Credit default swap and bond markets: which leads the other?

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We analyse the links between credit default swaps (CDSs) and bonds and try to determine which is the leader in the price discovery process. As the respective sizes of the markets are quite different for sovereigns and corporates, we consider a sample including both categories. For each entity, we compare CDS premia with spreads on a generic 5-year bond. The results show that the CDS market has a lead over the bond market for corporates. Moreover, the CDS market’s lead has been fuelled by the current crisis. This also holds for sovereigns, although not for low-yield countries.
Credit default swap (CDS) spreads have been particularly high and volatile since the onset of the current crisis. They surged dramatically for financial institutions in the immediate aftermath of the bankruptcy of Lehman Brothers; later on, the cost of protection for sovereign debt also soared across the board. On the one hand, these movements could be attributed to the normal reactions of markets. After all, defaults are expected to be more frequent during crises and this fundamental reason may have been sufficient to raise the cost of protection. On the other hand, credit derivatives markets have possibly overreacted during the crisis, paving the way for contagion phenomena. Both effects have certainly been at play and are entangled, as the deterioration of fundamentals has brought about risk aversion, over-pessimistic expectations about default rates and liquidity squeeze effects.

In these developments, the CDS market is often singled out, although the underlying debt market co-moves closely with it. In theory, CDS and bond spreads should be roughly equal. In practice, this equality does not hold for a number of reasons, due to the imperfect match between the two types of contracts, although both spreads are highly correlated. Given this close relationship between CDS and bond spreads, a key issue relates to which market has the lead on the other in the price discovery process. Is it the CDS market? In this case, the bond price would adjust to CDSs. Or is it the other way round? If so, the CDS market would simply follow the bond market. In several previous studies, the CDS market has been evidenced to have the lead on the bond market.1 In other words, innovations on the CDS market have a greater tendency to spill over to bond spreads than the other way round. However, these results need to be updated in the light of the present crisis. The remarkable expansion of new segments of the CDS market such as sovereign CDSs, which increased by 28% in 2009, may also have changed the situation.

To address these issues, we consider a sample of CDSs and bonds, including banks and sovereigns from different areas and take a look at the links between their spreads.

1| LINKS BETWEEN THE TWO MARKETS AND THEIR RELATIVE LIQUIDITY

1|1 A basic approximation

Theoretically, the CDS premium (or spread) is roughly equal to the bond spread for the same borrower and maturity. To see this, let us consider a portfolio made up of a bond and a CDS. As the CDS is meant to hedge the default risk, a long position in this portfolio is roughly equivalent to holding a risk-free asset. Therefore, the return on the portfolio, which is equal to the bond yield \( y_t \) minus the CDS premium \( c_t \), must be close to the risk-free rate \( r_t \). This equality can be written as: \( y_t - c_t \approx r_t \).

Both spreads are meant to compensate for the investor’s loss in the event of the borrower’s default. They thus depend on the same main determinants: the probability of the borrower’s default and the expected recovery rate, as well as risk aversion factors.

In reality, bond and CDS spreads are never equal for a number of reasons, such as accrued interest,2 the cheapest-to-deliver option and counterparty risk among other factors.3 Market liquidity also plays a key role in the gap between the two spreads.

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1 See for example: ECB, 2004; Norden and Weber, 2004; Blanco et al., 2005; Zhu, 2006; Baba and Inada, 2007.
2 In the event of default, CDS holders can obtain the par value of the bond but not the accrued interest.
3 For a complete description of the factors at play see Ollion-Axoxou (2004).
1 The effect of liquidity

Corporate bond markets often lack liquidity, which explains the presence of a liquidity premium in bond yields. According to different studies, CDS spreads incorporate a lower liquidity premium than bonds, especially for the 5-year maturity, which is the most traded maturity. This may result in a CDS spread that is slightly smaller than the bond spread. These liquidity effects are also decisive when determining which is the leading market. Indeed, it is the market investors are likely to turn to when they want to liquidate their positions. As expected, they will favour the more liquid market.

Several factors underpin the greater liquidity of the CDS market. First, when an investor wants to liquidate a CDS position, he does not have to sell it back on the market, he can write another contract in the opposite direction, which is of course not possible for bonds. Second, CDS contracts are not in limited supply like bonds, so they can be sold in arbitrarily large amounts. Third, the CDS market on a given borrower is not fragmented as the bond market is, being made up of all its successive issuances. Fourth, a number of investors, such as insurance companies or pension funds, purchase bonds as part of a “buy and hold” strategy, whereas CDS sellers are more active on the market.

All the factors mentioned above also apply to sovereign CDSs. However, a major difference stems from the respective size of their markets. For corporates, the CDS market has nearly outsized the bond market, as it reached USD 9.7 trillion versus USD 10.0 trillion for their long-term debt securities in September 2009. For sovereigns, the situation is radically different. The government bond market is much larger, since it has long been fuelled by large regular issuances, its amount outstanding having reached USD 36 trillion in September 2009. In comparison, the CDS market is still in its infancy, amounting to USD 1.9 trillion at the same date, in spite of a recent astonishing growth.

MATCHING CDSs WITH BOND SPREADS

To investigate the relationship between the two markets, we need a sample containing data on CDSs and bonds on the same entity that are exactly matched in terms of maturity. There are two difficulties to overcome: to have liquid CDSs, with reliable prices and without missing data; and to construct a generic bond of the same maturity, which requires a whole range of bonds available. These constraints lead us to consider only top issuers on the bond markets, namely some governments and major financial institutions.

The 5-year maturity is chosen because it is the most traded maturity for CDSs. For sovereigns, we use the 5-year benchmark bond yield. For financials, we have to construct a synthetic 5-year bond yield, by interpolating the yields of two bonds with lower and higher maturities.

Given all the constraints, we consider a sample of CDS and bond yields on 18 governments and 17 financials. For sovereigns, as the CDS market is quite recent and lacked liquidity prior to 2007, we start from 2 January 2007. For financials, we can start a little earlier, in July 2006. All data are daily and end on 18 March 2010.

The bond spread is calculated as the difference between the bond yield and a risk-free rate. We consider a 5-year risk-free rate by area, such as the German Bund for the European Union, gilts for the United Kingdom, and the US Treasury bond for other areas.

We end up with 33 pairs of CDS and bonds spreads of the same maturity. Two of these pairs are depicted by way of example in Chart 1. As expected, the developments are fairly parallel on the two markets.

4 This has been evidenced by several studies, Longstaff et al., 2005, Cossin and Lu, 2005, Crouch and Marsh, 2005, Zhu, 2006.
5 CDS figures concern gross notional amounts of single-name CDS for non-financial corporates, source: DTCC, those for long-term securities are extracted from the BIS, Quarterly Review, March 2010. Figures for sovereigns given below are extracted from the same sources.
6 5-year senior CDS premia are extracted from Bloomberg for financials and Datastream for sovereigns; bonds yields are taken from Bloomberg for sovereigns and Datastream for banks.
7 We use the same kind of method as Hall et al., 2004. The interpolation is not possible for a long period, as the maturity of bonds used in the interpolation shortens over the period.
8 The 18 sovereigns are: Austria, Belgium, Denmark, Finland, France, Netherlands, Greece, Ireland, Italy, Portugal, Spain, and Argentina, Brazil, Mexico, Lithuania, Poland, Turkey, Philippines. The 17 financials are: BBVA, Santander, Crédit Agricole, ING, San Paolo, Société Générale, Bayerische Hypo-und Vereinsbank, Deutsche Bank, Abbey, Barclays, HBOS, and Bank of America, Citibank, Goldman Sachs, JPMorgan, Morgan Stanley, Wells Fargo.
Table 1
Speed of adjustment of each market to the gap between CDS and bond spreads
(as a %)

<table>
<thead>
<tr>
<th>Market</th>
<th>Whole period</th>
<th>Crisis period</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CDSs</td>
<td>Bonds</td>
</tr>
<tr>
<td>Sovereigns</td>
<td>3.3</td>
<td>4.7</td>
</tr>
<tr>
<td>Financials</td>
<td>0.4</td>
<td>0.7</td>
</tr>
</tbody>
</table>

1 In columns 1 and 3, changes in CDS spreads are regressed on their lagged values, lagged values of changes in bond spreads, and the lagged value of the gap between CDS and bond spreads (panel-data estimate with 5 lags). In columns 2 and 4, changes in bond spreads are explained by the equivalent regression. The absolute value of the coefficient on the latter variable is reported in this table. It represents the speed of adjustment of each market to the other. A lower adjustment speed means the market is leading the other. The leading market is indicated in bold. All the reported coefficients are different from zero at a 99% confidence level, except for the one equal to 0.0.

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3|1 Adjustments to consistent levels of CDS and bond spreads

CDS and bond spreads are shown to be linked through a long-run relationship. In other words, bond and CDS spreads co-move in the long run. Consequently, every time CDS or bond spreads deviate from one another, they are likely to get closer afterwards. The next question is how the adjustment to this long-run relation works. When there is a deviation, which spread will adjust to the other? Or will both spreads move to close the gap?

To answer this question, we estimate the speed of adjustment of both CDS and bond spreads to the gap between them. If bond spreads are found to adjust more rapidly than CDSs, this would mean that the bond market tends to follow the CDS market, more than the other way round. If this is the case, the CDS market would be leading. That is exactly what the following results suggest.

3|2 Results on the whole sample

The adjustment speeds of bond and CDS spreads to the long-run relationship are reported in Table 1. Let us first take a look at the results for sovereigns over the whole period. For example, the figure of 4.7% in the second column means that the sovereign bond spread typically closes 4.7% of the gap with the CDS spread on a daily basis. For example, if the bond spread is 100 basis points (bp) higher than the CDS, it will decrease by 4.7 bp each day in order to meet the CDS level. Symmetrically, if the bond spread is smaller than the CDS by 100 bp, it will increase each day by 4.7 bp to catch up (all other things being equal).
Conversely, the speed of adjustment of sovereign CDS to bond spreads is estimated at 3.3% (first column). Hence, both markets go a bit of the way to adjusting to each other. Nevertheless, we should note that the bond spreads adjust somewhat more strongly, which suggests a slight lead of the CDS market for sovereigns.

For financial institutions, bond spreads also adjust to CDSs (with a speed of 0.7%) more than the other way round (0.4%). This hints at a leading role for the CDS market. This corroborates results obtained in previous papers on corporate markets. It is also consistent with the greater liquidity of the CDS market.

Besides these long-term adjustments, there are also strong short-term interactions between the two markets. They can be captured by causality tests, which assess whether daily changes in each market depend on the changes observed the day before on the other market. Results show that short-run interactions are mostly bi-directional. Two-way causality is found for all the considered sovereigns at a 90% confidence level, and also for 12 out of 17 financials. For the other 5 financials, CDS spreads “cause” bond spreads in 4 cases, the reverse being found in only one case.

On the whole, short-term interactions go in both directions. Adjustments to long-run levels tell another story, evidencing a lead of the CDS market on the bond market. And these long-run effects are the most important to consider, given their lasting consequences for spreads.

### The effect of the crisis and discrepancies across sovereigns

Generally speaking, the start of the crisis can be dated from July 2007 for financial institutions, whereas difficulties on public debt only materialise later, after Lehman Brothers' bankruptcy in September 2008. To see whether the crisis has affected the links between the two markets, we run the same regression again over this period.

The lead of the CDS market is somewhat strengthened, for both types of borrowers. This is evidenced by the relatively higher adjustment speed of the bond market (third and fourth columns of Table 1). For financials, it even seems that the bond market is the only one to adjust to long-term levels during the crisis. These results support the hypothesis that the CDS market leads the bond market especially in bearish times.

Another way to check this hypothesis is to split our sample of sovereigns by risk category. To do this, we construct three panels of countries of increasing risk by considering their average CDS premia. The first group comprises the countries perceived as the safest, defined by an average CDS spread below 50 bp over the whole period. Given our initial sample, it includes only six European countries (Austria, Belgium, Denmark, Finland, France, Netherlands). The second group brings together European countries with higher spreads (Greece, Ireland, Italy, Spain, Portugal). The third group is composed

### Table 2

**Speed of adjustment of each market to the gap between CDS and bond spreads, by groups of sovereigns**

<table>
<thead>
<tr>
<th>Group 1: Austria, Belgium, Denmark, Finland, France, Netherlands</th>
<th>Whole period</th>
<th>Crisis period</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CDSs</td>
<td>Bonds</td>
</tr>
<tr>
<td>Group 1: Austria, Belgium, Denmark, Finland, France, Netherlands</td>
<td>1.2</td>
<td>0.3</td>
</tr>
<tr>
<td>Group 2: Greece, Ireland, Italy, Spain, Portugal</td>
<td>0.6</td>
<td>1.9</td>
</tr>
<tr>
<td>Group 3: Argentina, Brazil, Mexico, Lithuania, Poland, Turkey, Philippines</td>
<td>3.5</td>
<td>4.9</td>
</tr>
</tbody>
</table>

1 In columns 1 and 3, changes in CDS spreads are regressed on their lagged values, lagged values of changes in bond spreads, and the lagged value of the gap between CDS and bond spreads (panel-data estimates with 5 lags). In columns 2 and 4, changes in bond spreads are explained by the equivalent regression. The absolute value of the coefficient on the latter variable is reported in this table. It represents the speed of adjustment of each market to the other. A lower adjustment speed means the market is leading the other. The figure for the leading market is indicated in bold. All of the coefficients reported are significantly different from 0 at a 99% confidence threshold, except for the 3 of them which are those smaller than 1. The 0.3 and 0.6 coefficients are significant at a 99% only, the 0.5 coefficient, at a 98% threshold only.
of emerging countries (Argentina, Brazil, Mexico, Lithuania, Poland, Turkey, Philippines). The speeds of adjustments of these categories of countries are displayed on Table 2.

In the first group of low-yield countries, the bond spread hardly adjusts to the CDS spread. This situation persists over the entire period as well as during the crisis. This is evidenced by the weak speed of adjustment of bonds, which is hardly significantly different from 0. Consequently, CDS spreads are not driving the borrowing costs of States in these low-yield countries. On the contrary, the bond market has the lead on the CDS market.

The situation is exactly the reverse in riskier areas. The CDS market is found to be ahead of the bond market. The adjustments are particularly strong in the emerging countries. These results also highlight that the CDS market’s lead has been exacerbated by the financial turmoil in Southern Europe as well as in emerging countries.

**CDS premia are expected to co-move closely with bond spreads.** We check this on a sample of pairs of CDS and bond spreads for sovereigns and financials. The results show that the CDS market has a lead on the bond market in the price discovery process for corporates as well as sovereigns taken as a whole. For corporates, this is in line with the greater liquidity of the CDS market and the results found by previous studies on this topic. Moreover, the current financial turmoil has clearly amplified this role.

For sovereigns, these results are more challenging, as the size of the CDS market is still relatively small compared with the debt market. A closer look at the data shows that the lead of the CDS market only holds for high-yield countries. It is particularly pronounced in emerging areas. However, the government bond market still leads the CDS spreads in low-yield countries.
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