EC372 Economics of Bond and Derivatives Markets

Credit Default Swaps

1. Credit Default Swaps: basic ideas

Just as for any OTC contract, the terms of a *Credit Default Swap*, CDS, are at the discretion of the parties to the contract. The CDSs described below are of the simplest 'plain vanilla' type, which probably describes a large majority of such swaps, especially since mid-2008 (when the onset of the credit crisis resulted in greater caution in the design of derivative securities).

The two parties, A and B, to the CDS agree to make payments to one another according to the payoffs on a credit instrument, typically a bond, issued by a *reference entity*, C – a company or sovereign state, which is not a party to the swap. The C-bonds are risky inasmuch as C might renege on some aspect of the bond indenture, e.g. fail to make coupon payments or to repay the face value (principal) at maturity. Such a failure to comply with the C-bond indenture is termed a *credit event*, i.e. 'default' of C.

The actions that comprise the CDS are as follows:

1. One party, say A – the 'buyer' (or 'long') – agrees to make regular payments (say, every three or six months) to B for a specified period, typically until the C-bond is redeemed at maturity.

2. Party B – the 'seller' (or 'short') – pays nothing to A unless or until a *credit event* occurs for the C-bond, at which time B makes a *one-off payment* to A thus terminating the CDS.

   Typically the one-off payment from B to A is the face value of the C-bond, in return for which A delivers the C-bond to B, i.e. effectively B buys the C-bond from A at its *face value*. Alternatively, the CDS may be cash-settled: B pays to A the difference between the face value and the market value of the C-bond (which may be zero) shortly after the *credit event*.

   For *binary* CDS the payment following a *credit event* is an agreed fixed sum, irrespective of the market value of the C-bond following a *credit event*.

Thus a CDS can be interpreted as an insurance contract, with A (the 'insured') paying premiums to B – the 'insurer' – against the contingency of 'default' on the C-bond. However, the CDS is stand-alone in the sense that A is not obliged to own the C-bond – A may simply use the CDS to make a bet that C-bond will default (with B betting that it will not).

Although the CDS contract will include clauses that seek to characterise the circumstances that define a relevant *credit event*, some ambiguity almost certainly remains – the CDS is an *incomplete contract*. That is, swap agreements are inevitably *incomplete*. What happens if, for example, C merely delays a contractual payment (say, a coupon) rather than defaults outright? Or perhaps C is a company that is able to restructure its liabilities, in negotiation with its creditors, to avoid bankruptcy? (The 'restructured' C-bonds will continue

to exist but with different – presumably lower – contractual payoffs.) The CDS contract may make provision for some of these contingencies but realistically could not cover every possible eventuality. Evidently there is scope for complex, prolonged and expensive litigation.

Attempts have been made to limit the scope for disagreement, for example, by development of settlement auctions to determine the value of C-bonds if a credit event occurs – this is important because the C-bonds may not be worthless after a credit event, in which case their value typically affects the amount B pays to A.[1]

CDS contracts normally state the following (at least):

(a) *underlying asset*: identification of the precise C-bond issued by the reference entity, C;

(b) *notional principal* (typically the face value of the bond), say, \$N;

(c) *spread rate*, which, when multiplied by the notional principal, defines the amount A pays to B each year;

(d) *instalment dates* (say, every three or six months) at which A pays instalments to B;

(e) *duration* of the agreement, typically until the C-bond's maturity date;

(f) *action* following a *credit event*: e.g. A delivers C-bonds with face value equal to \$N to B, in return for a payment of \$N from B to A.

As noted above, the CDS contract would also include legal clauses (perhaps standard but nonetheless complicated) that seek to describe, as far as possible, all the circumstances that constitute a *credit event*.

Example:

(a) *underlying bond*: issued by ZZZ Inc, face value \$5m, paying 8% coupon every six months until 30 June 2015, when it is redeemed at face value.

(b) *notional principal*: \$5m.

(c) *spread rate*: 120b.p. The *spread rate* is negotiated between A and B possibly with reference to a published index of average spread rates quoted in financial markets for similar bonds to that issued by ZZZ Inc.

(d) *instalment dates*: every three months, beginning 30 June 2009.

(e) *duration*: 6 years, beginning 30 June 2009 (i.e. until the bond is redeemed).

(f) *action* following a *credit event*: e.g. A delivers ZZZ-bonds with face value \$5m to B in return for which B pays \$5m to A.

[1] Among other services, the International Swaps and Derivatives Association (ISDA) organises settlement auctions on behalf of its members.

Interpretation: the CDS obliges A to pay B $\$5\text{m} \times 0.0120 = \$60,000$ per year in quarterly instalments of $\$15,000$ for six years, until June 2015. If ZZZ Inc fulfils the terms of the bond indenture (i.e. does not default), that's all that happens. If a *credit event* occurs, A delivers the bond to B, in return for $\$5$m, and the CDS terminates. Thus, B becomes the holder of the bond following a credit event – despite default, the bond may have residual value (e.g. ZZZ may resume coupon payments at a later date, or may have replaced the bonds in restructuring its liabilities).

Note that A is not obliged by the CDS to hold the bond at any stage, except at a credit event, when A may need to acquire the bond (presumably at a low price) in order to deliver to B. Indeed, the CDS may allow for *cash settlement*; i.e. the *credit event* triggers a payment from B to A equal to the notional value of the swap minus the market value (perhaps zero) of the bond immediately following the *credit event*.

2. Risks associated with CDS contacts

The most obvious 'risk' is that a *credit event* occurs. This is not a risk ***of*** the CDS but instead the risk against the occurrence of which B agrees to insure A. The risk of the CDS itself is that either A or B defaults on the CDS contract.

Default on the part of A is of little consequence: if A ceases to pay instalments, B is simply released from any obligation if a *credit event* occurs. Default by B is potentially of much greater significance: B may not have, or be able to obtain, the large sum (face value of the bond) required for payment to A in a *credit event*.

How is A to be assured of the credit-worthiness of B? This could be implicit in the reputation of B, e.g. as a large (highly capitalised?) financial institution. As the CDS is a contingent liability for B, prudential considerations suggest that B should make provision for a *credit event*. This might be achieved by setting aside funds equal to the maximum amount that B has agreed to pay in a *credit event*. Alternatively, and probably less costly in foregone interest, B could seek to hedge the CDS by acquiring an asset with a matching payoff if a *credit event* occurs – perhaps B itself could purchase a CDS from another company (just as insurance companies re-insure risks).

Yet another possibility is for the CDS to stipulate that B makes a *good faith deposit* with a third party – a stipulation that appears to have been uncommon before the crisis of summer 2008. Subsequently, moves have been made to establish third-party clearing facilities (such as exist for futures contracts) for holding good faith deposits in margin accounts on behalf of CDS sellers. As of March 2010, third-party clearing for CDSs has evolved piecemeal, offered by existing clearing houses (e.g. LCH.Clearnet) and some derivatives exchanges (e.g. Chicago Mercantile Exchange, CME, and InterContinental Exchange, ICE).[2]

Such a move, which remains under consideration in the U.S. as of February 2009, would almost certainly require the standardisation – at least to some degree – of CDS contracts.

[2]Note that the CDS contracts themselves remain bilateral agreements between A and B, not exchange-traded contracts, the development of which would require more standardization than has yet proven acceptable. Naturally, the clearer imposes conditions on parties to the CDS, including (i) restricting the institutions for which guarantees are provided and (ii) determining the margins that the parties must deposit with the clearer.

3. Valuation of credit default swaps

CDS contracts, in common with most swaps, begin life with value zero – usually achieved by setting the *spread rate* at a level that satisfies both parties, such that no initial side-payment is demanded by either party. However, as time passes, information will accumulate about the creditworthiness of C, i.e. about the probability of a *credit event*. This information will almost surely result in a non-zero value for the CDS, positive for one party, negative for the other, as assessments of the likelihood of a *credit event* change with the passage of time.

Attempts are made to calculate the value of CDS contracts by estimating the 'fair value' (i.e., hypothetical market price in the absence of arbitrage opportunities) of a bond with identical contractual provisions to the C-bond but with a probability of default considered to be realistic at any date. Such estimates are problematical, however, not least because the 'probability of default' is (it *always* is) obtained as the prediction of a model, the parameters of which are inevitably estimated with error: there is ample scope for disagreement. Even with agreement, the estimation of default probabilities is notoriously error prone – witness the events of August/September 2008.

4. Creation of synthetic Asset Backed Securities

Notice that the payoffs on a risky bond can be replicated by – i.e. are equivalent to – a portfolio comprising: (i) a *short*-CDS (i.e. sale of a CDS) and (ii) a long position in (i.e. purchase of) a risk-free bond which is contractually identical to the C-bond but with a zero probability of default (i.e. for which no *credit event* will occur).[3]

In view of this equivalence it is possible to devise a separate legal entity, B – a *Structured Investment Vehicle* (SIV) – comprising (i) a portfolio of *short*-CDSs corresponding to a range of different C-bonds, with a range of default probabilities, together with (ii) risk-free bonds. Thus it is possible to construct a *synthetic* Collateralised Debt Obligation (CDO) – a CDO that contains *none* of the the bonds that form its collateral.

Consequently a financial intermediary could – for a fee – create an SIV, designed in such a way that it is funded with the issue of several tranches of synthetic CDOs, i.e., with payoffs identical to conventional CDOs but for which the SIV has a portfolio of short positions in a portfolio of credit default swaps – instead of the risky securities underlying the swaps. Of course, the SIV should also hold the requisite number of risk-free bonds (i.e. with face value equal to the total face value of the bonds underlying the swaps). Given the complex and opaque composition of many SIVs, however, the originating financial intermediary may enhance its fee by holding not (low return) risk-free bonds but more lucrative investments. The prospect for default of such an SIV (let alone the bonds underlying its portfolio of swaps) is not hard to conceive.

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[3] If it is insisted that there can exist no completely risk-free bond, then for the purpose at hand a 'low-risk' bond (e.g. a Treasury Bond in the U.S., or gilt-edged stock in the U.K.) would serve as a benchmark.