Sovereign default probabilities online -

Extracting implied default probabilities from CDS spreads

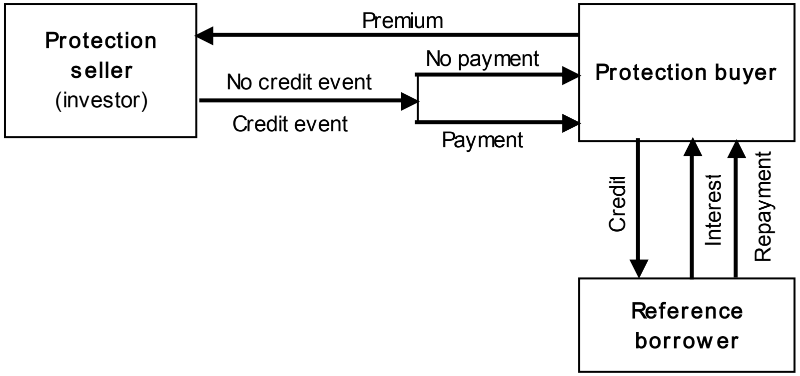
Global Risk Analysis

Deutsche Bank Research

Basics of credit default swaps

- Protection buyer (e.g. a bank) purchases insurance against the event of default (of a reference security or loan that the protection buyer holds)
- Agrees with protection seller (e.g. an investor) to pay a premium
- In the event of default, the protection seller has to compensate the protection buyer for the loss

Credit default swap



What are CDS spreads?

Definition: CDS spread = Premium paid by protection buyer to the seller

Quotation: In basis points per annum of the contract's notional amount

Payment: Quarterly

Example: A CDS spread of 339 bp for five-year Italian debt means that default insurance for a notional amount of EUR 1 m costs EUR 33,900 per annum; this premium is paid quarterly (i.e. EUR 8,475 per quarter)

Note: Concept of CDS spread (insurance premium in % of notional)

≠ Concept of yield spread (yield differential of a bond over a "risk-free" equivalent, usually US Treasury yield or German Bund yield)

How do CDS spreads relate to the probability of default? The simple case

For simplicity, consider a 1-year CDS contract and assume that the total premium is paid up front

Let S: CDS spread (premium), p: default probability, R: recovery rate

The protection buyer has the following expected payment: S

His expected pay-off is $(1-R)p$

When two parties enter a CDS trade, S is set so that the value of the swap transaction is zero, i.e.

$$S=(1-R)p$$

$$S/(1-R)=p$$

Example: If the recovery rate is 40%, a spread of 200 bp would translate into an implied probability of default of 3.3%.

How do CDS spreads relate to the probability of default? The real world case

Consider now the case where

Maturity = N years

Premium is paid in fractions d_i (for quarterly payments d_i =0.25)

Cash flows are discounted with a discount factor from the U.S. zero curve $D(t_i)$

For convenience, let

$$q=1-p$$

denote the survival probability of the reference credit with a time profile

$$q(t_i),\ i=1\ldots N$$

Assume that there is no counterparty risk

Valuation of a CDS contract in the real world case

For the protection buyer, the value of the swap transaction is equal to

Expected PV of contingent payments (in the case of default)

\- Expected PV of fixed payments

= Value for protection buyer

Computation of the fixed and variable leg

With proper discounting and some basic probability math, you get

$$PV[\text{fixed payments}] = \underbrace{\sum_{i=1}^{N} D(t_i)q(t_i)Sd_i}_{\text{Discounted premium payments if no default occurs}} + \underbrace{\sum_{i=1}^{N} D(t_i)\{q(t_{i-1}) - q(t_i)\}S\frac{d_i}{2}}_{\text{Accrued premium payments if default occurs between payments dates}} \quad (1)$$

$$PV[\text{contingent payments}] = \underbrace{(1-R)}_{\text{Compensation payment}} \sum_{i=1}^{N} D(t_i) \underbrace{\{q(t_{i-1}) - q(t_i)\}}_{\text{Prob. of default in respect. period}} \quad (2)$$

Note that the two parties enter the CDS trade if the value of the swap transaction is set to zero, i.e. (1)=(2)

Sovereign default probabilities online

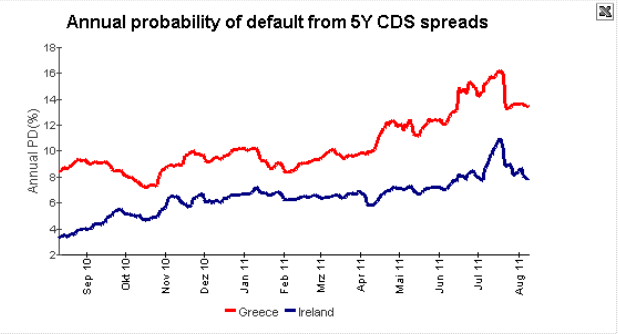
DB Research provides a web-based tool to translate CDS spreads into implied default probabilities

Access Sovereign default probabilities online

Country	CDS spread [Bp] *	Ann. PD [%] **	Date
Germany	83	1.1	09.Aug.2011
Greece	1666	13.4	09.Aug.2011
Hungary	411	4.8	09.Aug.2011
Indonesia	160	2.0	09.Aug.2011
Ireland	756	7.9	09.Aug.2011
Israel	150	1.9	09.Aug.2011

*) Source: Bloomberg **) Source: DB Research

Please select your recovery rate assumption: 25 %



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