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7.1 CDS and CDS Spreads

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Introduction to Credit Risk Management

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7.1 CDS and CDS Spreads

Course week(s)


#WEEK 7

Course subject(s)


#CDS AND STRESS TESTING

In this class we introduce **Credit Default Swaps (CDS)**.

A CDS is a financial instrument that works like an insurance



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entity).

Assume you own a bunch of bonds from a given company. If you want to cover yourself against the risk of default of that company, you may look for a CDS. Assume that I agree to sell you the protection you are looking for. You are the buyer, I am the seller.

For the entire duration of the swap, you will pay me a regular amount of money as a premium for the insurance against the default of your reference entity (the issuer of the bonds). If a default happens, I am obliged to buy all your bonds at their face value, so that you do not lose any money, since I take all your credit risk related to that company.

This is how a CDS heuristically works. In the video lesson, we will be more precise.

A CDS can be used to **quickly compute** the PD of a counterparty, in this case the reference entity. This computation can be very helpful for taking rapid decisions on the market, but it is not optimal, because it relies on some probabilistic assumptions about risk-neutrality and martingales.

Until the last crisis, the CDS market has experienced a strong period of expansion. CDS were very popular contracts.

At the end of the day, this was and is reasonable: thanks to a CDS, with a little price you can transfer your credit risk to someone else.

But, as you can read in the extra materials of this week (in the Sofa Session), the possibility of transferring risk has generated distortions on the markets. Many banks and financial institutions have started being too risk-affine, increasing the general riskiness of the system.

Credit Default Swaps (together with CDO) have been indicated as one of the causes of the 2007-2008 crisis.

In this lesson, we do not enter into this discussion, since we prefer to stay on the technical level, but in the extra materials you will

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TW3421x - Week 7 - Credit Default Swaps



Video



Subtitles



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Here the [script](#). And here the [slides](#).

Attention: the slides in the video contain a small typo in the formula you can see at 6:48. The result is correct. In the numerator, 0.0125 and 0.015 should be switched. The pdf slides have already been corrected.

In the video lesson, in order to compute the PD of a counterparty, namely the reference entity of the CDS, we have considered the formula

$CS \cdot (1 - R)$, where CS is the CDS spread and R is the recovery rate.

In reality that formula can be used in general (with caution!), every time we have some sort of credit spread. It is sufficient to read CS as “credit spread” and not only as “CDS spread”.

A very common credit spread is the so-called **bond yield spread**,

mathematical finance, it can be corrected by some minor factor).

Let's start from the **risk-free rate**.

The risk-free interest rate is the theoretical rate of return of an investment with no risk of financial loss. Such an investment does not exist in reality (everything is risky, because risk 0 does not exist!), but it is often assumed in mathematical finance.

In everyday business life, we can approximate the risk-free rate with the interest rate paid by (zero-coupon) bonds issued by AAA governments, whose probability of default is extremely low (but not 0!). Typical examples are the German *bund* or the three-month U.S. Treasury bill. By the way...why don't you read [this](#)?

In general, the **yield** of a bond is the implicit rate of return of the bond. It is defined as the discount rate that, if applied to all the cash flows generated by a bond, gives a bond price equal to its market price (that is their difference is 0). Market price is usually computed using the [zero term structure](#), but we skip that part. An example is the simplest way to understand this.

Imagine we have a 2-year bond with face value (also known as par value) equal to €100, which pays 5% per annum semiannually, that is a coupon of €2.5 every 6 months. The market price of the bond (what we pay today to buy the bond) is €98.97.

What is the yield of the bond?

The yield is the rate y which solves the following equation:

$$2.5\exp(-0.5y) + 2.5\exp(-1y) + 2.5\exp(-1.5y) + 102.5\exp(-2y) - 98.97 = 0$$

Notice that we discount all coupons at the right time instant (0.5 = 6 months, 1 = 1 year, and so on). Also notice that at the end of year 2 we get the coupon and also the face value of the bond, that is 102.5

Solving the previous expression is rather simple in R. We can use the function *uniroot* (type ?uniroot for more details).

We first define the object we want to solve:

```
f=function(y)
```

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$\text{uniroot}(f, \text{lower}=0, \text{upper}=1)$

What we get is more or less $y=0.0548$.

Now, assume that the risk-free rate is 3% (this is a completely fictitious and unrealistic value!).

What is the bond yield spread of our bond?

Simply $0.0548 - 0.03 = 0.0248$, or 2.48%.

This value can then be used in the formula above for estimating the PD of our counterparty. It is just another type of CS.



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