument would therefore require an exemption of market makers from such a measure.

As regards non-market makers, it is not clear how a ban on naked sovereign CDS would affect their behaviour. Since standard CDS contracts usually last for several years, one way of reducing or exiting a net seller position is to buy a CDS. However, another way of exiting a sell position is to terminate the contract early (i.e. negotiating the exit with the counterparty). This may be costly, because the counterparty would have to adjust its strategy as well. Finally, a seller might "assign" its legal position to another counterparty, i.e. the contract would not be terminated but taken over by another counterparty, with the buyer remaining the same). Both of the latter techniques are frequent in the market.

³² Stultz, R., Credit Default Swaps and the Credit Crisis, Journal of Economic Perspectives, Winter 2010

Nonetheless, a ban of *buying* naked CDS may reduce the incentive of CDS *sellers* to enter the market.

The second question relates to the effect of such a ban on the bond market and beyond that on the financing conditions of the country and entities of the country that will be the object of the ban.

Under a permanent naked CDS ban, CDS would possibly become more classical insurance devices, i.e. customised to closely-related exposure. This would reduce the market's ability to trade credit risk and, make proxy-hedging³³ impossible. As a result, the cost of bond market financing for the broader economy could increase.

It has often been argued that the credit risk transfer through CDS improves the ability of borrowers to place debt in the market and that CDS would therefore have a beneficial impact on the underlying cash market. However, the theoretical case is not so clear-cut.

On the one hand, credit risk transfer may allow debtors to place more debt in the market, as it relaxes lenders' constraints on credit exposure.³⁴ For example, holders of sovereign debt could relax limits on country exposure by partly hedging with CDS. Another reason might be that in case of concentrated debt renegotiation a reduced exposure (through CDS) could strengthen the lenders' bargaining power in restructuring allowing to issue more debt.³⁵

On the other hand, credit risk transfer may reduce lenders' incentives to screen and monitor the borrower which would increase informational uncertainties and make the market less efficient.³⁶ This situation in which CDS buyers also hold an underlying cash position is to some extent the opposite case to a "naked" position in CDS and has been referred to in the literature as "the empty creditor problem".³⁷

Empirically, this issue has been studied for corporate debt by Ashcraft and Santos (2009) with mixed findings.³⁸ The authors do not find evidence that the average firm on which CDS are traded has benefited from a reduction in the credit spreads that it pays to issue in the bond market or to borrow from banks. However, there is evidence that the onset of CDS trading has increased the cost of debt financing for the riskier firms as well as those that are more informationally opaque. In contrast, safer and more transparent firms experience a small reduction in the spreads after their CDS started to trade.

³³ These are hedges, which cover a non-deliverable obligation that is sufficiently correlated with the deliverable obligations. Examples would be using sovereign CDS to hedge exposure to banks or corporates in the same jurisdiction or to hedge exposure to other sovereigns, for which no sovereign CDS are traded. Since CDS are a synthetic market, it would of course be possible for market participants to write CDS contracts on any "exotic" reference entity. Since market liquidity for that contract would be low, however, the CDS seller would require a significant premium beyond the credit risk. Therefore, proxy-hedging may be less precise but cheaper.

³⁴ Hakenes, H. and I. Schnabel (2009): *Credit Risk Transfer and Bank Competition*, Max Planck Institute for Research on Collective Goods, Bonn, Preprint 2009/33.

³⁵ Bolton, P. and M. Oehmke (2010): *Credit Default Swaps and the Empty Creditor Problem*, Columbia University, Working Paper.

³⁶ Hakenes and Schnabel (2009)

³⁷ See, for example, Box 13 in ECB (2009).

³⁸ Ashcraft, A. and J. Santos (2009): Has the CDS market lowered the cost of corporate debt?, *Journal of Monetary Economics*, 56, pp. 514-23.

For sovereign CDS, no similar study exists. As the assessment of sovereign creditworthiness by and large rests on public information, reduced screening incentives through CDS should play only a minor role. However, rather opaque public accounts have been important in the recent sovereign debt crisis.

Overall, it is not clear how the bond market would be affected by a ban on naked CDS. Moreover, there are substitute strategies to bet on a downturn on sovereign risk: sell a future on the bond, buy a put option, sell a call option, short sell the bond are usual investment techniques that would also need to be addressed in order for the ban to have some kind of efficiency.

Nevertheless, if such a ban would be considered as a temporary measure in case of "emergency", trading credit risk would be possible in normal times but slowed down in emergency situations.

In principle, it is possible that CDSs, due to the leverage, can help to build momentum on cash bond markets. For example, a sudden rise in the demand for CDS to hedge either pure sovereign risk or more general macroeconomic risks, or even to speculate on that market, may unleash disproportionate effects on the CDS prices if their supply cannot react swiftly in the short run. If market participants base their expectations concerning bond prices on CDS behaviour, this may contribute to a sell-off on the cash bond market, which may lead to self fulfilling expectations. Nevertheless, buying protection is not for free. For example, a buyer of CDS on Greek risk will have to pay an annual fee of around 740 basis points³⁹.

However, if market participants are indeed basing their expectations on the CDS markets, this kind of momentum could eventually lead to increase of yields. Moreover, since prices and trading volumes in this type of product are unknown to other market participants on a daily basis, they may create an impression that widening CDS spreads are a reflection of bearish views of the wider market, while in reality this move may be caused by only a handful of transactions. Overall, the lack of post-trade transparency limits the ability of participants and supervisors to analyse the market.

If emergency situations remained a measure of last resort, the functioning of the CDS market may not be changed much from the present one. This of course would depend on the definition of emergency, for example how would that be linked with the bond market, what would be the indicators used etc.

As mentioned above, there are substitute strategies that would enable market participants to circumvent a ban. However they need time to be developed and implemented, thus using temporary bans could prove to be an efficient way of dealing with short-term emergency situations.

On the other hand, if temporary bans become a "normal" practice of supervisors, this could create additional uncertainty in the market. If in more volatile market situations a ban can be imposed market participants might price in this uncertainty and bond yields might therefore increase. Further, a self-fulfilling prophecy may take place – higher and more volatile yields provide stronger support for the introduction of a temporary ban.

³⁹ As of 2 June 2010

Another drawback of a ban is that it can send a very strong message to the financial markets about the gravity of the situation of the country(ies) for which the ban will be set in place.

- There are also a number of other questions related to any such ban.

One question relates to the possible scope of such a ban, in function of the definition of naked and insurable interest. Insurable interest could be defined narrowly, i.e. that only investors that are long the sovereign bonds could buy CDS and for a maximum amount equal to their long bond exposure. It could also have a wider definition that would include beyond the bond exposure all related exposure for which buying a CDS on a sovereign name could be used as proxy hedge. For instance, a bank that would have an exposure to a Greek corporate entity for which CDS are not traded could use Greek sovereign CDS to hedge itself. The more restrictive option would prevent many entities from being able to hedge their risks but could be more easily implemented as the nature of the exposure will not have to be studied and only a check on long bond position would be enough.

Another question regarding the implementation is the time horizon imposed on the "insurable interest". The "insurable interest" could have a binding effect at the time the CDS is entered into and could also be implemented with various time horizons. It could be required that the "insurable interest" be documented throughout lifetime of the CDS. The maturity of CDS would be close to the (remaining) maturity of the bond. The CDS would have to be terminated when the "insurable interest" was closed-out or sold. Alternatively, the insurable interest would need to exist at inception, i.e. the time when CDS was bought (but not necessarily thereafter). For example, one would be allowed to sell the bond immediately after the insurable interest had been established. This might slow down building up short positions in credit but not abolish it.

Overall, in light of the evidence of the functioning of CDS markets and challenges to implementing a ban, it may not seem entirely appropriate to consider a ban as a permanent rule. Instead one could also envisage banning naked CDS as a possible 'emergency' measure in extreme market situations. Such an exceptional measure could actually be more efficient because of less opportunity of circumvention and permanent damage to the price-finding mechanism of capital markets.

Any possible ban on naked CDS could possibly be included in the legislative proposal on short selling due in the autumn, as one of the measures that national regulators will be allowed to take in case of market disorder or market dysfunction either in the sovereign CDS market related to their national debt or in their national sovereign bond market.

In addition to a ban on naked CDS, other emergency measures could be included like limiting positions taken on the CDS market or maximum exposure per counterparty

Imposing physical settlement

A less intrusive policy option for sovereign CDS could be to abandon cash settlement and to impose physical settlement into the contractual terms. Without doubt, the industry will regard this as a regressive step.

In some sense, physical settlement is similar to a ban of naked CDS. In contrast to a prohibition of entering a CDS without "insurable interest", physical settlement requires the insurable interest (defined as the deliverable obligations) only in a credit event.

When the CDS (and the underlying bonds) trade sufficiently far away from a possible credit event (the expected default probability is low), CDS can still be used for "proxy-hedges". Near default (or near a credit event), one would expect the correlation between non-deliverable obligations and deliverable ones to decrease. The reason is that proxy-hedges "track" the common factors and near default credit risk becomes information-sensitive about the reference entity and dominated by idiosyncratic risk. The "turning point" is of course not predictable.

Imposing physical settlement could have a temporary effect on bond yields. Close to default, naked CDS buyers would be under pressure to obtain deliverable obligations. This would increase the demand for bonds of the sovereign in question, mitigating the price decline in the bond. Such effect would be stronger, the shorter the period allowed for delivering the bond to the CDS seller after a credit event. However, as such purchases would be unwound thereafter, bond yields would not decline permanently but there volatility would possibly rise.

A few potential issues need to be considered:

Firstly, there could be some, possibly negative repercussions with central clearing. Even though, technically, physical settlement does not pose difficulties for central counterparties (CCPs), reduced liquidity in sovereign CDS may increase the length of the period needed to replace the trades of a clearing member in default. The CCP would possibly address this by requiring more collateral.

Another issue to be considered are index products in which the sovereign single name is a component. On the one hand, indices are aggregate views and it may not sound easy to drive debt costs of a particular sovereign through an index. On the other hand, it is possible to replicate a short position in a single name CDS through buying the index and selling all single names except the one in question. A selective return to physical settlement would have to tackle this issue.

Lastly, the implementation of requiring physical settlement would need to be carefully designed. For example, the delivery period after the determination of a credit event would have to be defined. Moreover, a time limit would have to be specified in which the occurrence of a credit event would have to be established.

Beyond the ban and the physical settlement, the emergency powers given to regulators could also include positions limits. The question of position limits is not extensively discussed here as it does not appear at first glance as the most appropriate tool. Nevertheless, the question of position limits that could make more sense for commodities markets than financial ones will be discussed within the revision of MiFID.

5.3. Revision of the Market Abuse Directive

One of the key issues raised by sovereign CDS is the possibility of market abuse or market manipulation. As previously mentioned, this issue is currently being investigated for Greek sovereign CDS by CESR. While this investigation is progressing, the revision of the Market Abuse Directive (MAD) should assist in ensuring a better monitoring of the sovereign CDS market. A legislative proposal is foreseen for December 2010.

Indeed, the MAD is based on the concept of prohibiting insider dealing or market manipulation in financial instruments which are admitted to trading on a regulated

market. If an instrument is admitted to trading on a regulated market, then any trading of this instrument is covered by MAD. Only for insider dealing and not for market manipulation does the prohibition set by the MAD also extend to financial instruments not admitted to trading on a regulated market but whose value depends on such financial instrument. Lastly, the MAD does not apply to trading which is purely OTC.

Therefore, as such, potential manipulation of the bond markets by CDS is currently not covered by the MAD.

The revision of the MAD should tackle this issue. It will aim at extending the scope of this Directive to cover manipulation of regulated markets or MTFs through OTC derivatives.

5.4. Revision of the Market in Financial Instruments Directive (MiFID)

The revision of MiFID for which a legislative proposal should be presented early next year will be key in addressing several issues of the sovereign CDS, not only for the sovereign CDS market in itself but also for the sovereign bonds market which is closely linked. The revised MiFID could address the issues of: transparency to regulators for both the sovereign CDS market and the sovereign bond market, and also the issue of the trading venue for the sovereign CDS market.

Increasing transparency to market regulators and the public

Compared to other OTC markets, sovereign and corporate CDS markets have a relatively high level of transparency for regulators, supervisors and market participants, mostly due to the existence of the trade repository operated by DTCC as mentioned above.

On the regulatory front, DTCC has recently committed to release to regulators all the data that they may need⁴⁰. In addition, at the national level in Europe, some countries⁴¹ have extended the transaction reporting obligation to OTC derivatives instruments where the underlying is an instrument admitted to trading on a regulated market in the EEA, therefore covering CDS market on single names.

These two sources of information provide the specified regulators with valuable information about the CDS market. In addition, the Transaction and Reporting Exchange Mechanism (TREM) allows exchange of information between the different European countries. A new version of the TREM system with improved data quality that will further improve the exchange of information should soon be released.

But the scope of the transactions reporting to regulators for the sovereign CDS market needs to be harmonised across Europe. The revision of MiFID should be able to tackle this issue. The subsequent question will be the ability of TREM to cope with the enlarged scope of information collected and potentially exchanged by regulators.

Furthermore, the organisation of information sources for regulators for their market surveillance duties need to be discussed. As mentioned previously, the aim of trade repositories is not primarily market surveillance; therefore, their data set is not really formatted for that for the time being.

⁴⁰ Statement by DTCC on 23 March 2010

⁴¹ Austria, Hungary, Ireland, Spain and United Kingdom,

Transparency to market participants of the sovereign CDS market

In terms of publicly available information, the situation is less satisfactory. Apart from the data made available by DTCC, the level of transparency is similar to other OTC derivatives market. Because of the existence of market data vendors, there is some level of pre-trade transparency in terms of indicative quotes and volumes but nearly nil post-trade transparency, especially in the transactions between dealers and end clients.

The revision will need to consider the issue of pre and post trade transparency for OTC derivatives markets, including of course sovereign CDS market. This could be done along the work of the discussion of the transparency of the sovereign bond markets which is discussed further below.

Possible trading of CDS on organised venues

Because of the specific role of sovereign bond and CDS markets, it could be considered that the activity on sovereign CDS needs to be fully transparent to the public. Therefore, it could be argued that a large part of sovereign CDS need to be traded on exchanges or on electronic trading platforms. This would be in line with the communication of the G20 that mentioned the need to "trade derivatives on exchanges or electronic venues when appropriate".

Trading on such venues would have the usual advantages of such trading mode i.e. full pre and post trade transparency to regulators but also market participants. It would also benefit from the trading limits most of the time imposed by organised markets in terms of maximum positions, maximum daily evolution of prices.

The negative impact on liquidity of the sovereign CDS market will need to be closely assessed but it could be moderate as the bulk of the transactions on sovereign CDS mostly happened on standard maturities such as 5 and 10 years. Furthermore, the counter argument often put forward against trading on regulated market versus OTC is that the tailor-made aspect should be less of an issue. As sovereign bonds tend to have pretty standard dates and maturities, the hedging of bond positions would still be possible. Regarding the hedging of other positions, CDS already act as proxy hedges and therefore the match between the underlying risk and the hedge is not perfect and would only be made marginally less perfect by the standardisation attached to trading on exchanges. Furthermore, such a move could generate more liquidity on the CDS market with a wider range of participants. This could also improve the quality of pricing as price on an exchange gather orders from a larger number of buyers and sellers.

A key question to be considered for such possible measure is the attitude of regulators outside Europe. The sovereign CDS market is a global market; therefore, mandating trading of such instruments to organised venues would need to be implemented globally to be efficient and avoid regulatory arbitrage.

Possible measures for the bond market

Increased transparency vis-à-vis supervisors

During its work, the task force has encountered difficulties in obtaining information about the bond markets. National supervisors who have been trying to investigate market abuse or market manipulation seem to have faced similar problems. Obtaining

transaction details and evolution of positions on the sovereign bond market is very difficult as most transactions take place OTC with no trade repository or consolidating transaction system. Being able to monitor the activity of participants on both the CDS and the related bond market is key for detecting cases of market abuse.

Government securities are usually held in domestic central securities depositories (while Eurobonds are held in Euroclear and Clearstream). Besides ensuring the integrity of securities issues and settling transactions, Central Securities Depositories (CSDs) provide custodial services. In principle, CSDs have the full overview of positions on the respective government bonds. However, CSDs only register bond ownership to the level of CSD membership. For example, if two clients of a CSD member trade a bond, the CSD will not become aware as the position of its member is not changed. As brokers may be CSD members as well as using other custodians, establishing a registry on ultimate bond ownership through CSDs may be an enormous task.

Any required measure would therefore be to set up a kind of trade repository that would collect the transactions of all market participants on the specified bond market, similar to DTCC for CDS transactions.

Increased transparency vis-à-vis market participants

The quest for transparency in the sovereign bond market could be taken one step further by providing trade transparency to market participants. Because most of the transactions on bonds take place over the counter, there is no obligation to have the information about price and volumes, both before or after the transaction, reported anywhere. Indeed, MiFID transparency obligations being pre or post trade only apply for the time being to equities. One of the key questions of the revision of MiFID will be the possible extension of these requirements to non equity markets including bond markets.

CESR has started work on this question several months ago and issued several recommendations in July 2009. In addition, it has just closed a consultation on the non-equity transparency⁴².

In its work dated July 2009, CESR discussed the TRACE system.

Phased in from 2002 to 2005, the Trade Reporting and Compliance Engine (TRACE) which is operated by the Financial Industry Regulatory Authority (FINRA) collects trade information about all USD-denominated debt securities issued by US and foreign private issuers⁴³. Since March this year, the reporting system has been extended to include debt issues by federal government agencies, government sponsored organisation as well as primary market transactions. For each trade, the dealer is required to identify the bond and report among other things: the bond, time of execution, trade size, trade price, yield and security identifier. The reporting should take place within 15 minutes of execution. Only part of this information is made public by FINRA, especially the price including any mark-up and the time of transaction. Size of trade is provided if the par value transacted is below USD 5 million for investment grade bonds and USD 1 million for non investment grade.

⁴² See CESR website: *Consultation on CESR's advice in the context of the MiFID Review: Non-equity markets transparency closed on 4 June 2010*

⁴³ See Annex I of Report dated 10 July 2009 by CESR on "*Transparency of corporate bond...*" for further information on US TRACE system

The effects of TRACE have been extensively investigated by researchers and the benefits and drawbacks of TRACE largely discussed within CESR⁴⁴, mainly in terms of its impact on the liquidity of the bond market and the cost and feasibility of setting up such a system.

CESR has noted that a copy of the TRACE system does not find broad support from market participants in the EU corporate bond market. Nevertheless, CESR concluded that "additional post trade transparency, if properly calibrated might be helpful in restoring market confidence". These comments are related only to the corporate bond market. In case of sovereign CDS, the relevant bond market is the sovereign bond market for which no recommendations are made.

Setting up a TRACE system specifically for the sovereign bond market is more difficult because of its specificities. In general, the government bond market tends to be more transparent than the corporate bond market. Price information is much more readily available and price formation much more centralised than in the corporate bond market⁴⁵. Firstly, there are far less issues outstanding than in the corporate bond market. There are commitments from primary dealers to provide market making activity on the outstanding issues, which contribute to higher liquidity. About 50% of the trades are done electronically which is likely to provide a higher level of post trade transparency. Lastly, most standard sized trades are taking place on the Euro MTS platform which seems highly transparent as quotes and transactions go directly to market data providers and are available immediately to market participants.

Given the level of existing transparency on the government bond market, the case for more transparency and for a TRACE type system on the government bond market is more difficult to make. On the contrary, increasing further the transparency could have side effects and damage the liquidity of the government bond market. So, the setting up of a trade repository discussed earlier on may be a more appropriate solution as it allows greater adaptation of transparency levels between regulators and market participants.

In terms of legislative instruments, these measures could be considered for inclusion in the legislative proposal for the revision of MiFID which will deal with the transparency of non equity markets.

⁴⁴ See CESR 10 July 2009 on "*Transparency of corporate bond...*"

⁴⁵ See CEPR "*European Government Bond Markets: transparency, liquidity, efficiency*" (May 2006)

ANNEX 1: SOVEREIGN DEBT RESTRUCTURING AND CDS

At bankruptcy, bonds of different maturity but same seniority will usually have equal value. However, if the credit event is "restructuring", bonds of different maturity can trade at different prices. If restructuring lowers the default probability in the short-term, short-term bonds would gain in value relative to longer-dated bonds. If in that credit event, any bond could be delivered, CDS buyers would have an incentive to deliver the cheapest bond to the seller, even if the CDS contract was of short maturity. In order to limit this "cheapest-to-deliver-option" and to protect the CDS seller, multiple auctions can be held in order to closely match the CDS maturity with that of the bonds.

In view of the possibility that CDS may change lender incentives in restructuring, this section looks briefly at CDS contracts when sovereign debt is considered to be restructured.

Sovereign debt restructuring may be preceded by a failure to pay or repudiation/moratorium, which would already constitute a credit event. With cash settlement now the norm, CDS buyers with underlying cash positions may retain their bonds or deliver them to the CDS sellers at the auction price, as described above. Despite the option to trigger the CDS contract, this case may be less problematic.

However, debt restructurings may occur before an actual failure to pay or moratorium. In such restructurings, debt holders may be asked to exchange their obligations against newly issued debt on less favourable terms. Repudiation may act as a fall-back to overcome the incentives of bond holders to free-ride on others' tendering their obligations.

While this section is by no means intended to provide a legal opinion, a cursory reading of the ISDA 2003 Definitions suggests that a voluntary exchange of obligations would not constitute a credit event. In contrast, restructuring that binds some obligation holders would constitute a credit event, no matter whether that restructuring was decreed by government or agreed between government and a "sufficient" subset of obligation holders – unless such an event was part of the terms of the obligation.⁴⁶

Restructuring through collective action clauses (CACs), which provide one means of addressing sovereign debt crises ex ante, may thus not cause a credit event if existent when the CDS was bought or the obligation issued.⁴⁷

⁴⁶ "Restructuring means that, with respect to one or more Obligations and in relation to an aggregate amount of not less than the Default Requirement, any one or more of the following events [*i.e. reduction in interest or principal, deferral etc...*] occurs in a form that binds all holders of such Obligation, and is agreed between the reference entity or a governmental authority and a sufficient number of holders of such Obligation to bind all holders or is announced or otherwise decreed by a Reference Entity or a Governmental Authority in a form that binds all holders of such obligation, and such event is not expressly provided for under the terms of such obligation in effect as of the later of the Trade Date and the date as of which such obligation is issued or incurred" (ISDA Credit Derivative Definitions 2003, Section 4.7.)

⁴⁷ However, it has been argued that CACs would cause a credit event in any case, if they do not specify the restructuring event ex ante, see Verdier, P.-H. (2004), *Credit Derivatives and the Sovereign Debt Restructuring Process*, Harvard Law School, mimeo.

CDS holders may thus have an incentive to not participate in a restructuring, retaining their obligations in the hope of a later credit event on this subset of obligations. This would tend to aggravate the free-rider problem.

If indeed, most of the CDS bought were "naked", the above issues would be less of a problem. However, this cannot be taken for granted. The failure to invoke a CAC on a small, thinly-traded bond issue thus might have the potential to cause a later credit event on that particular issue and affect all CDS sellers. Finally, if some bond issues do not contain CACs, a retroactive introduction of CACs to these issues also seems likely to result in a credit event.

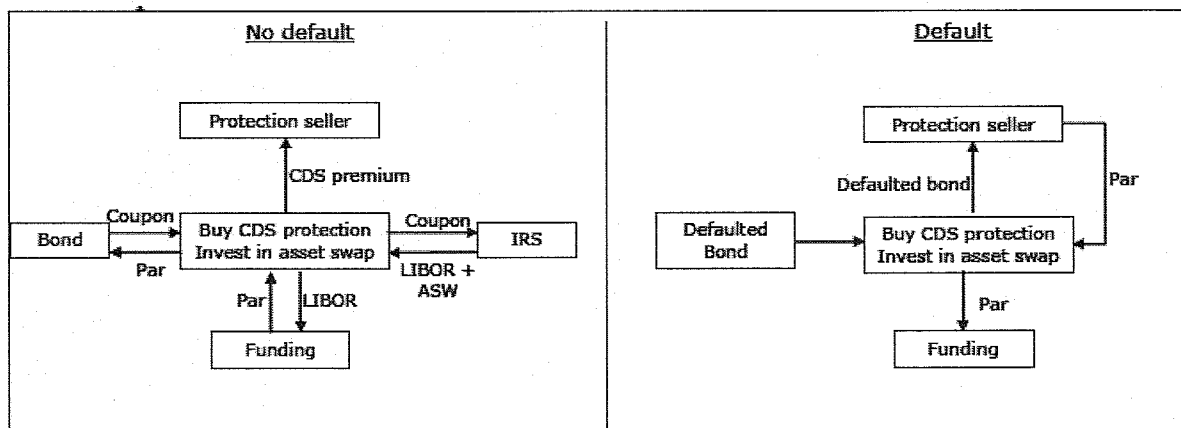
A credit event on one of the reference obligations suffices to affect all CDS alike. In the light of the study's results about the geographical distribution of CDS sellers and buyers, the above thoughts should receive further consideration.

ANNEX 2: THE NO ARBITRAGE RELATIONSHIP BETWEEN CDS AND ASSET SWAPS

An alternative arbitrage condition that can be used for analysing the pricing interaction between the CDS and bond markets is called the CDS-bond basis (or simply the basis). It involves forming a portfolio that combines the purchase of protection against the default of a bond via a CDS contract, and entering into an asset swap agreement where the fixed coupon payments of a bond are swapped against a stream of variable payments (a floating rate). The whole position is financed with a floating rate loan.

This portfolio is fully hedged, i.e. it is a risk-free position. To see this, consider the two possibilities that can occur before the maturity of the bond: no default (the left picture) and default (the right picture). In both cases the portfolio is free of risk and yields the same outcome. If there is no default the position is unwound at maturity; the bond issuer pays back the par value, which is used to pay back the initial loan to finance the position. If the bond issuer defaults, the CDS contract pays the par value of the bond, which is used to pay back the initial loan.

Graph: The theoretical no-arbitrage relationship between the CDS premium and the asset swap spread



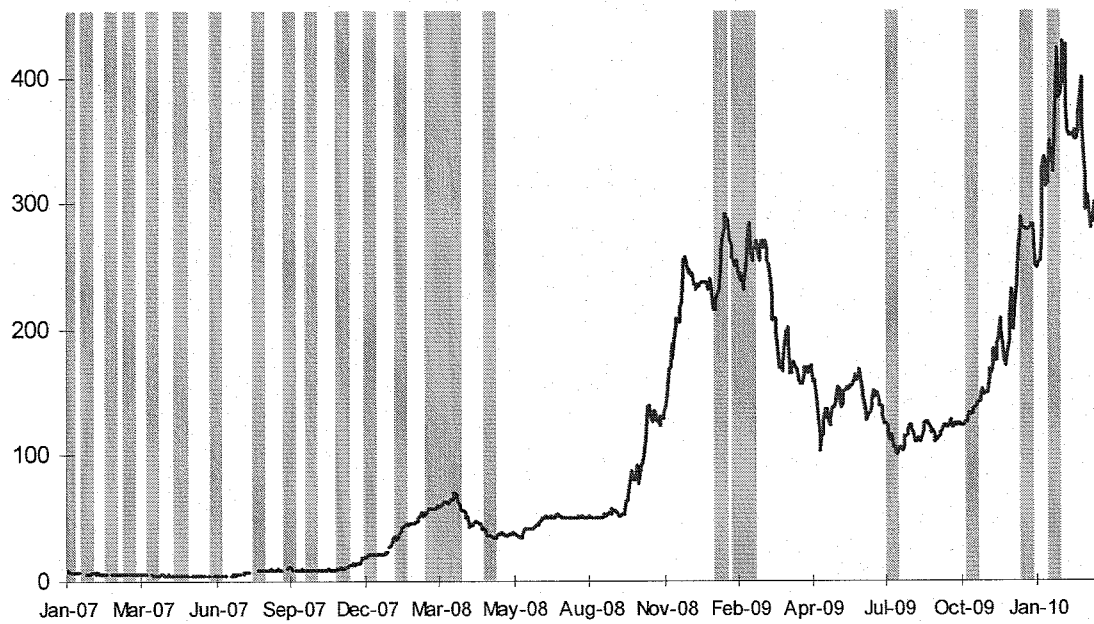
Source: De Wit (2006)

For this position to be free of arbitrage opportunities, the CDS premium and the asset swap spread must be equal, and the difference defines the CDS-bond basis. The asset swap spread (the difference between the extra return that has to be added to the floating rate for the swap to be accepted) is labelled ASW in the graph. The CDS-bond basis is defined as the difference between the CDS premium and the asset swap spread: $Basis = s_{CDS} - s_{ASW}$, where s_{CDS} is the CDS spread and s_{ASW} is the asset swap spread. The basis should be zero for there to be no arbitrage opportunities.

The basis can be positive or negative for several reasons. In general terms, factors that add risk to the CDS relative to the asset swap tend to increase the basis, while factors that add risk to the asset swap relative to the CDS tend to decrease it. Some reasons for finding a positive basis are: the cheapest to delivery option embedded in the CDS contract, the CDS premium is floored at zero (while the asset swap spread can be negative), CDS restructuring clause (leading to a technical default different from what constitutes a default on the bond), the bond trading below par while the CDS contract guarantees the par amount, and hampered profit realisation in case of default. Reasons for a negative basis include: funding issues, counterparty default risk that is asymmetrically distributed, accrued interest differences on default, and bond trading above par.

ANNEX 3: GREEK CDS SPREADS AND ISSUANCE DATES

(Issuance dates are represented with shaded areas)



Source: Bloomberg

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