

Discussion papers

Credit default swaps

Contract characteristics and interrelations with the bond market

L. Amadei, S. Di Rocco, M. Gentile, R. Grasso, G. Siciliano



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Abstract

Since the financial crisis and, even more, since the recent sovereign debt crisis, the role of credit default swap (CDS) has been subject to growing attention by policy makers and regulators, because of fears that transactions of a speculative nature on the CDS market may amplify tensions on the bond markets. The link between CDS and bond markets is complex and it is deeply affected by their different degree of liquidity and by market imperfections exacerbated by the financial crisis. The recent turmoil has impacted on the feasibility of arbitrage strategies between the two markets, increasing the gap between CDS prices and underlying bonds rates; CDS prices tend however to have a leading role in the price discovery process when the market for the underlying bonds is less liquid. Having regard to the European government bonds market, there is no clear evidence that speculation through CDS has affected the prices of the underlying bonds, nor that it is possible to manipulate the price of CDS in order to generate de-stabilising informative signals on the credit risk of sovereign issuers. Regulatory responses to such concerns based on constraints or restrictions on CDS transactions must be assessed with extreme caution, because they might not have the desired effects and might have an adverse impact on the orderly functioning of the government bond market. Post-trade transparency obligations may instead mitigate the potential destabilising effects of CDS speculative trading.

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1 Summary and main conclusions

Since the financial crisis and, even more, since the recent sovereign debt crisis, the role played by credit default swap (CDS) has been subject to growing attention by policy makers and regulators, because of fears that transactions of a speculative nature on the market of such instruments may amplify tensions on the bond markets.

CDS can be a more efficient and immediate tool to assume short positions on credit risk, compared to bond short-sales. Relevant self-regulation activities launched in 2009 have also laid the basis for facilitating the use of CDS for speculative purposes.

The CDS market has its own, very specific characteristics. The information gathered from one of the main inter-dealer brokers show that CDS trade frequency is extremely low and that the differential between buy and sell quotes is, on average, quite large.

The link between the CDS market and the bond market is complex and may vary from corporate to sovereign issuers.

Arbitrage between the two markets should narrow the gap between CDS prices and the underlying bonds spread (bond yield, less risk-free rate), but with the 2007 financial crisis, this has rarely been the case. The limitation to arbitrage strategies is mainly related to the presence of market imperfection and the increased perception of counterparty risk. Whilst for corporate issuers the CDS prices tend to be lower than the bond spreads, for sovereign issuers the opposite has been experienced. Bond and CDS markets have also a different price discovery process: for corporate issuers and for some peripheral countries of the euro area, changes in CDS prices tend to anticipate changes in bond spreads, whilst the opposite is true, or less evident, for sovereign issuers with a high rating and a more developed bond market. These differences would appear to be due mainly to the different liquidity of the corporate and government bond market.

Evidence regarding the leadership role played by the CDSs in the price discovery process for some peripheral countries of the euro area does not necessarily imply that the prices of government bonds can be manipulated by trades concluded on the CDS market. There is also no clear evidence that speculation on the CDS market should distort government bonds prices, nor that it is possible to manipulate the price of CDS in order to generate de-stabilising informative signals.

Regulatory reactions to such concerns, that could result in constraints or restrictions to CDS transactions, would appear to be of dubious effect. They may also result in a sensitive reduction of the liquidity of the CDS market, which would in turn affect the orderly functioning of the government bond market. Post-trade transparency could instead mitigate the potential destabilising effects of CDS speculative trading.

2 The characteristics of CDS contracts

2.1 Contract characteristics and market size

The CDS is a contract aimed to transfer a credit exposure on a bond issuer (the "reference entity") in relation to a given nominal value. In very general terms, in exchange for payment of a recurring sum, the buyer of CDS receives a positive pay-off in case of a deterioration of the credit quality of the reference entity. The purchase of a CDS therefore may be seen as a short position on the credit risk of the reference entity.

The same result can also be obtained by short selling a bond of the reference entity. However, this transaction can be more complex or involve greater risk if compared to the purchase of a CDS, for at least two reasons: 1) short sales are limited by the shortage of bond in the repo or securities lending market¹; 2) securities lending agreements typically expire in a short-term and must be rolled over regularly generating the risk of a change in the lending cost. On the contrary, the purchase of a CDS allows a short position to be taken for a long period of time (usually 5 or 10 years), avoiding the typical and recurring operating problems and risks of a short sale.

There are, however, relevant differences in the two types of transaction. The purchase of a CDS implies the assumption of a leveraged position (since the contract is similar to a purchase of a put option on the credit rating of the reference entity), but it entails the payment of a period premium, whilst a short sale has no such cost but absorbs regulatory capital. The CDS has a non-linear pay-off, whilst a short sale has a linear pay-off. Additionally, the CDS involves the assumption of a counterparty risk that is normally higher than that of a short sale.

If the CDS buyer holds an exposure towards the reference entity (typically a bond, or a credit position), the purchase of the CDS can hedge the credit risk on that exposure.

The CDS seller will receive the recurrent premium and, should a "credit event"² occur in relation to the reference entity, will have to compensate the buyer by protecting him from the loss suffered. When a credit event occurs, the contract is terminated and the seller must pay the buyer the nominal contract value. The CDS buyer should deliver bonds of the reference entity for their nominal contract value (this is referred to as "physical delivery"), but in most of the cases a cash settlement, without the exchange of the underlying securities, is preferred. In this case, the seller

1 To make a short sale of a bond, a loan is required through security lending transactions which may take various different contractual forms (securities lending or repo agreement, see further on for a more detailed analysis of this aspect). The bond can thus be sold without owning it (so-called "naked short selling"), but since transactions on bond are generally settled 3 days after the conclusion of the contract ($T + 3$), the seller has 3 days to borrow the bonds and deliver them at the contract settlement date. If the seller is not able to find the bonds, the transaction will not be settled, generating a so called "fail".

2 As will be better explained further on, a "credit event" may take the form not only of bankruptcy, but also failure to make payment of a coupon, debt restructuring, etc.

shall pay the buyer the difference between the nominal value and the market value of the underlying bond (according to mechanisms that will be explained further on).

The use of CDS contracts can, therefore, meet the demand for speculation on credit risk (this is the case, for example, when buying a naked CDS – i.e. without holding a credit exposure towards the reference entity – or when selling protection without holding positions of the opposite sign) or for hedging. As will be explained further on, it is also possible to arbitrage price differences between the bond and the CDS markets.

In addition to CDS contracts relating to a specific reference entity ("single name CDSs"), contracts on indexes representing a portfolio of issuers ("index" or "basket" CDSs) have also become popular. In this case, each reference entity equally contributes to the total nominal value of the contract. The most common CDS indexes are those managed by the Markit group and include indexes on European issuers with the most liquid single name CDSs (iTraxx indexes) and those that cover the US issuers (CDX indexes). The growing popularity of CDS indexes is due to the fact that they offer a simple and immediate instrument, particularly suitable for institutional investors, to hedge in a single transaction a credit exposure on a portfolio of issuers.

A CDS contract may be extinguished in relation to a credit event, but its status may also vary over time for several other reasons. The first is what is referred to as "novation", namely the replacement of one of the two original counterparties to the contract with a third counterparty. The second, is the application of the early termination clause. Of course, it is also possible to "close" the position by implementing a transaction of the opposite sign ("offsetting transaction")³; this, however, in legal terms, does not cancel any previous contract. This type of contract "closure" is the most commonly used and contributes to the growing number of CDS transactions, because the chain of offsetting positions between the final seller and the buyer of protection can be very long.

For this reason the "flow" data on the trading volume may be potentially not indicative of the dimension of the CDS market. From this viewpoint, it may be useful to consider the stock data on gross positions (in notional terms), through they still approximate the flow figure (being the sum, in absolute terms, of purchases and sales of CDSs of all operators as of a certain date). Data on net positions (for each net buyer of protection, the balance of protection bought and sold is calculated and this difference is then added across all net buyers) may give instead an estimate of

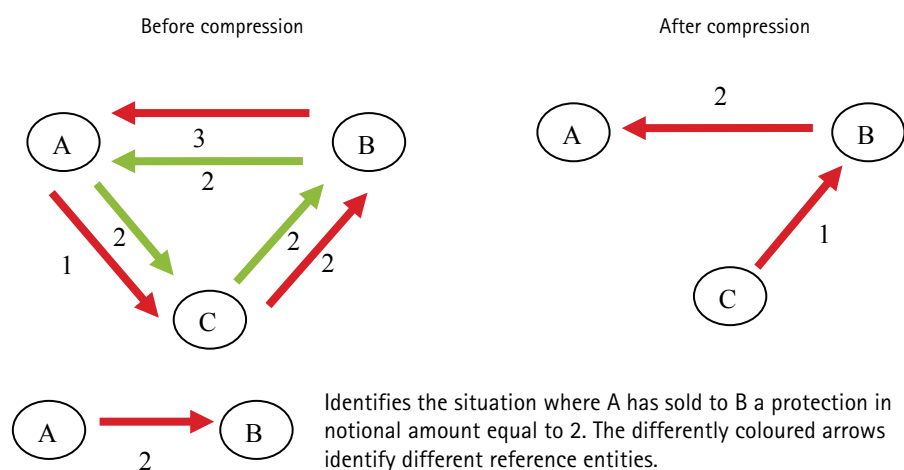
3 This is not the case when a central counterparty interposes itself between the original counterparties to each contract (through a novation process). In this case, the positions of the traders are offset multilaterally and a bilateral balance is determined for each operator towards the central counterparty. The purchase of a CDS followed by a sale of the same amount ("offsetting transaction") would then give rise to a zero position towards the central counterparty.

payments to be made, on an aggregate level, in the event of the default of a reference entity⁴ (assuming the market value of defaulting bonds equal to zero⁵).

Since 2008, have been developed procedures to reduce the gross notional value of CDS positions, which can take place in bilateral form – where the counterparties directly agree to eliminate the redundant positions – or in multilateral form⁶. The procedure that appeared to be most efficient to reduce the value of the outstanding positions is referred to as "compression". It takes place in multilateral form, using algorithms that take into account the limits established by dealers on counterparty risk with regards to other dealers and identify contracts that can be eliminated or replaced with new, lower notional value contracts, with the aim of keeping the same risk profile (Figure 1). The compression and the institution of termination cycles have therefore resulted in a great reduction of the gross notional value of CDS positions⁷.

At the end of 2010, the gross notional value of CDS positions amounted to approximately 26,000 billion US dollars (Figure 2), whilst the net notional value amounted to almost 2,000 billion dollars (i.e. 8% of the gross notional value). The weight of contracts on individual issuers accounted for approximately 57% of total gross positions and for approximately 50% of the net positions, whilst the remaining share was represented by index and basket CDS.

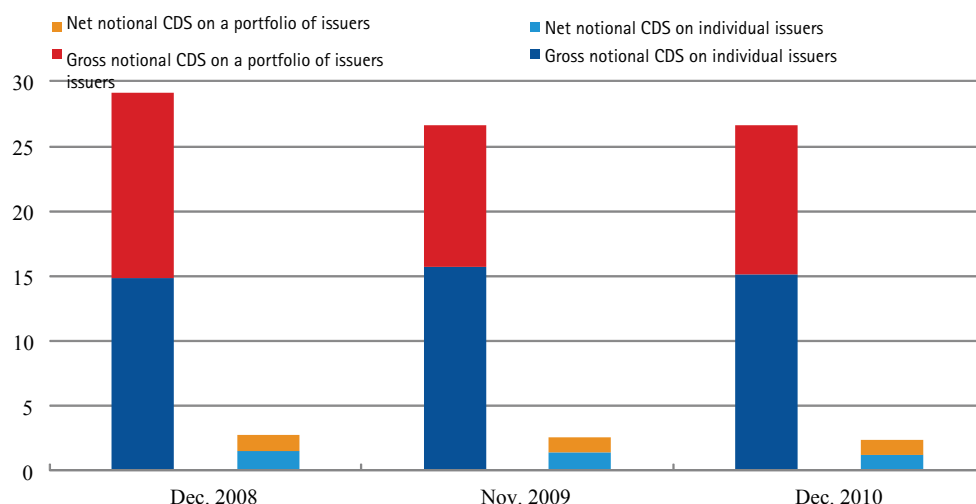
Figure 1 Example compression of CDS contracts



Source: Bank for International Settlement.

- 4 This is technically correct only if operators adhere to a contractual multilateral offsetting mechanism of the positions should a credit event occur. This type of service is supplied for example in the US by the Depository and Trust & Clearing Corporation (DTCC).
- 5 The market value is usually greater than zero as it considers an estimate of the recovery rate. The payment value in the event of default would therefore amount to: net notional value x (1 - recovery rate).
- 6 These procedures are referred to as "compression cycle", "termination cycle" or "tear-up".
- 7 See European Central Bank, CDS Market Overview, 2004.

Figure 2 Notional value of CDS positions
(figures in thousands of billions of US dollars)



Source: calculation on Markit and DTCC data.

According to the Bank for International Settlements (BIS), the reason why the gross notional value of the CDS contracts has more than halved since the peak reached at end of 2007 (in which it reached almost 60,000 billion US dollars) is due to a large extent to the great development of the mentioned offsetting mechanisms, rather than to a decreased interest in the CDS market. The BIS shows, in fact, that CDS trading has continued to grow even after 2007⁸.

CDS on sovereign issuers account for approximately 16% of the total gross notional value and 20% of the net notional value of positions as of December 2010. Approximately 80% of the net notional value therefore relates to CDS on private issuers⁹. The market of sovereign CDS has, however, recorded strong growth rate in more recent times: in 2009, net positions grew by around 20% and gross position by 30% (whilst the growth rate of CDS on corporate issuers grew by 4% on gross positions and approximately by 10% on net positions); in 2010 net positions more than doubled, whilst gross positions grew by more than 50%.

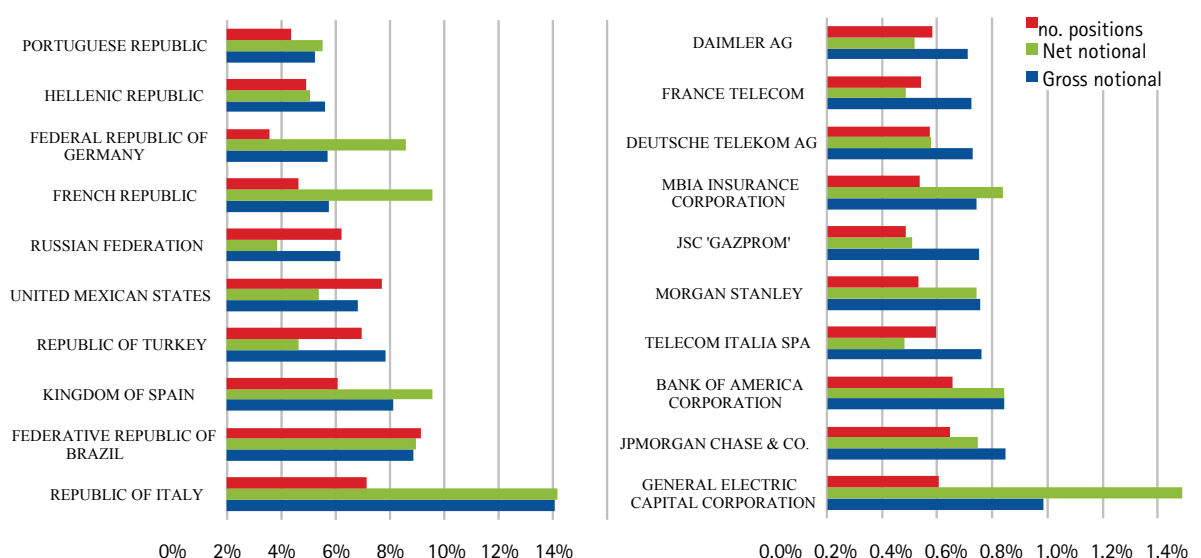
⁸ Bank for International Settlements, Counterparty risk and contract volumes in credit default swap market, Quarterly Review, December 2010.

⁹ The greatest weight of CDS on corporate issuers as compared with that of the CDS on sovereign issuers partly reflects the different dimension of the market of government bonds as compared to that of corporate bonds. The data from the Bank of International Settlements for advanced countries and the main emerging countries show that in September 2010 the value of government bonds amounted to approximately 38,000 billion US dollars, as compared to approximately 10,000 billion US dollars for bonds of non-financial issuers and 41,000 billion dollars for bonds of financial issuers (including securitisations and structured securities, such as CDOs, CBOs, etc.). Bonds of corporate issuers therefore amounted to approximately 51,000 billion dollars, compared to the 38,000 billion dollars of government bonds. On the other hand, as mentioned, the notional value of CDS on corporate issuers is 4 times that of the CDS on sovereign issuers. This difference may reflect the fact that the hedging needs through CDS are more relevant for corporate issuers than for sovereign issuers.

The development of the CDS market on sovereign issuers is therefore a relatively recent phenomenon, probably due to the growth in hedging demands that has emerged with the great deterioration of public finances in the main advanced countries.

Figure 3 also shows how the CDS business on sovereign issuers is far more concentrated than that of the CDSs on corporate issuers. In December 2010, the top 10 sovereign reference entities accounted for approximately 55% of the notional amount (both gross and net) of the total CDS on sovereign issuers, and approximately 44% of the number of open positions. The Italian Republic was the top reference entity for CDS contracts on sovereign issuers, with approximately 12% of the share both on gross and net notional amount, followed by Brazil and Spain. The top 10 corporate reference entities (i.e. financial and non-financial companies) accounted for just over 5% of the total notional amount (both net and gross) of CDS on corporate issuers and approximately 3% of the total number of open positions. The top reference entity was General Electric, followed by JP Morgan and Bank of America.

Figure 3 Top 10 corporate and sovereign reference entities in terms of CDS notional amount in December 2010
(figures in % of totals relating to corporate/sovereign issuers)

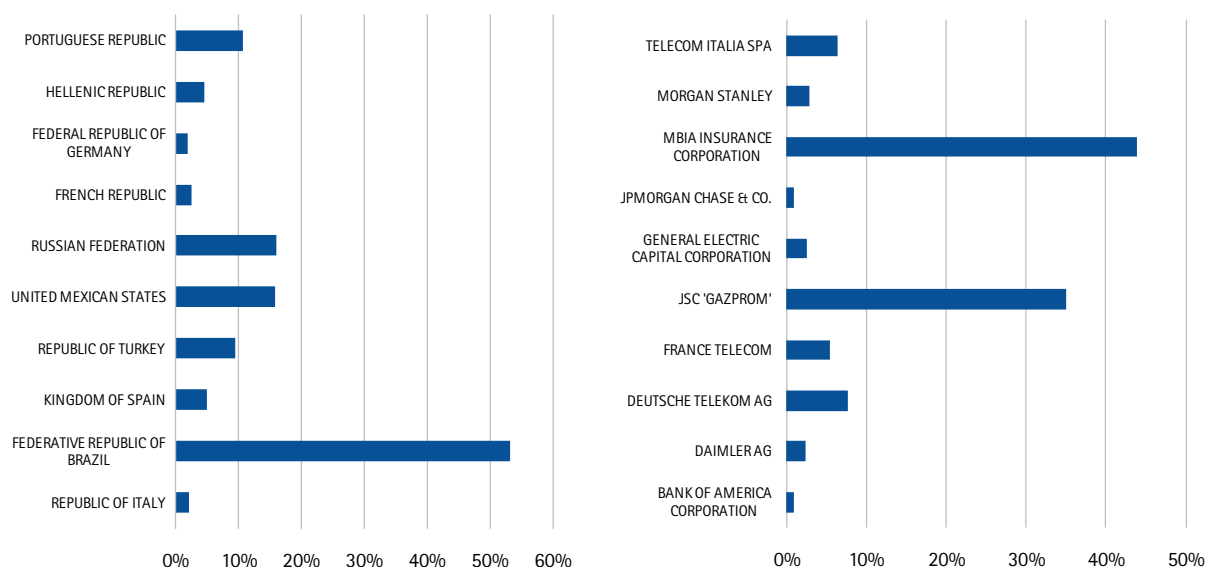


Source: Markit and DTCC data.

Figure 4 shows the ratio of net CDS positions and the bond debt issued by the underlying reference entity. This ratio gives an initial indication of the relative dimension of the CDS market as compared with the bond market, although, as it will be explained further on, this does not necessarily indicate a different degree of liquidity in the two markets. As regards to the sovereign issuers, Brazil, Mexico, Russia and Portugal are those with the highest weight of CDS on the underlying debt in terms of net notional amount. These are also the only countries of the top 10 reference entities, together with Turkey, for which the gross notional amount of the

CDS is greater than that of the outstanding bonds. For the Italian Republic, this value is small (approximately 2% with the net notional amount, and 22% of the gross notional amount), and is in line with the figures for France and Germany.

Figure 4 Net notional amount of CDS as a percentage of bond debt for the top 10 corporate and sovereign reference entities in December 2010
(figures in % of bond debt)



Source: Markit, DTCC and Dealogic data.

For the main corporate issuers, the weight of the net positions in CDS on bonds issued is, on average, modest, though with some relevant outliers. However, cases in which the gross notional amount exceeds the value of outstanding bonds are slightly more frequent compared to sovereign issuers (5 cases in the top 10 corporate entities against 4 in the top 10 sovereigns).

2.2 Contract standards

The strong growth of the CDS market has resulted in growing demands for standardisation of contract terms in order to create a framework of greater legal certainty, reduce the number of disputes and facilitate back office and contract management operations.

More generally, the initiatives taken to define a common framework of reference to be applied to OTC derivatives, have been promoted by the International Swap Dealer Association (ISDA)¹⁰ with the adoption of the Master Agreement on OTC

¹⁰ The ISDA is a private international association made up of more than 800 members including dealers, asset management companies, issuers and law firms.

Derivatives. Compliance with the Master Agreement allows counterparties to: a) define the net amount to be transferred following the aggregation of all credit and debt positions with regards to a single counterparty; b) close all positions related to a defaulted counterparty through a single payment ("close-out netting"). With specific regards to CDS, ISDA has published a model for contract confirmation (Master Confirmation Agreement on Credit Default Swaps) and has defined clauses in relation to the characteristic elements of contracts and the procedure to determine the list of deliverable bonds (i.e. the bonds that can be delivered in case of physical settlement following ascertainment of a credit event).

The contract standards prepared by the ISDA aim to reduce the risk of disputes that typically arise in case of a contract liquidation consequent to the declaration of a credit event¹¹ and have allowed for a simpler liquidation of contracts. In particular, payments on contracts of opposite signs between two counterparties can be offset, and the contracting parties hold the option of choosing cash settlement with reference to the price resulting from an auction mechanism.

In April 2009, the ISDA then proposed the adoption of the so called "Big Bang Protocol", a standard that saw the voluntary adhesion of more than 2000 banks, hedge funds and institutional investors¹².

A first aspect of particular importance introduced by the Big Bang Protocol is the compulsory use of the auction to calculate the liquidation price of CDS contracts.

Until 2005, CDS contracts liquidation was provided exclusively through the physical delivery of the underlying bond. This system was coherent with the use of CDS mainly as hedging instruments and ensured that the value of the CDS did not normally exceed that of the underlying reference entity. With the growing use of CDS for trading and speculation, the frequency of cases whereby the notional value of CDS contracts exceeded the value of the underlying bond increased. In case of credit event the buyers of protection, who did not have the underlying bonds to deliver in order to comply with the physical settlement, had to buy them on the secondary market, creating an artificial price pressure ("short squeeze").

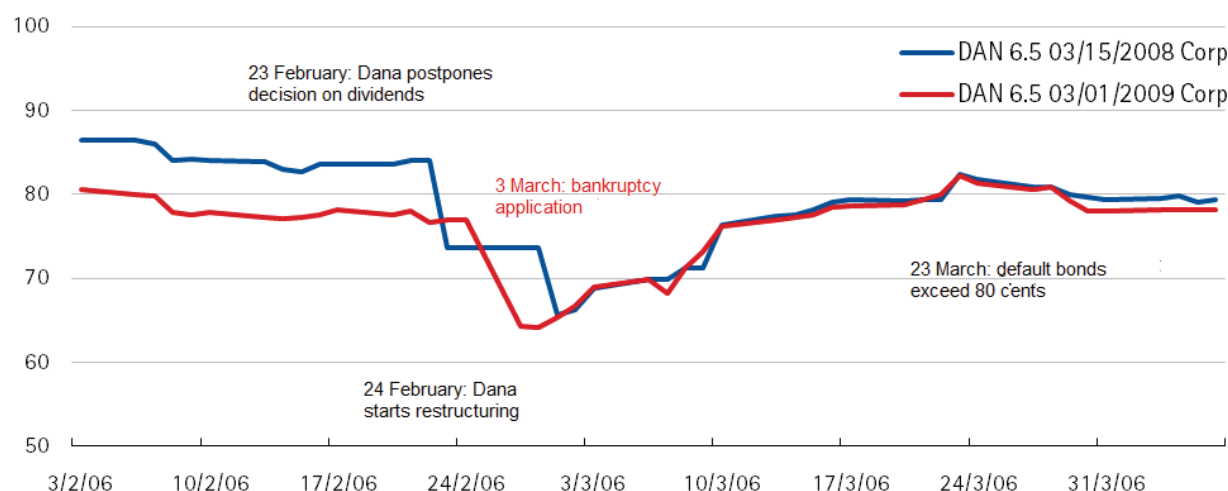
11 The ISDA has defined the type of credit events that determine the liquidation of contracts. These are: 1) bankruptcy (definition that mirrors the wording of the ISDA Master Agreement); 2) obligation acceleration (situation where the relevant obligation becomes due and payable as a result of a default by the reference entity before the time when such obligation would otherwise have been due and payable); 3) obligation default (situation where the relevant obligation becomes capable of being declared due and payable as a result of a default by the reference entity before the time when such obligation would otherwise have been capable of being so declared); 4) failure to pay (failure of the reference entity to make, when and where due, any payments under one or more obligations); 5) repudiation/moratorium (where the reference entity or a governmental authority disaffirms, disclaims or otherwise challenges the validity of the relevant obligation); 6) restructuring (covers events as a result of which the terms, as agreed by the reference entity or governmental authority and the holders of the relevant obligation, governing the relevant obligation have become less favourable to the holders than they would otherwise have been). For sovereign issuers, the definition of credit event differs, as there is no regulation applicable to the bankruptcy of a sovereign country.

12 On 14 July 2009, the ISDA integrated the Big Bang Protocol with a view to standardising the regulation of CDSs in debt restructuring cases. This protocol has been named the "Small Bang Protocol".

One example of a short squeeze occurred during the Dana Corporation bankruptcy in March 2006. At that time, the company had bonds outstanding for approximately 2 billion dollars and CDS contracts for a value ten times higher. Figure 5 shows the rise in prices of two bonds of Dana Corporation following the declaration of bankruptcy (3 March 2006), likely due to buy-side requests made by protection buyers, who had to deliver bonds in order to settle the related CDS contracts.

Prior to the adoption of the Big Bang Protocol, the ISDA's solution for mitigating the risk of a short squeeze was based on the option of signing a specific protocol whereby a centralised auction determined a single price for cash settlement. For dealers subscribing to the Big Bang Protocol, participation in the auction process has become compulsory. By concentrating liquidity in a single auction, the price discovery process becomes more efficient and the risks of a short squeeze (for contracts settled by physical delivery) is reduced.

Figure 5 Price of Dana Corporation bonds before and after the default



Source: Bloomberg.

It is likely that these operative innovations have made recourse to cash settlement safer and more efficient, laying the basis for the growth in the use of CDSs for trading and speculation.

With the adoption of the Big Bang Protocol, the determination of certain elements required to liquidate contracts, previously assigned to one of the contract counterparties, who acted as calculation agent, is now assigned to specific Determination Committees¹³. These committees make binding decisions with regards

¹³ The Big Bang Protocol introduced committees consisting of 10 dealers with voting rights and 5 non-dealers without voting rights. Each committee has territorial competence over one of the five main geographic areas (America, Asia ex Japan, Australia – New Zealand, EMEA and Japan). One of the main tasks of the committees is to ascertain the presence of a credit event, from which time it runs the term of 90 days by which the counterparty who has purchased protection must apply for the termination clause, or the contract is voided.

to those adhering to the protocol, on the terms and conditions for ascertaining the presence of a credit event, identifying deliverable bonds, establishing whether or not an auction must be held to determine contract settlement price and deciding the related operating procedures.

The application of the ISDA protocol has also resulted in a standardisation of contract expiry dates¹⁴ and of premiums. Premiums are now established at 100 or 500 basis points for contracts concluded on the US market and, for European single name corporate, at 25, 100, 500 or 1000 basis points. Hence the contract may require an upfront payment, i.e. an initial payment that offsets the difference between the price of the CDS negotiated by the counterparties and the premium established by the protocol.

3 Evidence on the liquidity of the CDS market for corporate issuers

Since the MiFID pre- and post-trade transparency regime does not apply to (OTC) CDS market, public information is therefore available on buy/sell quotes and on the number and value of the contracts concluded. Commercial data providers allow professional traders access to a certain level of pre-trade transparency, whilst post-trade transparency is more limited.

The data from one of the major inter-dealer brokers on the CDS market¹⁵ (in relation to trades from June to December 2010) gave some indication on the level of liquidity of the CDS market. The data cover the number of contracts concluded, the bid-ask spread and the number of price updates (at each request, the operators update the buy and sell quotes), though no information was available on the notional amount of contracts concluded.

The analysis suggests, in the first place, the presence of a strong concentration of trading on the five-year maturity (Table 1). More specifically, in the period from June to December 2010 of a total of 11196 contracts were concluded and approximately 86% concerned 5-year maturity. Subsequent analyses therefore refer to trading on contracts with 5 years maturity. These data refer to 1021 reference entities and 9631 contracts¹⁶, for which 201,553 quotes were exposed. 64

14 Established as 20 March, 20 June, 20 September and 20 December of each year; premiums are paid on these same dates, calculated by applying the actual/360 convention.

15 This is the GFI, which has developed an electronic trading platform used by the main CDS dealers. This platform is a multilateral trading facility (MTF) referred to as GFI CreditMatch and subject to the supervision of the English Financial Services Authority. The platform shows the bid and ask prices proposed by the dealers and the related quantities (the counterparties of the contracts are anonymous until proposal applications are placed). GFI then immediately releases the information on the contracts concluded, but only about the price and the reference entity. No information is disclosed on the counterparties and volumes traded.

16 As compared with the 9,762 contracts stated in table 1, the difference is due to a far more limited number of contracts with expiry dates of less than 5 years but more than 4 (the "odd maturities", which are also present, albeit only marginally, in the other expiry classes shown in table 1).

sovereign reference entities generated approximately 27% of total contracts, whilst the remaining 73% concerned corporate issuers¹⁷.

The data, however, show a poor coverage of trades on CDS on European sovereign issuers. The analysis that follows is therefore limited to CDS on corporate issuers.

For corporate issuers, the most significant sectors are telecommunications (49 reference entities and 13.3% of contracts), natural gas and banks (respectively, 12 and 96 reference entities and 6.1% and 5.8% of contracts). Table 2 provides data relating to CDS on the top 5 reference entities by industry sector in terms of number of contracts.

Table 1 Distribution of contracts executed on single-name CDSs by maturity
(data from June to December 2010)

Expiry	Number of contracts	%
up to 1 year	380	3.39%
from 1 to 2 years	277	2.47%
from 2 to 3 years	399	3.56%
from 3 to 4 years	202	1.80%
from 4 to 5 years	9,762	87.19%
from 5 to 6 years	33	0.29%
from 6 to 7 years	72	0.64%
from 7 to 8 years	5	0.04%
from 8 to 9 years	6	0.05%
from 9 to 10 years	59	0.53%
more than 10 years	1	0.01%
Total	11,196	100.00%

Source: elaboration of GFI data.

Table 3 shows other statistics for the corporate sector according to the geographic area of origin of the underlying reference entity (Western Europe, North America – United States and Canada –, Japan, emerging countries)¹⁸. Western Europe is the most relevant area both in terms of the number of contracts (approximately 47.5% of the total) and the average number of contracts concluded per reference entity (on average 10 contracts per reference entity in the 7 months examined), followed by North America, with approximately 40% of the total contracts. For European issuers the frequency of quote updates is far higher than that for North American issuers (approximately 3 updates of quotes per day compared with less

¹⁷ This evidence is in line with that relating to positions in terms of net notional value as explained in the previous paragraph, for which CDSs on sovereign issuers account for approximately 20% of the entire market.

¹⁸ Russia and countries of Eastern Europe, Africa, Australia, Asia (ex Japan) and Latin America.

than one update). For North American issuers, however, approximately 29% of quotes result in the execution of a contract (this percentage drops to 2.3% for European reference entities).

Table 2 Contracts executed on 5-years single-name CDS for the top 5 most traded reference entities
(data from June to December 2010)

Sector	Country of origin of the reference entity	Reference entity	No. Contracts (A)	No. quotes (B)	A/B (%)
Sovereign	Turkey	Turkey	431	2,920	14.76
	Brazil	Brazil	413	3,936	10.49
	Russia	Russia	300	2,075	14.46
	Mexico	Mexico	281	2,483	11.32
	The Ukraine	The Ukraine	239	2,545	9.39
Telecommunications	Portugal	Portugal Telecom	207	4,779	4.33
	Italy	Telecom Italia	199	4,654	4.28
	Spain	Telefonica	129	3,356	3.84
	France	France Telecom	45	1,641	2.74
	The United Kingdom	British Telecom	43	1,777	2.42
Gas	Russia	Gazprom	296	2,886	10.26
	Spain	Gas Natural SDG	55	2,180	2.52
	France	GDF Suez	34	925	3.68
	Australia	Woodside Petroleum	19	475	4.00
	The United Kingdom	Centrica	12	893	1.34
Banks	Russia	Vneshtorgbank	79	1,094	7.22
	Russia	Sberbank	34	362	9.39
	The USA	Citigroup	33	97	34.02
	The USA	Wells Fargo Corp	20	68	29.41
	The USA	Bank of America Corp	19	76	25.00

Source: elaboration of GFI data.

This data clearly shows that the trade frequency on the CDS market is far lower than that on the markets of the main financial instruments issued by the underlying reference entities (shares and bonds). For only very few reference entities, there is more than one CDS contract per day whilst in most cases there are long periods of time with no trading activity.

Table 3 Distribution of contracts executed on 5-year corporate CDS according to the geographic area of residence of the reference entity

(data on period June–December 2010)

Geographic area of the reference entity	No. reference entities	No. contracts (A)	%	Average no. contracts per reference entity	No. quotes (B)	%	Average no. quotes per reference entity	Average no. daily quotes	A/B (%)
Western Europe	336	3,309	47.5	9.8	143,481	83.5	427.0	2.8	2.3
North America	411	2,810	40.3	6.8	9,666	5.6	23.5	0.2	29.1
Japan	124	139	2.0	1.1	7,899	4.6	63.7	0.4	1.8
Emerging countries	86	711	10.2	8.3	10,836	6.3	126.0	0.8	6.6
Total	957	6,969	100.0	7.3	171,882	100.0	179.6	1.2	4.1

Source: elaboration of GFI data.

Table 4 provides data on the individual European countries. The United Kingdom, France and Germany are the main countries in terms of reference entities and contracts concluded, whilst Italy is the main country in terms of average number of contracts per reference entity (approximately 22 in the 6 months analysed). For Italy, the top reference entity in terms of number of contracts concluded is Telecom Italia (199 contracts), followed by Enel and Fiat (respectively 45 and 41 contracts; Table 5). There were 4,654 quote updates on Telecom Italia (on average around 30 per day), which in 4% of cases resulted in the conclusion of a contract.

Table 4 Distribution of contracts executed and quotes exposed on 5-year corporate CDS according to the country of residence of the reference entity

(data on period June–December 2010)

Country of origin of the reference entity	No. reference entities	No. contracts (A)	%	Average no. contracts per reference entity	No. quotes (B)	%	Daily average no. quotes per reference entity	A/B (%)
The United Kingdom	91	633	19.1	7.0	32,144	22.4	2.3	2.0
France	53	518	15.7	9.8	26,941	18.8	3.3	1.9
Germany	46	573	17.3	12.5	22,490	15.7	3.2	2.5
Holland	24	340	10.3	14.2	11,561	8.1	3.1	2.9
Sweden	19	123	3.7	6.5	7,711	5.4	2.6	1.6
Spain	19	89	2.7	4.7	4,467	3.1	1.5	2.0
Switzerland	18	287	8.7	15.9	10,741	7.5	3.9	2.7
Italy	16	350	10.6	21.9	10,707	7.5	4.3	3.3
Other countries	50	396	12.0	7.9	16,719	11.7	2.2	2.4
Total	336	3,309	100.0	9.8	143,481	100.0	2.8	2.3

Source: elaboration of GFI data.

Table 5 Contracts executed and quotes exposed on 5-year CDS on Italian listed issuers
(data on period June–December 2010)

Reference entity	No. contracts (A)	%	Average no. contracts per day	No. quotes (B)	%	Average no. quotes per day	A/B (%)
Telecom Italia	199	56.9	1.3	4,654	43.5	30.2	4.3
Enel	45	12.9	0.3	1,801	16.8	11.7	2.5
Fiat	41	11.7	0.3	1,371	12.8	8.9	3.0
Edison	17	4.9	0.1	837	7.8	5.4	2.0
Atlantia	14	4.0	0.1	339	3.2	2.2	4.1
Finmeccanica	9	2.6	0.1	386	3.6	2.5	2.3
Monte dei Paschi	7	2.0	0.0	227	2.1	1.5	3.1
Intesa Sanpaolo	6	1.7	0.0	480	4.5	3.1	1.3
ENI	6	1.7	0.0	209	2.0	1.4	2.9
Generali	3	0.9	0.0	157	1.5	1.0	1.9
UniCredit	2	0.6	0.0	149	1.4	1.0	1.3
Banco Popolare	1	0.3	0.0	51	0.5	0.3	2.0
Mediobanca	-	-	-	22	0.2	0.1	-
Banca popolare di Milano	-	-	-	13	0.1	0.1	-
Banca Italease	-	-	-	6	0.1	0.0	-
Unione di Banche Italiane	-	-	-	5	0.0	0.0	-
Total 16 reference entities	350	100.0	2.3	10,707	100.0	69.5	3.3

Source: elaboration of GFI data.

Data on the number of contracts concluded are not necessarily a reliable indicator of liquidity, nor they allow for comparison of countries and reference entities. Hence, a more accurate indicator of the level of market liquidity may be provided by the bid-ask spread ¹⁹.

By analysing the most traded CDS by reference entities for United Kingdom, Germany and Italy, we note that the bid-ask spread tends to be related (albeit only quite weakly) to the number of contracts and the number of quotes updates (Table 6). Telecom Italia has the lowest spread (4.5%) and the highest number of contracts and quotes updates among major European issuers. On average, spreads exceed 5% with peaks of above 10%.

¹⁹ The spread has been calculated as a differential between bid-ask quotes, compared with their semi-sum.

Table 6 Liquidity indicators of 5-year CDS on European listed issuers
(data on period June–December 2010)

Country of origin of reference entity	Reference entity	No. contracts (A)	Average no. contracts per day	No. quotes (B)	Average no. quotes per day	Bid/ask spread average (%)	A/B (%)
Germany	HeidelbergCement	79	0.5	1,679	10.9	5.49	4.7
	Continental	69	0.4	1,787	11.6	4.83	3.9
	BMW	46	0.3	1,178	7.6	6.22	3.9
	Daimler	43	0.3	1,186	7.7	5.94	3.6
	TUI	36	0.2	396	2.6	5.92	9.1
Spain	Telefonica	129	0.8	3,356	21.8	6.63	3.8
	Gas Natural SDG	55	0.4	2,180	14.2	9.95	2.5
	Iberdrola	52	0.3	1,820	11.8	10.59	2.9
	Repsol	14	0.1	1,142	7.4	14.34	1.2
	Banco Bilbao Vizcaya	14	0.1	525	3.4	6.44	2.7
France	France Telecom	45	0.3	1,641	10.7	8.31	2.7
	GDF Suez	34	0.2	925	6.0	10.51	3.7
	Renault	30	0.2	1,011	6.6	6.61	3.0
	Saint-Gobain	29	0.2	1,341	8.7	10.42	2.2
	Peugeot	29	0.2	1,061	6.9	6.57	2.7
The United Kingdom	British Telecom	43	0.3	1,777	11.5	6.61	2.4
	Vodafone	41	0.3	1,540	10.0	7.66	2.7
	Marks & Spencer	32	0.2	1,223	7.9	7.44	2.6
	Anglo American	31	0.2	1,227	8.0	10.96	2.5
	Safeway	24	0.2	737	4.8	10.96	3.3
Italy	Telecom Italia	199	1.3	4,654	30.2	4.50	4.3
	Enel	45	0.3	1,801	11.7	10.49	2.5
	Fiat	41	0.3	1,371	8.9	5.58	3.0
	Edison	17	0.1	837	5.4	14.47	2.0
	Atlantia	14	0.1	339	2.2	11.40	4.1

Source: processing of GFI data.

4 The links between the CDS market and the underlying bond market

CDS prices provide a first approximation of the default probability of insolvency of the reference entity. In the simplest model, we can assume that the CDS price is equal to the expected default probability (PD), corrected by the recovery rate (RR). Therefore $CDS = PD \times (1 - RR)$, where $PD \times (1 - RR)$ is the expected loss (EL).

CDS prices also reflect the risk premium (RP), namely the compensation required by market participants to bear a given level of risk. The risk premium may vary over time as various factors may affect the risk aversion of market participants, affecting CDS prices when EL remains unchanged.

Hence CDS prices reflect two key components: expected loss and risk premium ($CDS = EL + RP$). In turn, the risk premium depends both on subjective factors related to risk aversion and to the level of volatility of market factors that affect default probability. There are two types of factors for which market participant require compensation. The first is the "jump-to-default risk" (JtD-R), i.e. the risk of a sudden default before the market has had the possibility of updating the default probability on the basis of a trend of market factors that may explain this probability; the second is the risk premium for the volatility of systemic risk factors (S) that affect default probability²⁰. This means that there is a risk premium for unexpected default (JtD-R) and a risk premium for expected default, i.e. the risk that can be forecasted on the basis of standard rating models.

CDS prices reflect several factors, including default probability, recovery rate in the event of default, risk premium for jump-to-default and risk premium for the volatility of factors that explain default probability standard ratings models. An increase in CDS prices may not reflect necessarily an increased in expected default probability, but rather an increase in the risk premium or a reduction of the expected recovery rate in the event of default.

These factors – PD, RR^{21} and RP – are the same that affect bond spreads (i.e. the difference between the yield of a bond issued by the reference entity and the risk-free rate).

In principle bond spread should equal CDS price. Since a long position in the bond and the purchase of a CDS replicates a risk-free asset the bond yield minus the CDS premium must be equal to the risk-free rate; hence bond spread (yield less risk-free rate – $R - r$) must be equal to CDS price ($CDS = R - r$). Arbitrage should guarantee such equilibrium.

20 For a broader explanation see European Central Bank (2009).

21 The recovery rate can naturally be closely (inversely) linked to the default probability.

As we will discuss further on, counterparty risk in CDS contracts and market imperfections that hinder arbitrage result in CDS prices being almost always different from bond spreads.

Another factor that can explain the misalignment of CDS and bond spreads, is related to the different level of liquidity of the two markets. Both CDS and bond spreads incorporate a liquidity premium – i.e. a premium for the risk of losses deriving from transaction costs on the secondary market (bid-ask spread, market impact, etc.). This premium may differ, as indeed liquidity conditions of the two markets differ. It has been documented by various studies that a great number of bonds are characterised by low liquidity, since investors (both retail and institutional) tend to adopt buy-and-hold strategies and because the dimension of the individual loans is often limited, and such as not to allow for the formation of an active secondary market²².

The CDS market may be more liquid than the bond market for various reasons: 1) the closure of a CDS position, as explained previously, does not necessarily require the "sale" of the contract on the secondary market, as for bonds, since it is sufficient to open a position of the opposite sign; 2) the CDS supply is potentially unlimited and CDS notional can exceed the amount of the reference entity bonds; 3) liquidity is concentrated on a few standardised CDS contracts (typically those with 5 years maturity), whilst liquidity on the bond market is fragmented on the different issues.

Many of these factors can, however, be less relevant, or entirely irrelevant, for the government bond market. For example, having regard to point 2), the statistics given above show how, on an aggregate level, the ratio of notional value of the CDSs to outstanding bonds is far lower for sovereign issuers than for corporate issuers²³. Additionally, with reference to point 4), the liquidity of the government bond market tends to be generally higher than that of corporate bonds²⁴.

It is therefore possible that the CDSs on corporate issuers incorporate a lower premium for liquidity than the related bond spreads, whilst for public debt bonds the opposite happens, especially for those countries with a very broad, liquid government bond market.

There are, however, other distinctive elements of the CDS market that affect liquidity risk. The ECB reports that the CDS market liquidity is supplied by a very

²² For the banking bond market, see Grasso *et al.* (2010).

²³ By crossing the statistics of the BIS given at note 8, with the data of the DTCC, it can be estimated that on an aggregate level, the ratio of notional value of the CDS and underlying in circulation is approximately 5% for sovereign issuers and 50% for corporate issuers.

²⁴ One of the main reasons is that countries wishing to keep a transparent, secondary government bonds market, also through the involvement of intermediaries who play a primary dealer role, with a view to attracting the interest of investors and facilitating the listing of new bonds on the primary market. Some studies in relation to the major European countries and the USA have shown how the various government bond listing methods on the primary market affect the transparency and organisation of trade on the secondary market (see CEPR, European Government Bond Markets: transparency, liquidity, efficiency, 2006).

limited number of dealers. More specifically, in 2008, trading on the CDS market was concluded mainly by just five dealers (JPMorgan, Goldman Sachs, Morgan Stanley, Deutsche Bank and Barclays)²⁵. The extremely high concentration of the suppliers of liquidity on the CDS market generates specific risks of potentially systemic nature related to the possibility that for whatever reasons one of the largest dealer comes out of the market. This "liquidity concentration" risk tends to be less strong on the bond market.

Hence, there are various reasons that may explain, in static terms, the difference between CDS and bond spreads, mainly explained by the counterparty risk of CDS contracts, the market imperfections that hinder arbitrage, and the different liquidity of the two markets. The next paragraph will provide details on how arbitrage strategies should close of the gap between the CDS and bond spreads, discussing the limits to the feasibility of such strategies.

The next paragraph will analyse the problem in dynamic terms, analyzing whether new information that leads market participants to review their expectations on default probability (or recovery rate) tend to be incorporated first in CDS prices rather than in those of bonds, or vice versa, testing if one of the two markets plays a leading role in the price discovery process. In other terms, it is possible that there may be a misalignment between CDS prices and bond spread in the short-run, because one of the two markets may react more quickly (or more accurately) to the flow of new information.

4.1 Arbitrage strategies between the CDS market and the bond market

In principle, a bond covered by a CDS on the bond issuer replicates a risk-free security. The bond yield (R), net of the premium paid for the purchase of the protection (C), should equate the risk-free rate (r). Therefore, we should have $C=R-r$, or $C=S$, where $S=R-r$ is the bond spread.

We indicate the repo rate with F , namely the cost of borrowing using securities as collateral.

In theory, we can assume that there is no possibility of arbitrage only when the premium of the CDS (C) is equal to the bond spread S . The difference between C and S is usually defined as "basis" ($\text{Basis} = C - S$). If the basis is different from zero, fully leveraged arbitrage strategies are possible, namely transactions that are (in theory) risk-free and which result in a positive return with no capital absorption, as explained further on.

²⁵ European Central Bank (2009) cit.

Negative basis ($C < S$).

When the basis is negative, the following arbitrage strategy can be implemented: buy the bond financing it at the repo rate F and collecting the return $R = S + r$; purchase protection through CDS, paying the premium C .

In detail, the bond purchased is used as collateral in the repo transaction (the repo rate is therefore the rate of a lending transaction guaranteed by bonds, which takes form in a spot sale and future repurchase of the bond, and the difference between the two prices represents the cost of lending). If the bonds pledged as a guarantee are of high rating, the repo rate F is normally close to the risk-free rate r .

The return of this risk-free portfolio (the credit risk on the long position in bonds is covered by the CDS purchase) is equal to $(S + r) - F - C$. Assuming that F equals the risk-free rate r , the profit amounts to $S - C$. Since $S > C$, the return of this strategy will be positive. These transactions will continue until the basis is driven to zero.

Positive basis ($C > S$).

When the basis is positive, the following arbitrage strategy can be implemented: short selling the bond by taking a securities lending position through a reverse repo transaction and selling protection by collecting the premium C .

The security lending position acts as a reverse repo, where the arbitrageur buys the bond and sells it forward. Repo and reverse repo are obviously identical transactions but seen from the two opposite perspectives; hence the arbitrageur implementing a reverse repo invests the liquidity deriving from the short sale and should therefore receive the repo rate F . Under some circumstance, there may be few operators willing to lend securities and the cost of the security lending results in having a return rate on the invested liquidity much lower than the repo rate normally negotiated for that type of collateral. We may therefore end up with $F < \text{repo rate}$ ²⁶ (repo rate $- F$ therefore represents the implicit cost of the securities lending).

The overall return on this strategy will equal the premium collected on the sale of the CDS, C , plus the return of the reverse repo F , less the return of the bond sold short $(S + r)$, or $C + F - (S + r)$. Assuming that F is equal to the risk-free rate r , the resulting profit is $C - S$ (the basis).

However, both positive and negative basis arbitrage are non completely riskless.

²⁶ In this situation it is said that the repo rate is "special". Duffie (1996) has shown how cases where the repo rate is special, i.e. below the risk-free rate or the repo rate normally negotiated for that specific type of collateral, are linked to the presence of legal or institutional constraints to bond lending. The International Capital Market Association (ICMA) stresses how in extreme situations of major imbalance between demand and supply the repo rate may even be negative, particularly in conditions of very low short-term rates. Negative repo rates are frequent for more liquid government bonds (those referred to as "on the run" or "cheapest to deliver" in arbitrage between the spot and future markets). See ICMA, "A white paper on the operation of the European repo market, the role of short selling, the problem of settlement failures and the need for reform of the market infrastructure", 13 July 2010.

The counterparty risk of CDS contracts makes the arbitrage not entirely riskless, although this risk can be mitigated through an exchange of collateral²⁷.

Moreover, these strategies generate the expected pay-off only if kept until the bond maturity (or until the credit event). There is the risk of a change in F (the repo-rate) when rolling-over the bond lending or financing position. More generally these arbitrage strategies may not always prove attractive, particularly in extreme market conditions, because they may need to be closed before to their natural expiry, at a loss²⁸.

Finally, there may be frictions in the operation of markets that prevent an immediate allocation of resources towards arbitrage strategies (according to the slow-moving capital theory²⁹).

For these reasons in real market conditions, especially after the financial crisis following Lehman Brothers default, the basis has been rarely close to zero, with a clear differentiation between corporate bonds and sovereign bonds.

Regarding to the government bonds of the main European countries, Figure 6 shows how the basis has almost always been positive (CDS > bond spread³⁰); only in the case of Greece there have been persistent negative basis episodes³¹. The Appendix reports the graphs relating to CDS trend and the spread on government bonds for the main countries of the euro area³². The persistent positive basis for the major European countries may be explained in various ways. There may have been a flight-to-liquidity effect that resulted in a great compression of the premium for the liquidity incorporated into the spread on government bonds of some country³³, especially after the Lehman default. This does not, however, explain why arbitrage has not resulted in a closing of the gap with the CDS. One may argue that arbitrages

27 The buyer of the CDS is exposed for payment that he shall receive in case of a credit event, whilst the seller is exposed for the regular flow of premium payments. However, at the time of conclusion of the contract, if the pricing is fair and credit rating of the counterparties is equal or very similar, the two exposures should balance out, as the expected value of the payments in case of a credit event shall equal the value of the premiums. As the default probability of the reference entity changes, the contract may assume a positive market value for one of the two counterparties and an adaptation of the guarantee value may thus be required.

28 See Shlifer and Vishny (1997). Fontana (2010) observes that, in conditions of great turbulence, the application of the mark-to-market to financial positions linked to these strategies may cause significant losses to be posted on accounts that can result in the liquidation of the positions, at a loss.

29 See Duffie (2010a).

30 The bond spread is calculating using the euro swap rate (IRS) as risk-free rate. The swap rate is the rate at which issuers with high credit ratings can borrow at fixed rates, and the benchmark used by the market for pricing new issues on the primary market. The swap rate, as this is a generic reference rate listed on the capital market, has the advantage as compared, for example, with the rate on Germany government bonds, of not being influenced by the problems of liquidity or distortion linked to tax or other elements that can influence bond prices, and are always listed with reference to pre-defined expiry dates.

31 The same evidence is stated by Fontana and Scheischer.

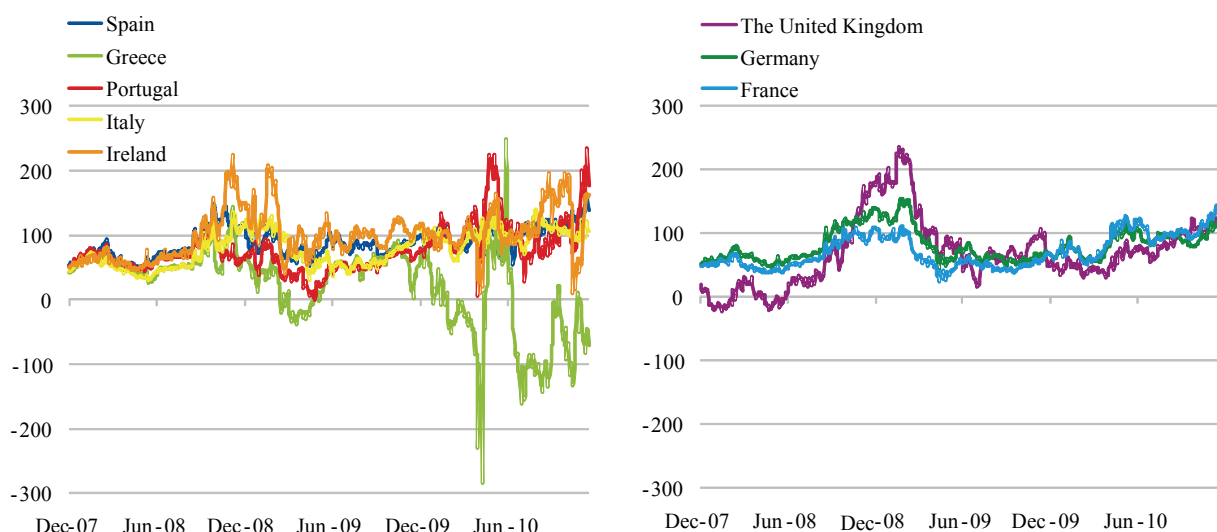
32 The Appendix also provides the graphs relating to the "implicit rating" in the CDS and bond spreads, compared with the official rating (assigned by Moody's). From the beginning of the sovereign debt crisis (around February 2010), both the CDSs and the bond spreads began to show default probabilities that were far greater than those incorporated into the official rating for the peripheral countries of the euro area (but also for France and Austria). The official rating showed great inertia, whilst CDS and spread are extremely volatile in periods of greatest turbulence.

33 See Fontana and Scheischer cit.

based on the short sale of government bonds are here limited by the high costs or difficulty in borrowing bonds. The sale of protection on the debt of these countries could also be complex, resulting in a lower premiums compared to the indicative quotes used to represent the data of Figure 6³⁴. CDSs were also over priced as a result of a lack of sellers of protection or the perception of high counterparty risk linked to this type of transaction. The lack of CDSs sellers may be due, for example, to the fact that the banks cannot sell protection on the public debt of the countries in which they reside, due to the extremely high correlation between their default probability and that of the sovereign issuer (the “wrong-way correlation”).

In the case of Greece, the negative basis may be explained by the difficulty of financing long positions in Greek bonds through the repo (probably because of the high haircuts³⁵ required on these transactions, precisely due to the expected downgrading of Greece).

Figure 6 Basis trend for European sovereign issuers
(values in basis points)



Source: elaboration on Thomson Reuters data. The basis is calculated as the difference between the CDS and the 5-year bond spread (difference between the return at expiry and the 5-year swap rate).

Some studies have shown that for corporate bonds, the basis was on average negative since the financial crisis in the half of 2007, similarly to what observed for Greek government bonds³⁶. The latest evidence seen in Figure 7, in

34 This is a general problem relating to the effective possibility to correctly measure the basis, as the data reflect indicative, non-binding quotes and are the result of averages of quotes gathered during the day (according to methods set by the data provider Markit).

35 The haircut is the method by which collateral is constituted in repo transactions. For example, against securities for a value of 100, a loan of 98 is received (2% haircut) and the repo rate (cost of the loan) is calculated on 98. The higher the haircut, the more expensive the arbitrage transaction, which thus becomes not entirely self-financed, but does absorb a share of capital that must be remunerated at a suitable rate, which is above the risk-free rate.

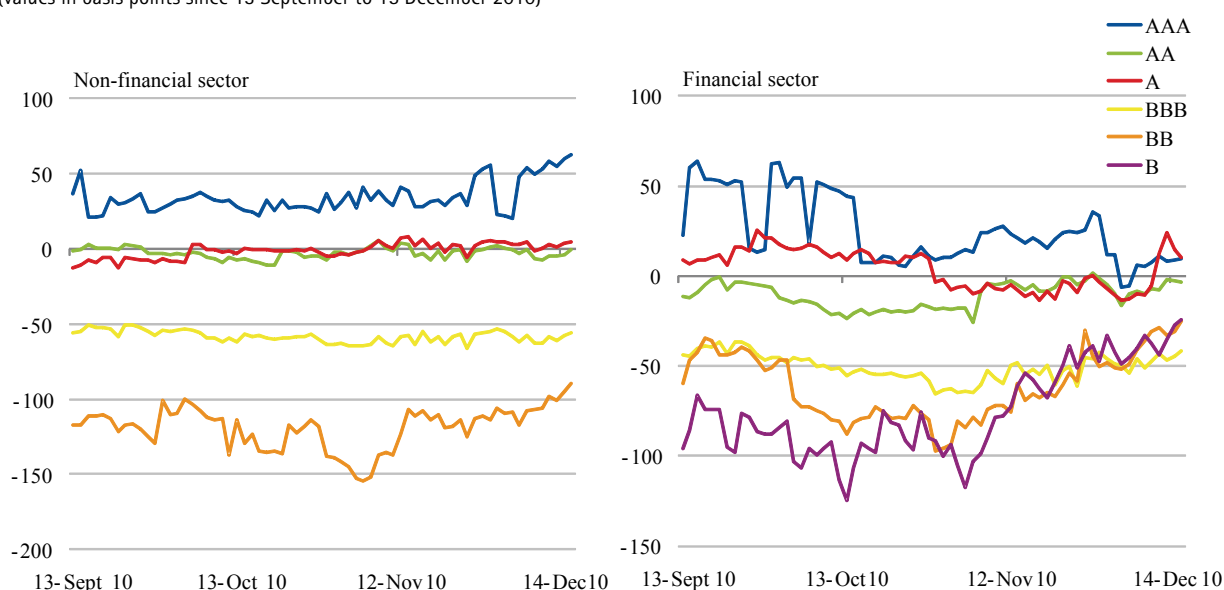
36 See Fontana (2010).

relation to a sample of around 800 bond of European and American issuers for the period September–December 2010, shows how the basis was negative for issuers with rating of BBB or below, whilst for issuers with A and AA rating the basis was close to zero and for those with AAA rating averaged at 30 basis points.

Hence, for corporate issuers the basis is related to the issuer credit rating, whilst for sovereign issuers (except for Greece), the basis tended to be similar across the various countries considered, regardless of the rating.

Arbitrage to exploit the negative basis for corporate issuers (purchase of the bond by repo and purchase of the CDS) has often proven to be quite risky due to the increased counterparty risk in the protection purchase transactions and the increased volatility of the repo rate, due to the lack of liquidity and tensions affecting the inter-bank markets. For bonds with lower ratings, arbitrage is made even more expensive by the penalising repo rates and the high haircuts needed to collateralise the transaction. This may explain the evidence of Figure 7, whereby a negative basis is seen to a greater extent for issuers with lower credit ratings.

Figure 7 Average value of basis according to rating classes of the reference corporate entity
(values in basis points since 13 September to 15 December 2010)



Source: processing of Markit data. Data relating to approximately 800 American and European bonds for whom there is a 5-year CDS on the issuer and there are fixed rate bonds with expiries close to 5 years. The basis is calculated as the difference between the CDS and the asset swap spread of the bond (namely the spread on the swap rate that the issuer would pay by virtue of a 5-year fixed rate issue). The sample of 800 bonds represents approximately 1% of the more than 70,000 bonds recorded by Markit, which cover the most traded securities of the institutional investors.

These considerations do not, however, explain the different trend of the basis between government bonds and corporate bonds. One possible explanation is that for sovereign issuers it is easier to arbitrage the negative basis since the repo market on government bonds is more liquid and less expensive than that on

corporate bonds and, for the same rating, haircuts are lower. As mentioned earlier, this may explain why the Greek basis, since the second half of 2010 behaved more similarly to that of a corporate bond than that of other European sovereign issuers.

4.2 The price discovery process on the CDS market and the bond market

The above discussion in the determinants of the "basis" reflects a static approach, as it analyses the market imperfections that prevent arbitrageurs from exploiting the difference between CDS and bond spreads. The friction that prevents arbitrage also explain the persistence over time of a positive or negative basis.

A second explanation of the fact that the basis is different from zero relates to the possibility that CDSs and bond react differently to the new information that affect the expected default probability (or recovery rate). Hence, a positive or negative basis may reflect a temporary delay in the alignment of the two markets which, in the long term, is arbitrated out.

Economic literature has broadly analysed this issue, especially with reference to the corporate sector, finding that, in general, CDS play a leading role in the price discovery process, where price variations of CDS anticipate variations in bond spreads. This evidence is coherent with the hypothesis whereby CDS prices adjust more rapidly to the release of new information and that adjustment, in turn, generates an informative signal with respect to which bond spreads react, with a time lag.

Blanco, Brennan and Marsh (2005), in a study conducted on daily data from 2001 to 2002 in relation to a sample of investment-grade bond, find short-term deviations between CDSs and bond spreads (i.e. a basis different from zero), which tend to be corrected in the long-term through a price adjustment mechanism in which CDS play a leading role³⁷. The authors justify the evidence whereby CDS are more sensitive to changes in credit risk with the greater liquidity of the market and the different type of players that operate on the CDS market. As illustrated previously, there are many factors that may determine a greater liquidity of the CDS market compared to the bond market. This makes the CDS market more suitable for more aggressive or speculative trading strategies. Additionally, as explained in the first paragraph, when taking a short position on credit risk, CDS may be a more efficient instrument compared to the short sale of bonds. For these reasons, it is possible that traders with more aggressive and dynamic strategies prefer to operate on the CDS markets, whilst the bond market is populated by investors with buy-and-hold strategies.

Regarding sovereign issuers Coudert and Gex (2010) show that in countries with low credit ratings, corporate CDS play a leading role, particularly during periods

37 Similar results are documented by the European Central Bank (2004), Norden and Weber (2009) and Zhu (2006).

of turbulence, whilst for countries with high ratings, spreads on government bonds play a leading role in the price discovery process. Fontana and Sheicher (2010) also find that CDS play a leading role for peripheral countries of the euro area, whilst in countries with higher ratings, the leading role is played by the government bond market (in particular for Germany, Austria and France).

To offer a more updated evidence on the relationship between CDS and spread of government bonds, we developed an empirical application similar to that used in the previously mentioned studies.

The analysis is based on an econometric model that requires a preliminary test of co-integration between CDS prices and government bonds spreads (through the Johansen co-integration test). This implies to test the presence of a long-term relationship of zero basis (where CDS price equals the government bonds spread).

If the series are co-integrated, to test the presence of a short-term misalignment of CDS and bond spread, and the direction through which adjustment is applied towards long-term balance, i.e. who is the leader and who is the follower in the price discovery process, we applied a "vector error correction model" (VECM) econometric model:

$$\begin{aligned}\Delta p_{cds,t} &= \alpha_1(p_{cds,t-1} - c - bp_{TS,t-1}) \\ &\quad + \sum_{i=1}^q \beta_{1i} \Delta p_{cds,t-i} + \sum_{i=1}^q \delta_{1i} \Delta p_{TS,t-i} + \epsilon_{1t} \\ \Delta p_{TS,t} &= \alpha_2(p_{cds,t-1} - c - bp_{TS,t-1}) \\ &\quad + \sum_{i=1}^q \beta_{2i} \Delta p_{cds,t-i} + \sum_{i=1}^q \delta_{2i} \Delta p_{TS,t-i} + \epsilon_{2t}\end{aligned}$$

where $p_{cds,t-1} - c - bp_{TS,t-1}$ represents adjustment towards the long-term relationship ($p_{cds,t-1}$ e $bp_{TS,t-1}$ are, respectively, the CDSs prices and the government bonds spreads with respect to the risk free rate).

If the parameter α_1 is statistically not significant, whilst parameter α_2 is positive and significant, this indicates that the adjustment process towards the long-term relationship is determined by changes to government bonds in response to changes of CDSs, namely that the leading role in the price discovery process is played by the CDS market. If, instead, α_1 is negative and statistically significant, whilst α_2 is not significant, it is the bond market that plays the leading role. When both parameters are significant (and in that case, we have an alternation of sign³⁸), both markets contribute to the price discovery process and the Gonzalo-Granger statistic,

38 If one of the two series has a negative sign (as is the case for spreads on government bonds for some countries), the alternation of sign may not occur.

defined as $\frac{\alpha_2}{\alpha_2 - \alpha_1}$, allows us to establish which market makes the greatest contribution to the price discovery process: if the result in absolute value exceeds 0.5, the CDSs play a more important role compared to the bond market, whilst if it is lower than 0.5 (the maximum for construction is 1), the opposite is true.

If on the contrary the series are not co-integrated, the Granger causality test is used to establish if CDSs changes are affecting those of the bond spread or vice versa³⁹. The limit of this approach is that we can end up with a two-way result, as in the case of the VECM, in the causality relationship. In this case the test does not allow us to establish which of the two markets plays the main role in the price discovery process.

This approach is applied to the daily series of the 5-year CDS and government bonds spreads. We test the model for the period running from June 2009 to November 2010. The choice of this period is due to the fact that it includes two sub-periods that are relatively different: the first, from June 2009 to February 2010, shows a relative calm on the fixed income markets while the second, from March 2010 to November 2010, is affected by the sovereign debt crisis. The results in the two sub-periods allow us to test the hypothesis that the relationship between CDS and bond market may vary according to the level of turbulence, as argued by Coudert and Gex (2010).

In general, the results of the empirical application (illustrated in the Appendix), clearly show the existence of a leading relationship of the CDS with respect to government bond spread for some peripheral countries of the euro area. This relationship becomes statistically more robust and economically more relevant in the post-crisis period (i.e. from March to November 2010), particularly for Ireland, Greece and Spain, whilst for the other countries, results are less stable and depend on the period of time considered. The entity of the coefficient α_2 , which indicates the intensity of the leading role played by the CDS varies greatly across countries, reaching a peak in Ireland, Greece and Spain.

This evidence is generally coherent with the results of Fontana and Sheicher (2010), albeit with some differences that would, however, appear to be due to the different period analysed (September 2008 – June 2010) and the different frequency of data collection (weekly, rather than daily) used by the authors⁴⁰.

The fact that the CDS do not always play a leading role in the sovereign issuer debt markets seems to contradict the argument of Blanco, Brennan and Marsh (2005). According to these authors, CDS market play a leading role since it is easier to open short positions with CDS and because the market is populated by sophisticated

39 This approach is based on the estimate of a VAR (Vector Auto-Regression) model that coincides with the VECM model illustrated in the text, assuming, on the basis of the evidence of co-integration test of Johansen, that α_1 are and α_2 are equal to zero.

40 The use of weekly data reduces the noise as compared with the the use of daily data, but also reduces the number of observations available. It is therefore unclear exactly what the net effect on the statistical robustness of the estimates is.

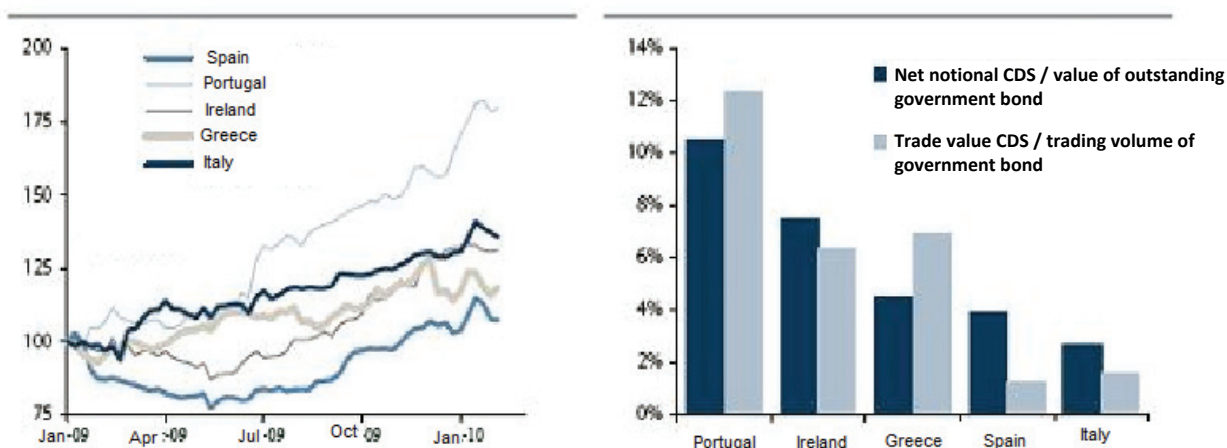
operators with more aggressive strategies. These considerations certainly also apply to the CDS market on sovereign issuers, although the CDS do not always play a leading role.

The main reason that can explain the different behaviour of the CDS market between peripheral countries and core countries seems to be due to the different liquidity of the CDS market and the bond market, which, in turn, may be affected by the credit risk valuation. In countries where the credit risk is higher, there has been an increase of CDS positions due to hedging needs, which has resulted in a growth of liquidity of the CDS market as compared with that of the bond market. Figure 8 shows the growth of net positions on the CDSs of peripheral countries and shows that the incidence of trade on CDSs is greater in the countries with a higher risk (Greece, Ireland and Portugal).

Figure 8 Size and liquidity of the CDS market for peripheral countries of the euro area

Net notional value of the CDSs (Jan. 2009=100)

Relationship between CDS market and government bond market



Source: Barclays Capital.

5 Policy implications

Regulators and policy makers are paying close attention to the CDS market because of the possibility that operations on this market may amplify the debt crisis of the peripheral countries of the euro area, generating destabilising effects and increasing tension on the government bond market.

This problem can be analysed from different perspectives. The first one relates to the possibility that, through operations on the CDS market, it is possible to affect the underlying government bond and thereby affect the cost of financing public debt. A second profile concerns the low transparency and lack of information

on trades taking place on the CDS market, so that this market may be subject to manipulation strategies which generate destabilising "informative" signals for the underlying government bond market.

In response to this concern, the European Commission has issued a proposed Regulation that envisages the possibility of Member States, in emergency situations, of prohibiting or limiting the operations in CDS on government bonds⁴¹; the nature of these limits may vary depending on the situation and may potentially involve the prohibition of purchasing "naked" CDS, i.e. purchasing CDS without holding a underlying position to be hedged. Other proposals include the introduction of a transparency regime towards the authorities (reporting) of the short positions in government bonds and, in emergency situations, the possibility for the countries to request further information to market participant about the purpose of their use of CDS and impose market disclosures of short positions implemented through CDS. In another consultation document on the MiFID review, the European Commission proposes a transparency regime on trade concluded on OTC markets, which would, therefore, also extend to the CDS market⁴².

The policy debate is therefore focussed on the need, even in emergency situations, of introducing limits to the operations on the CDS market, assessing, in particular, the efficiency of these prohibitions in mitigating the risks indicated earlier and the relative costs in terms of altering capital market efficiency and the need of introducing measures aiming to increase the transparency of transactions on the CDS market.

Three key issues will therefore be discussed. The first relates to the possibility that speculation through CDS may have a destabilising effect on the government bond market. The second issue concerns the benefit of introducing transparency obligations on CDS trade, also with a view to mitigating any potentially destabilising effects of speculation through CDS. Finally, we will discuss the implications of the regulatory proposals on the limitation to operations on CDS, with specific regards to the prohibition of naked CDS.

5.1 Can speculation through CDS de-stabilise the bond market?

The evidence presented in the previous paragraph regarding that CDS market may play a leading role in the price discovery process does not necessarily imply that it is possible to influence the government bond market through CDS operations. This evidence merely indicates that the CDS market may be more reactive to new information compared with the government bond market.

41 Regulation on short selling and certain aspects of Credit Default Swaps, of 15 September 2010.

42 Review of the markets in financial instruments directive, 18 December 2010.

Current economic literature does not provide any conclusions on this issue and there is no clear empirical evidence on the fact that speculation through CDSs may have influenced the prices of government bonds⁴³.

Moreover, the evidence and studies on the persistent positive "basis" for European States (i.e. CDS prices greater than bond spread) since the financial crisis, seem to suggest that it is precisely during great turbulence that there is a sort of decoupling of CDS and the bond spreads, hence making it difficult to drive up bond spreads buying CDS (see paragraph 3.1 on the example of arbitrage in the case of positive basis). Finally, the case of Greece shows how the "manipulation" did not start from the CDS market but rather from the conduct of the Greek authorities themselves, who radically reviewed the data on the public debt and deficit.

In practical terms, a way to affect the government bond market is to implement speculative transactions based on the short sale of government bonds and the purchase of CDS. The sale of government bonds increases fears of insolvency, thereby resulting in an increase of CDS prices, which, in turn, cause a further drop of government bonds prices. The speculator can therefore close the position at a profit by selling the CDS at a higher price and repurchasing bonds at a lower price⁴⁴.

Another option is to purchase naked CDS at higher prices (and therefore at a price greater than the "theoretical" value expressed by an efficient market), hoping to start-up imitative strategies by other operators ("herding behaviour"), and create an excess demand for protection. CDS prices should begin to rise and the speculator could close the position at a profit ⁴⁵. Those purchasing naked CDS causing prices to rise may generate a destabilising informative signal or a situation of panic amongst the other operators, who will thus attempt to reduce exposure towards the issuer, selling the relevant bonds or purchasing CDS.

It is clear that these are very complex and high risk strategies. In the first case, it would appear to be difficult to affect the prices of government bonds through short sales, mainly because of the capital needed, given the large dimensions of government bonds market in all major European countries. Despite this, some observers report the experience of the currency crisis in 1992, where speculation (also through derivatives) successfully affected exchange rates of the pound sterling and Italian lira (determining the exit from the EMS), despite the fact that the currency market is very liquid and large.

43 In response to the consultation on the European Regulation, the International Monetary Fund (<http://www.imf.org/external/np/eur/2010/pdf/080510.pdf>), argues that the dynamics of CDS prices until April 2010 had been extensively influenced by the trend of the fundamentals of the individual countries (public debt and deficit, balance of payments, product growth, etc.) and, therefore, this would indicate the absence of any relevant speculation on the CDS market. Anecdotal evidence and subjective impressions of the majority of those involved in the public consultation on the Regulation also expressed some scepticism as to the possibility that speculation through CDS could effectively distort the government bond market.

44 See R. Portes, *Ban naked CDS*, Eurointelligence, 18 March 2010.

45 See Duffie (2010b).

In the second type of strategy, it should be assumed that there is a coordinated action (or rather a "action in concert") by a group of parties willing to purchase CDS at increasingly higher prices. Each "conspirator", however, has interest in leaving the others to pay a price higher than the current price (or the theoretical value) and, therefore, the strategy may be considered intrinsically unstable. Furthermore, it may be complex to induce imitation behaviour in other investors. According to some observers, instead, CDS represent the main instrument for coordinated speculative manoeuvres⁴⁶: as soon as market operators realise that someone is causing CDS prices to rise, imagining that others are adopting the same strategy, are led to aggregate to the "speculators", causing a coordinated behaviour that generates an actual "race" to the purchase of CDS and a rise in the related prices, which is destabilising in terms of the signalling effects it may have on the issuer default risk.

From a theoretical viewpoint, there are two key elements that affect the probability of the success of such strategies: *a)* the possibility of creating an "artificial" rise in CDS prices; *b)* the possibility that this rise may cause the market to review its expectations on the default probability (thereby affecting bond spreads).

The first element depends crucially on the level of liquidity of the CDS market on sovereign issuers, on which, as mentioned before, we do not, unfortunately, have sufficient information. It is possible that during periods of great turbulence, the CDS market can become highly illiquid, which would greatly reduce the number of protection sellers. As a result, it is possible to cause prices to rise significantly through limited purchase. As will be argued further on, the lack of a post-trade transparency regime makes the market unable to understand if the rise in CDS prices reflects a liquidity premium or if it is a signal of a review of expectations concerning default probability. The "opacity" of the CDS market is, therefore, a critical issue that can greatly affect the behaviour of other operators, making herding behaviour more likely.

Unfortunately, there is no research or specific empirical work on these aspects for the CDS market on sovereign issuers. There are, however, some analogies that can be taken from studies on corporate issuers, which can provide interesting insight.

Stulz (2010) argues, for example, that operations on CDS did not, by themselves, determine an acceleration of the tension culminating in the default of AIG or Lehman Brothers (indeed liquidation of the CDS on Lehman took place without particular operative problems). Despite the fact that in that period there were various CEO of American listed companies complaining about supposed manipulation on the CDS of their companies, the Securities and Exchange Commission (SEC) has never opened an investigation, nor have any clear signals been obtained in that side. Generally speaking, the presence of CDS has never had a clearly destabilising effect

⁴⁶ See Portes cit.

on banks, even in the most intense periods of financial crisis after the Lehman default.

Che and Rajiv (2010) state on the contrary that speculation through CDS can have negative effects on the stability and efficiency of the capital market, but their arguments cannot be immediately extended to the sovereign issuers market. In particular, the authors argue that those who are optimistic about the prospects of a firm may sell protection through CDS rather than supplying credit. This would reduce the credit supply as CDS activity absorbs collateral, causing enterprises to select riskier projects. In the same way, it could be argued that speculators with positive expectations may sell protection rather than buy government bonds. The absorption of collateral reduces the aggregate demand for bonds, resulting in a fall of bond prices.

Another area of research explores the difference in terms of the costs of debt between companies with and without a CDS market. Ashcraft and Santos (2009) report that in the period following the start-up of contracts on the related CDS, for more transparent companies with greater credit standing experience a slight reduction in the cost of debt, whilst for the other companies the costs of debt increases.

Other authors stress the fact that CDS can reduce bank incentives to exercise their monitoring role⁴⁷ and increase incentives to finance riskier projects, but at the same time increase the creditor market power in the event of debt restructuring, allowing enterprises an *ex ante* greater recourse to the capital market⁴⁸. This latter evidence may also be valid in the case of sovereign debt, but are related to the case in which CDS are used for hedging rather than for speculation.

5.2 Do we need a CDS trade-transparency regime?

As mentioned previously, in the policy debate is currently focussed on the possibility of introducing a reporting regime of short positions to the Supervisory Authority, as proposed by the European Commission and also with a view to allowing to better calibrate any restrictive interventions on the operations in CDS. This flow of information can, in fact, allow the Authorities to assess the effective weight of speculation activities in CDS and short positions, as compared with the overall volume of transactions on the bond market and hence the need to restrict some rules form of operations on CDS (such as naked CDS).

The issue of extending to the CDS market and, more generally, to OTC derivatives markets, pre- and post-trade transparency rules, similar to those established by MiFID for stock markets, involves different considerations.

47 See Hakenes and Schnabel (2009). Stulz (2010) however observes that the shares of American bank assets covered by CDS is surprising low (approx. 2%), probably because the CDSs are available or liquid for big companies only.

48 See Bolton and Oehmke (2010).

The literature on trade transparency is very broad and articulated, but does show some convergence of results on some fundamental elements.

Greater pre-trade transparency appears to reduce transaction costs for "uninformed" investors operating for liquidity needs and small orders, but at the same time, it incentivises to invest in information. Pre-trade transparency reduces the incentive to post bid-ask quotes by market-makers, particularly for large amounts and, therefore, can have a negative impact on liquidity and transaction costs.

Beyond the implications of these results, the application of a pre-trade transparency regime to the CDS market and, more generally, to the OTC derivatives markets, would not appear to be a feasible option, for the reasons explained below.

The CDS market, as for other OTC derivatives (such as, for example, interest rate swaps) is characterised by a two-layer structure. On the one hand, there are orders coming from "buy-side" intermediaries to dealers operating as market-makers. As mentioned before, the market is extremely concentrated from the dealer side, whilst buy-side operators are represented by a potentially far broader plateau of institutional investors and intermediaries. The interaction between buy-side operators and dealers is the one typical of OTC markets and takes place on bilateral telephone contacts and indicative, unbinding quotes exposed by major data providers. The second layer is instead represented by inter-dealer trades to manage or hedge transactions with buy-side clients or their own positions, which are intermediated by "inter-dealer brokers". These parties do not take any positions but only match dealer orders, guaranteeing anonymity to counterparties. The inter-dealer brokerage systems have gradually substituted the traditional voice brokerage mechanisms with automatic execution of orders based on electronic trading platforms where dealers can observe and apply quotes placed by other dealers, which, however, remain anonymous until the transaction is concluded.⁴⁹

It is therefore interesting to note how the inter-dealer segment of CDS market has independently developed systems providing pre-trade transparency, but the very limited number of participants and the high average size of transactions requires the anonymity of counterparties to optimise the trade-off of transparency and incentives to provide liquidity. Regulatory interventions aiming to impose different pre-trade transparency regimes would appear therefore to have a negative impact on the regular functioning of this market segment.

The case of a pre-trade transparency regime for the buy-side segment is different. Here, the trade-off described previously would appear to apply as well, hence transparency could certainly reduce transaction costs (and counterparty search costs), but would reduce dealer's incentive in providing liquidity. It would therefore appear reasonable to consider an approach similar to that taken for the equity market, where pre-trade transparency applies essentially to the orders of sizes that do not exceed given thresholds, typically parameterised to "uninformed" retail investor activity.

49 See Avellaneda and Cont (2010).

However, for the CDS market and, in general, for other OTC derivative instruments, this approach seems difficult to apply, given the generally very high trade size.

A second issue concerns the need for a post-trade transparency regime. This issue has been widely analysed in the literature as well. In general, the advantages of post-trade transparency relate to the possibility of allowing for an efficient application of the best execution rule and, consequently, the creation of mechanisms to encourage competition between trading venues to attract investor orders which would result in a reduction of transaction costs. The information deriving from post-trade transparency clearly has an important value for market participants, as it contributes to the price discovery process. From this viewpoint, however, the key aspect is represented by the time lag with which this information is disclosed to market players. In markets characterised by great volatility and high trade frequency, such as the stock market, a delay of just a few minutes may radically reduce the informative value of post-trade transparency. At the same time, the immediate release of this information exposes the counterparties of the transaction to opportunistic behaviour by the other market players, particularly when transactions are of large size and implemented by "informed" operators. Immediate post-trade information therefore increases price impact costs for dealers carrying out large size transactions, reducing the incentive to supply liquidity to the market.

Having regard to these issues, the implementation of a post-trade transparency regime for the CDS market would require the definition of a time lag and/or of a certain level of aggregation (e.g. information at the end of the day, aggregated according to reference entity, etc.) to allow dealers to best manage their positions and minimise market impact costs. However, the purpose of post-trade transparency partly differs from that typical of other retail markets (i.e. best execution and incentive to competition between trading venues). The objective would be instead to allow investors to assess the effective prices of CDS contracts and to what extent they differ from the indicative quotes that may be used to provide destabilising signals to the market. Such information would allow to understand to what extent variations of CDS prices reflect effective changes in default probabilities or simply conditions of market illiquidity. The potentially destabilising effects of speculation through CDS could thus be mitigated allowing operators to gain access to important information, such as effective contract prices and trade volumes, for the price discovery process on the bond market.

5.3 What is the effect of prohibiting naked CDS?

Economic literature extensively supports the theory whereby the prohibition of short positions reduces the information content of prices⁵⁰. In the case of government bonds, however, the prohibition of naked CDS may not have a negative impact on informative efficiency, as the purchase of naked CDS is only one of the

⁵⁰ See Diamond and Verrecchia (1987).

various tools to assume a short position (short sale of securities, purchase of put options, sale of a call option or sale of futures). The prohibition of naked CDS may, therefore, have a marginal effect on the informative efficiency of government bond prices. Additionally, the evidence presented in the previous paragraph suggests that for various countries, the price discovery process takes place on the government bond market and CDS prices react with a time lag.

Some observers do, however, argue that the prohibition of naked CDS may result in the collapse of the entire CDS market⁵¹. Protection sellers would be unable to best manage the risks deriving from their positions, as they would be unable to purchase naked CDS with which to ensure adequate hedging. If protection sellers are essentially market makers, the exemption for this category of operators may solve the problem. Potential net sellers, however, who are not market makers, being unable to manage their own positions, would end up leaving the market. As a result, the prohibition may have a major negative impact on market liquidity as a whole and reduce the offer of "protection" for hedging requirements. It would thus be more difficult and expensive to buy CDS for "legitimate" hedging purposes ("covered CDS").

The prohibition would also affect proxy-hedging transactions, namely the purchase of CDS to hedge exposure on entities whose risk is closely linked to that of the sovereign issuer⁵² or to hedge the "country risk" of a portfolio of bonds of issuers of the same nationality. The prohibition may therefore have a negative effect on the private bond market, since the studies previously mentioned indicate that the possibility of hedging risk by means of CDS may increase the quantity of debt that a firm can issue and reduce its cost⁵³. The purchase of CDS that can be technically classified as naked, is often used by banks to hedge exposures towards sovereign issuers deriving from derivative transactions⁵⁴.

The prohibition of naked CDS would not alter the overall demand for "speculation" in the system, which may be offloaded onto similar strategies, such as short sales, and would thus end up having a more direct and immediate effect on government bonds prices. The prohibition may, therefore, bring about the opposite effect of accelerating the effect of speculative pressure on the bond market.

This latter conclusion crucially depends, however, on the fact that a short sale is considered as a perfect substitute for a CDS in assuming a short position. As

51 See Stulz (2010).

52 According to the International Monetary Fund, a significant portion of the purchases of naked CDSs on Greece in the first part of 2010 was due to hedging demands for exposures towards Greek banks, whose CDSs were instead non-liquid (Global Financial Stability Report, April 2010).

53 More specifically, the works discussed earlier by Hakenes and Schnabel (2009, Bolton and Oehmke (2010) and Ashcraft and Santos (2009).

54 Sovereign issuers often hedge the interest rate risk on government bonds issues through interest rate swap transactions with intermediaries. It is standard practice that such intermediaries do not ask sovereign issuers for collateral with which to hedge the counterparty risk, as instead would normally be the case with all other counterparties. The purchase of CDSs is therefore used as an instrument by which to hedge the risk deriving from such exposures in non-collateralised derivatives (see Association for Financial Markets in Europe, Sovereign CDS, December 2010).

we argued previously, it is precisely in times of great turbulence that it is difficult and costly to recourse to repos to finance bond short selling, whilst the purchase of a CDS can be more simply in operative terms, but may imply payment of high premium given to the lack of protection sellers. If for some market participants, CDS maintain an advantage compared to short sales, then the prohibition of naked CDS may effectively reduce the flow of speculative transactions, otherwise, there is no reason to expect that prohibiting naked CDS should have the desired effects.

In conclusion, the effectiveness of the prohibition appears to be rather doubtful and, moreover, it may have negative effects on the entire CDS market functioning.

Unfortunately, there are no empirical studies that can document the differential effects of the "presence" or "absence" of the CDS market for sovereign issuers, similar to those conducted for private issuers⁵⁵. In theory, even assuming that the prohibition of naked CDSs may reduce the net flow of speculative transactions, it is possible that the temporary "closure" of the CDS market may have significant effects on the cost and quantity of public securities that the market can absorb, in the same way as noted by some analyses of corporate issuers.

In theory, the presence of the CDS market should not affect the quantity of savings allocated to government bonds and, therefore, the aggregated demand for sovereign securities. However, at least two types of considerations may affect this conclusion. Firstly, the possibility of hedging credit risk may positively affect operators' decisions on the optimal level of exposure towards a given issuer and, therefore, the presence of the CDS market is not irrelevant⁵⁶; secondly, the opposite effect stressed by Che and Rajiv (2010) may occur, whereby speculation in CDS absorbs collateral and therefore reduces the demand for government bonds.

Furthermore the growth of the CDS market on sovereign issuers has been particularly intense in recent years, whilst in the past, the market was extremely limited. The latest data given in Figure 8 above show that the size of the CDS market is still small compared to that of the underlying market. If in the past, the European government bonds market had operated regularly without the CDS market (approximately until 2006), it is not clear to what extent a "return to the past" induced by the prohibition of naked CDS may alter new equilibria and operating methods with negative effect on the bond market dynamics.

From this viewpoint, some specificities of the primary government bond market may be noted, in relation to pricing methods based on the auction mechanism in which the so-called "primary dealers" participate. Primary dealers participating in the auctions cover themselves by short selling bonds and financing the transaction

⁵⁵ More specifically, the stated work of Ashcraft and Santos (2009).

⁵⁶ In general equilibrium models, derivatives are considered "irrelevant" as in a perfect market they can be replicated by combinations of underlying assets. Imperfections and transaction costs make the derivatives essential in having "complete markets". This means that the CDSs are important to market efficiency, namely to a market's capacity to express prices that result in an optimal allocation of resources.

on the repo market, rather than by buying CDS. However, the counterparty buying from the primary dealer bonds may need to cover himself by buying CDS⁵⁷. The prohibition of naked CDS may, therefore, generate illiquid CDS market conditions that could negatively affect the regular operation of public bond auctions.

Finally, it must be noted that Germany, as the only one of the 27 countries of the European Union, introduced a prohibition of naked CDSs in May 2010. The prohibition was extended to the government bonds in euros listed on German regulated markets. There is no evidence or specific studies documenting the effect of this measure on the government bonds market, although such an isolated measure leaves plenty of room for regulatory arbitrage, making the prohibition easily avoidable and therefore of little effectiveness. Hence, to be effective, the introduction of the prohibition would require a greatly coordinated action between the Union countries. To this end, the European regulation establishes that ESMA shall play a connecting role and stimulate the adoption of uniform, coordinated measures.

In view of these considerations, the prohibition of naked CDS would appear to be a risky regulatory option of doubtful effectiveness that perhaps is only feasible in very limited periods of great turbulence and in presence of a clear evidence of an accumulation of short positions through naked CDS (resulting from the information flows available through the reporting obligations to the Authority). Moreover, the decision to introduce the prohibition may have a destabilising effect, signalling to the market that there is great uncertainty with regards to the sovereign debt risk.

6 Conclusions

Starting with the financial crisis in 2007 and, even more, with the recent sovereign debt crisis, the role of credit default swap (CDS) contracts has been subject to growing attention by policy makers and regulators, because of fears that transactions of a speculative nature on the CDS market may amplify tensions on the bond markets.

CDS can be a more efficient and immediate tool to assume short positions on credit risk compared to bonds short selling. Self-regulation initiatives launched in 2009 have laid the basis for facilitating the use of CDS for speculative purposes.

The CDS market has its own, very specific characteristics. The information gathered from one of the main inter-dealer brokers on this market show that the trade frequency is extremely low and that bid-ask spreads are, on average, quite large.

⁵⁷ According to the Association for Financial Markets in Europe, cit., some institutional investors participating in the listing of government bonds, purchase naked CDS to hedge the risk of being assigned a greater quantity of securities than that desired. The prohibition may, therefore, have a negative effect on the demand for government bonds on the primary market.

The link between the CDS and the bond market is complex and differs between corporate and sovereign issuers.

Arbitrage between the two markets should ensure that CDS prices are equal to bond spreads (bond yield less risk-free rate), but starting with the 2007 financial crisis, this has rarely been the case, mainly because of friction and market imperfection and because of an increase of counterparty risk. For corporate issuers CDS prices tend to be lower than bond spreads, whilst for sovereign issuers the opposite is the rule. Differences also appears with regards to the price discovery process: for corporate issuers and for some peripheral countries of the euro area, changes in CDS prices tend to anticipate changes in bond spreads, whilst the opposite is true, in any case less evident, for sovereign issuers with high ratings and with a more developed government bond market. These differences appear to be due to the different level of liquidity of the corporate bond market compared to that of the government bond market.

Evidence on the leading role played by the CDS in the price discovery process for some peripheral countries of the euro area does not necessarily imply that the prices of government bonds can be manipulated by trading on the CDS market. In general, there is no clear evidence that speculation by CDS can destabilise government bond markets, nor that it is possible to manipulate the price of CDS in order to generate wrong informative signals on credit risk.

Regulatory responses to such concerns based on constraints or restrictions on CDS transactions appear to be of dubious effect. Additionally, they may result in a reduction of liquidity of the CDS market which may have a negative impact on the regular functioning of the government bond market. Obligations of post-trade transparency could instead mitigate the potentially destabilising effects that can be generated by CDS trading.

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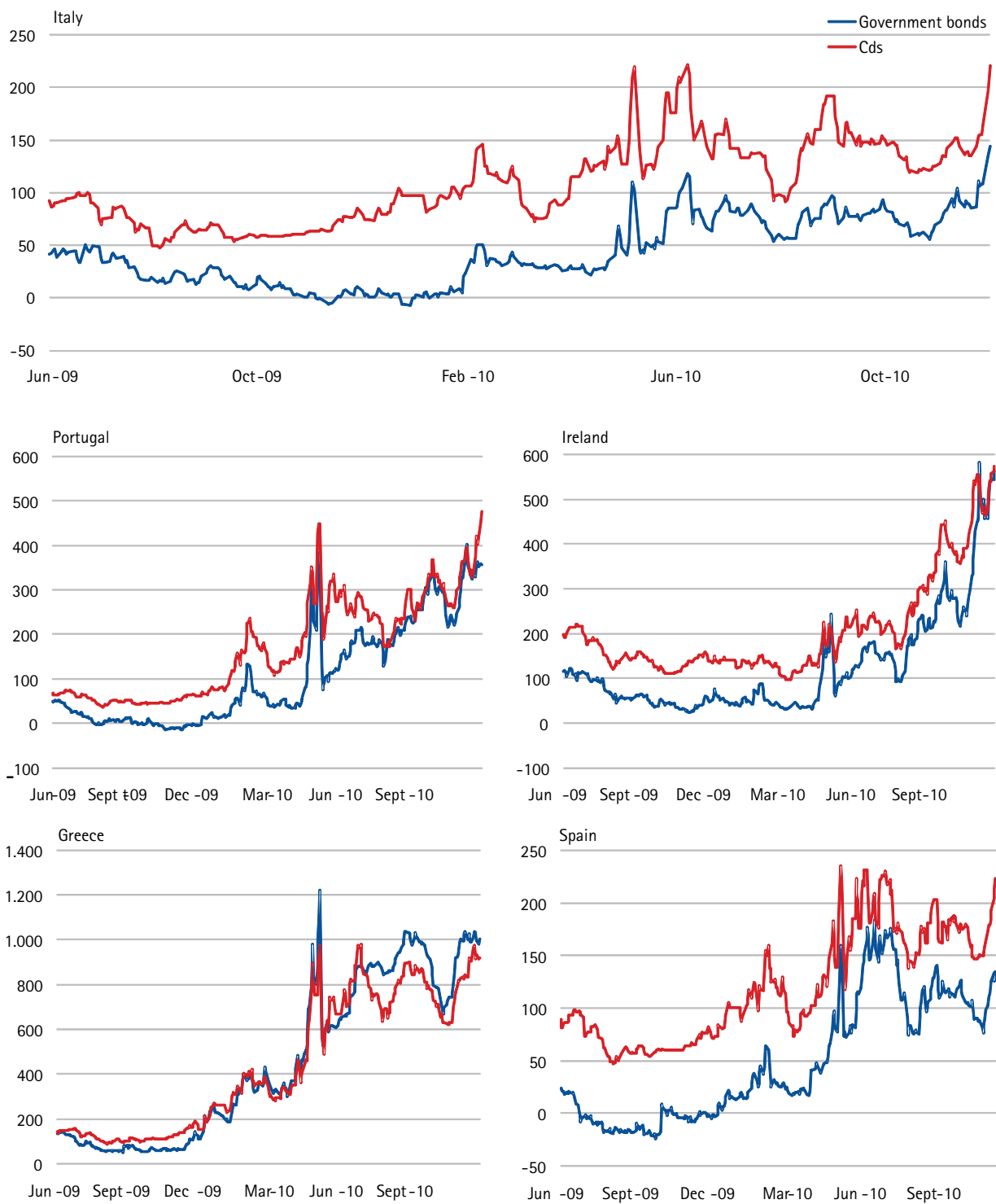
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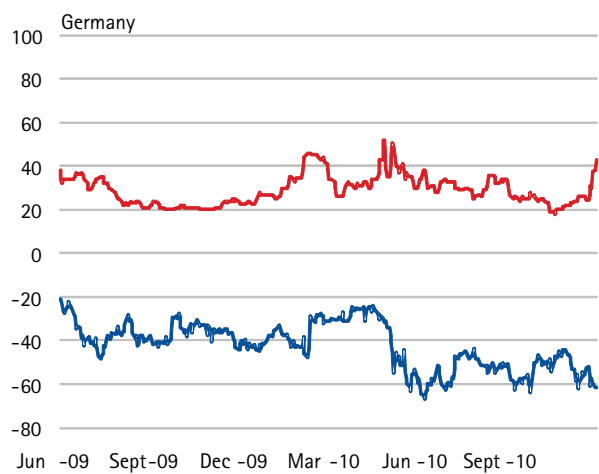
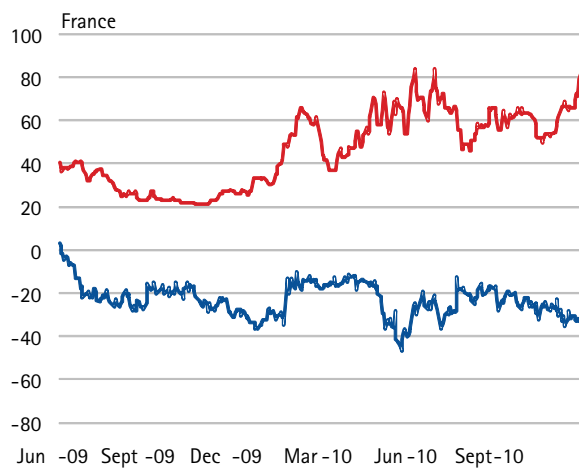
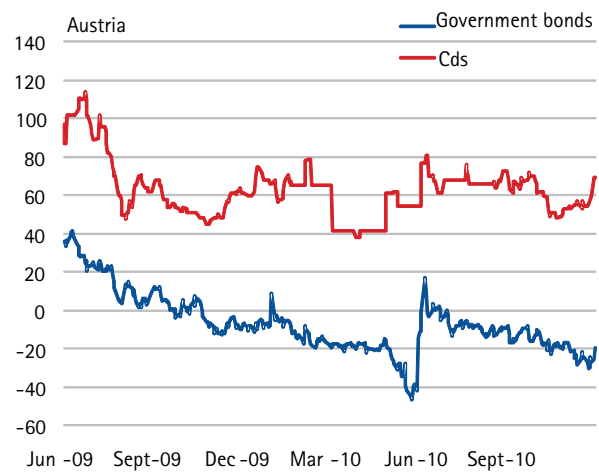
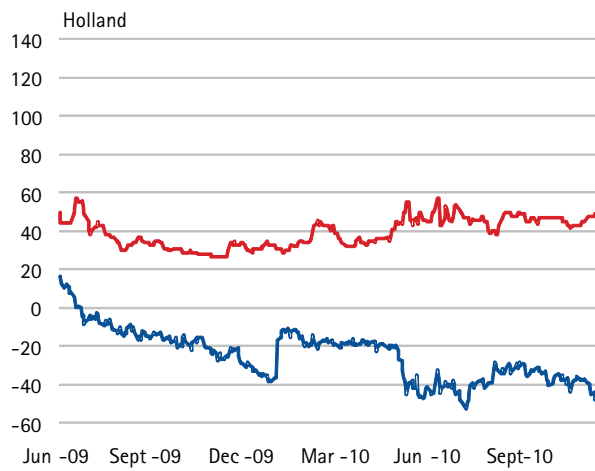
Stulz R. M. (2010), *Credit default swaps and the credit crisis*, Journal of Economic Perspectives.

Zhu H. (2006): *An empirical comparison of credit spreads between the bond market and the credit default swap market*, Journal of Financial Services Research.

Appendix

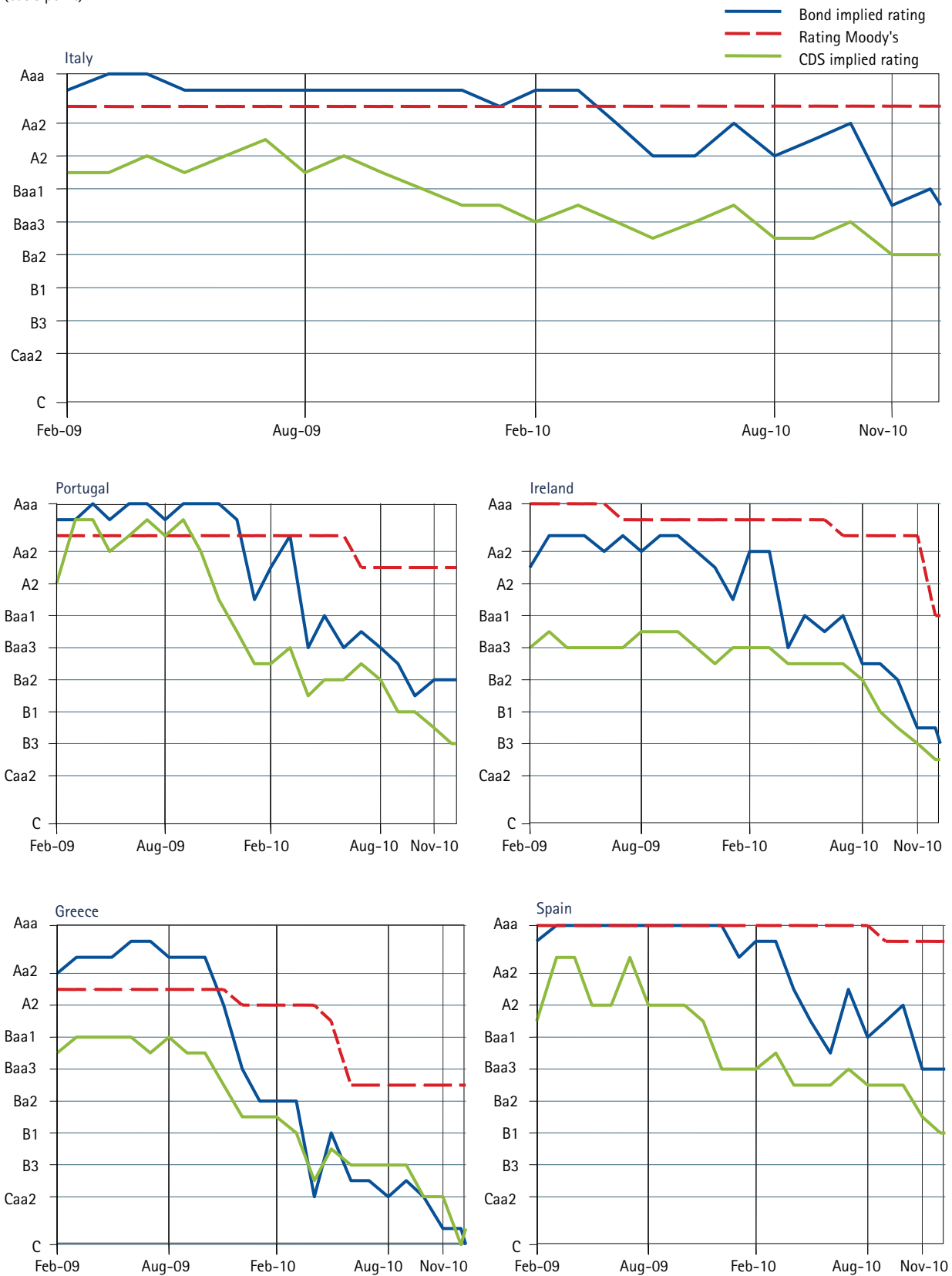
CDS listings and spread on government bonds for some European countries
(basis point)

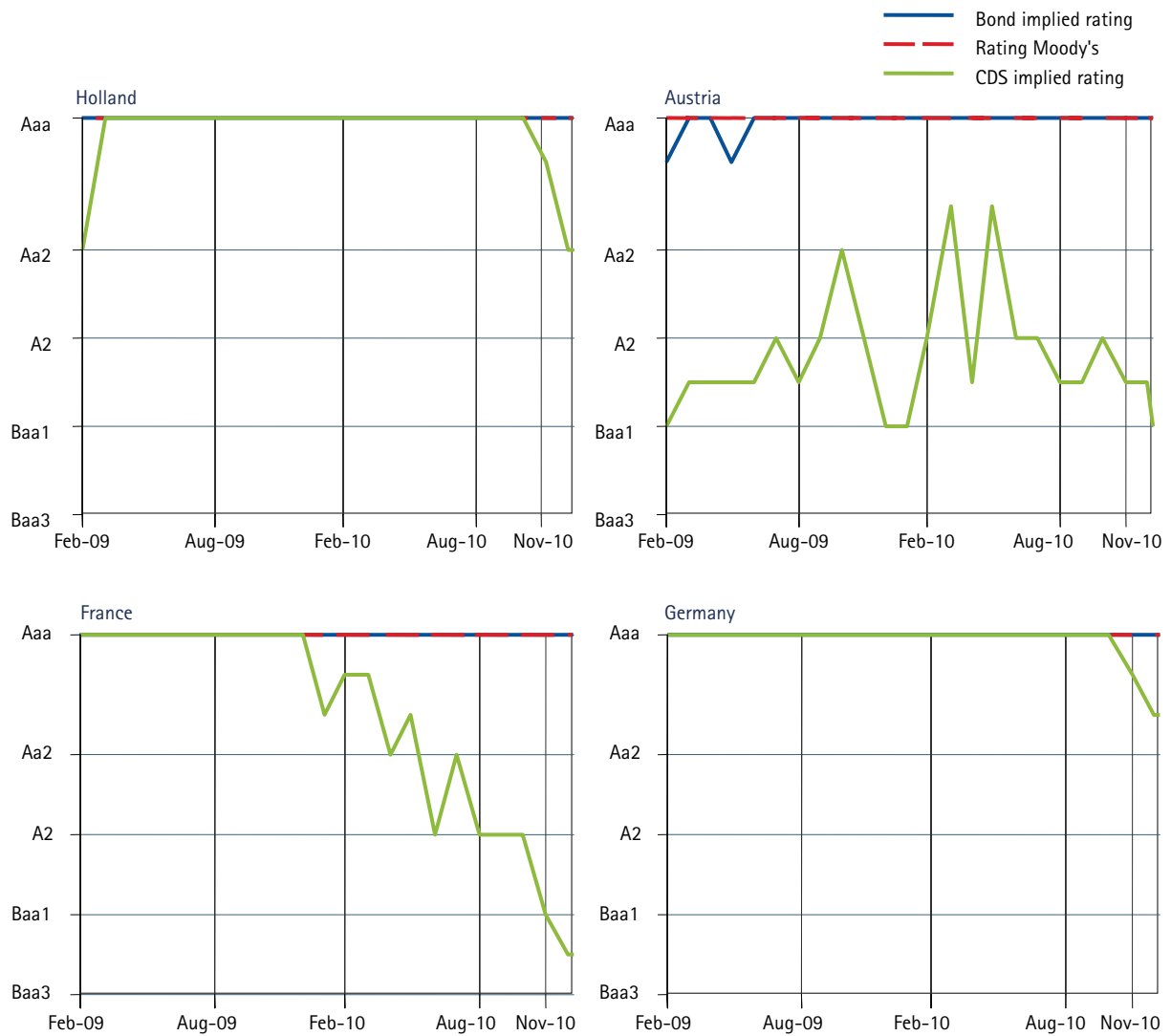




Source: calculations based on Thomson Reuters data. The spread of government bonds is the difference between return at expiry of 5-year bonds and the swap rate at 5 years.

Implicit ratings in CDSs and spreads on government bonds
(basis point)





Source: Moody's.

Estimates of parameters of the VECM/VAR model for the relationship between CDS and spread on government bonds

	Ireland	Greece	Spain	Portugal	Holland	France	Austria	Italy	Germany
Whole period (June 2009 – November 2010)									
Johansen cointegration test (trace statistic) ¹	cointegrated (**)	cointegrated (*)	cointegrated (***)	not cointegrated	cointegrated (**)	cointegrated (**)	cointegrated (**)	cointegrated (*)	cointegrated (*)
α_1^2	0.027	-0.02	-0.07*	-	-0.021**	-0.001	-0.03**	-0.03*	-0.04***
α_2^2	0.04***	0.07*	0.08***	-	-0.047**	-0.004***	0.03**	0.01	-0.01
Gonzalo–Granger	-	-	0.53	-	0.69	-	0.5	-	-
Granger causality test ³	-	-	-	9.85** and 26.59***	-	-	-	-	-
more important contributor of the price discovery process	CDS	CDS	CDS	not definable	CDS	CDS	not definable	Bond	Bond
Pre-crisis period (June 2009–February 2010)									
Johansen cointegration test (trace statistic) ¹	cointegrated (***)	not cointegrated	cointegrated (***)	cointegrated (*)	not cointegrated	cointegrated (**)	not cointegrated	not cointegrated	cointegrated (**)
α_1^2	0.017	-	-0.101***	-0.01	-	0.005	-	-	0.001
α_2^2	0.103***	-	0.051*	0.04**	-	0.026***	-	-	0.009***
Gonzalo–Granger	-	-	0.33	-	-	-	-	-	-
Granger causality test ³	-	4.30** and 15.23***	-	-	3.61 and 0.77	-	0.02 and 3.16*	4.54** and 11.52***	-
more important contributor of the price discovery process	CDS	not definable	Bond	CDS	no relationship	CDS	Bond	not definable	CDS
Post-crisis period (March 2010 – November 2010)									
Johansen cointegration test (trace statistic) ¹	cointegrated (**)	cointegrated (*)	cointegrated (***)	not cointegrated	cointegrated (***)	cointegrated (*)	cointegrated (*)	cointegrated (*)	cointegrated (*)
α_1^2	0.04	0.03	0.05	-	-0.096***	-0.03*	-0.04**	-0.09***	-0.08***
α_2^2	0.145***	0.104*	0.234***	-	-0.165***	-0.05***	0.05**	-0.04	-0.03
Gonzalo–Granger	-	-	-	-	0.63	0.62	0.56	-	-
Granger causality test ³	-	-	-	3.19* and 8.76***	-	-	-	-	-
more important contributor of the price discovery process	CDS	CDS	CDS	not definable	CDS	CDS	CDS	Bond	Bond

¹ (***), (**), (*) indicate that hypothesised presence of a co-integration relationship between variables is accepted respectively at 1%, 5% and 10%.

² (***), (**), (*) indicate that hypothesised parameter of zero is rejected at a significance level of 1%, 5% and 10% respectively.

³ (***), (**), (*) indicate that hypothesised existence of a cause-effect relationship between the variables is accepted at a significance level of 1%, 5% and 10% respectively.