Hedging Credit Risk

(DERIVATIVES AND STRATEGIES IN THE STRUCTURED CREDIT SPACE)

SIGMA CAPITAL ADIVISORS LLC

Credit Default Swap (CDS)

Description

A cashflow exchange between Party A (protection buyer) and B (protection seller) in which A pays B a regular payment (spread), based on an agreed notional value, in exchange for a lump sum payment promise, from B to A, IF a reference obligation (from a reference entity) defaults, before the contract expires. These contracts are now mostly traded over-the-counter through a swap execution facility (or *SEF*), their definitions are documented, standardized and governed by ISDA master agreements and can be physically settled , in which party B delivers the defaulted reference obligation, or cash settled, an amount of cash equal to equal to par minus the reference obligation (e.g. senior unsecured bond) recovery value. They are quoted on price (i.e. percentage of par value), based on a standard running coupon of 100bps for investment grade credits and 500bps for high yield ones.

Benefits

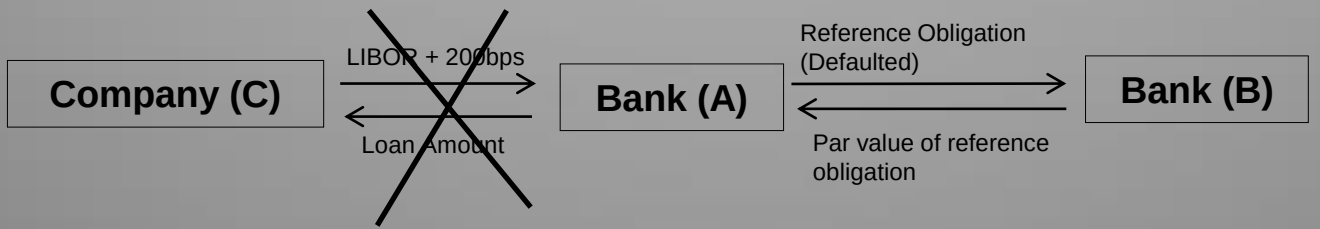
- Allows party A to invest in a particular debt instrument, obtain its coupon income, and hedge away the credit exposure of the underlying issuer (or reference obligation).
- Allows party B to short a bond, and sell credit insurance, providing a regular cash flow stream, hedging ONLY the credit risk of an issuer.
- Allows either party to speculate on the direction of the issuer credit spread, against the reference obligation yield spread in the cash market (Asset Swap Spread), against other issuers CDS spreads, or against any other obligation of the same issuer from a different part of the capital structure (e.g. stock).

Business Case

Bank A wants to invest in a particular sector or industry because it sees grow in the medium to long term. Within this sector or industry, Company C is requesting a 10 unsecured year loan for a plant expansion. Even though C has a healthy balance sheet and stable earnings, A has already too much exposure in its banking book and its credit risk management is unwilling increase its allocation. By entering into a CDS with Bank B, A is able to buy credit protection and synthetically reduce credit exposure to C.

Cash Flows

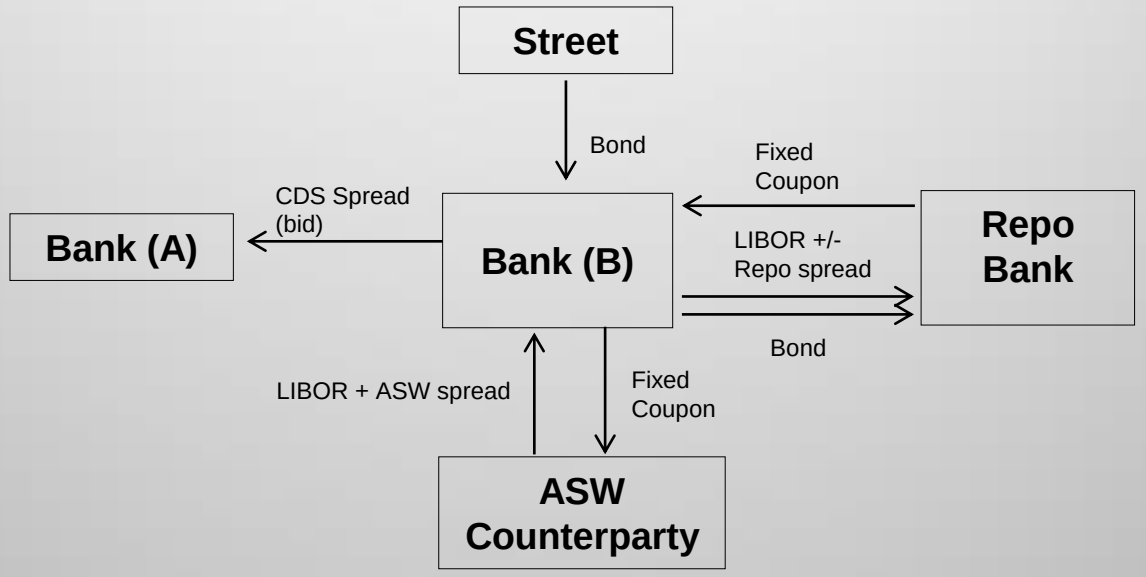
Credit Event



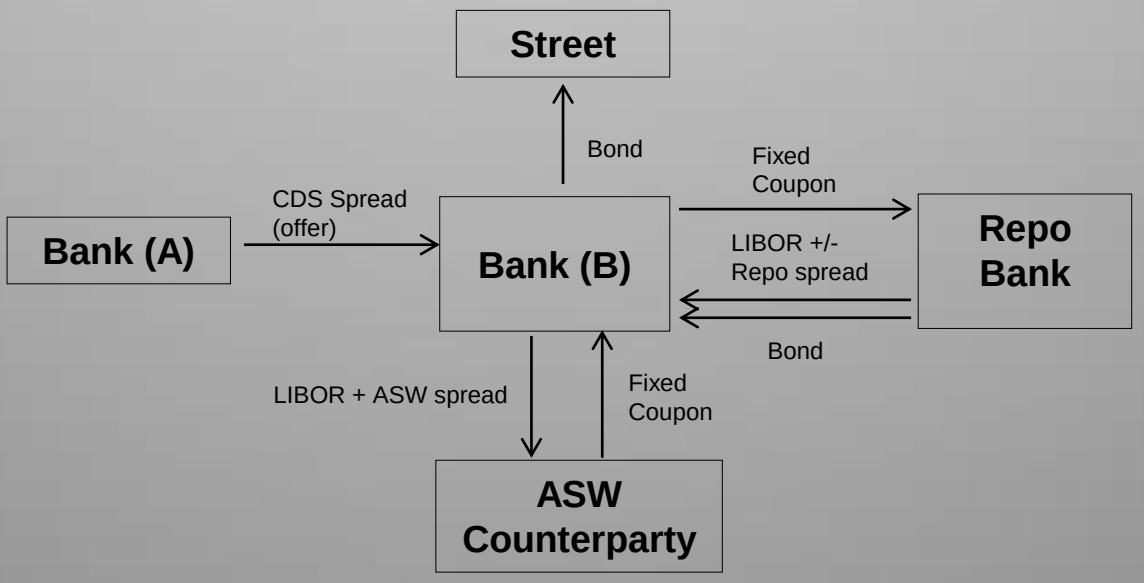
*Cash Flow (at Maturity) = Par Value – Defaulted Obligation **

** The ultimate effectiveness of the hedge in the event of default will depend on the different recovery values of the company's loans and senior unsecured obligation as well as the funding cost of the latter.*

Pricing and Valuation / No-Arbitrage



CDS Spread (bid) = Libor + ASW spread - Fixed Coupon - (Libor +/- Repo Spread) + Fixed Coupon = ASW -/+ Repo Spread

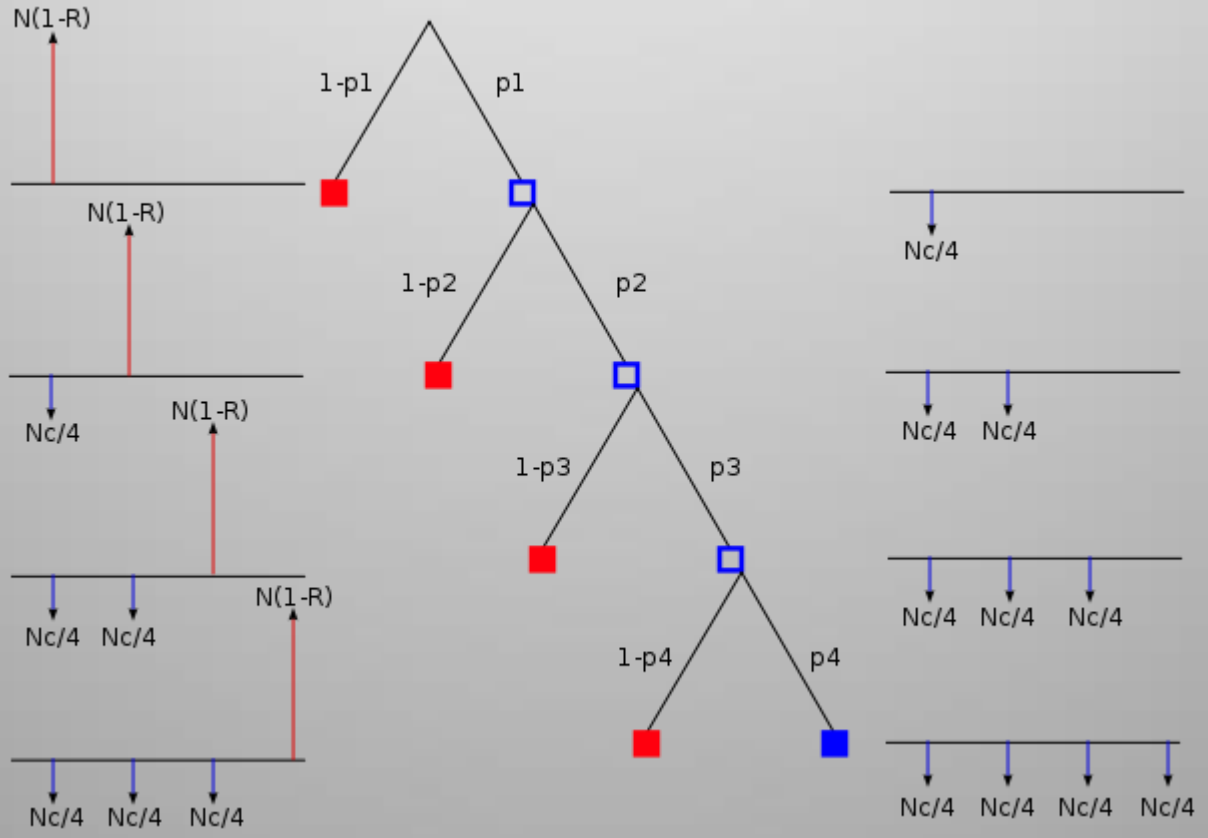


CDS Spread (offer) = -(Libor + ASW spread) + Fixed Coupon + (Libor +/- Repo Spread) –Fixed Coupon = -ASW +/- Repo Spread

Pricing and Valuation / Probabilistic

Under the probability model, a credit default swap is priced using a model that takes four inputs:

- the issue spread;
- the recovery rate (percentage of notional repaid in event of default);
- the credit curve for the reference entity;
- the discount curve (e.g. Libor).



$p = e^{-s(t)\Delta t/(1-R)}$ where *s(t)* is the credit spread zero curve at time *t* and *R* is the recovery rate. Therefore, we assume an exponentially decreasing probability of surviving.

Therefore, in order to get the PV of the default swap, we need to multiply the associated probabilities with their discount factors and loss rate (i.e. 1-R):

$$PV = (1-p_1)N(1-R)\delta_1 + p_2(1-p_1)\left[N(1-R)\delta_2 - \frac{N_C}{4}\delta_1\right] + p_1p_2(1-p_3)\left[N(1-R)\delta_3 - \frac{N_C}{4}(\delta_1+\delta_2)\right] + p_1p_2p_3(1-p_4)\left[N(1-R)\delta_4 - \frac{N_C}{4}(\delta_1+\delta_2+\delta_3)\right] - p_1p_2p_3p_4\left[\frac{N_C}{4}(\delta_1+\delta_2+\delta_3+\delta_4)\right]$$

* Source: Wikipedia

Credit Default Index Swap (CDX/iTraxx)

Description

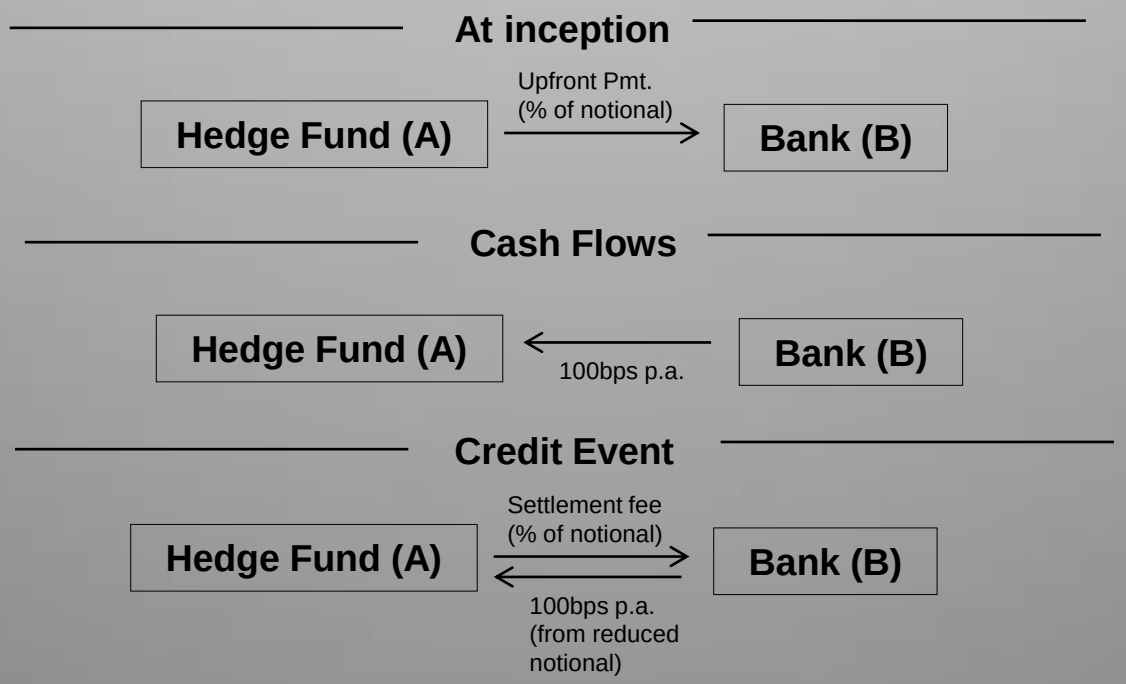
A cashflow exchange between Party A (protection buyer) and B (protection seller) in which A pays B a regular payment (spread), based on an agreed notional value, in exchange for a lump sum payment promise, from B to A, IF ANY underlying reference entities from a specified credit index (CDX or iTraxx), before the contract expires. As with single name CDS, these contracts trade OTC in SEFs, are cleared in central counterparties (CCPs), governed by ISDA and are settled in cash, an amount of cash equal to equal to par minus the reference obligation (e.g. senior unsecured bond) recovery value. The swap running coupon for investment grade (IG) credit indices is 100bps and is quoted on the theoretical/traded spread bid/offer, where to offset the difference between traded spread and running spread, and the accrual from the first coupon period, an upfront fee is paid. For high yield (HY) and emerging markets (EM), the running coupon is 500bps and is quoted on bid/offer price (i.e. percentage of notional), which is paid (or received) upfront. By convention, running coupons are paid every 20th of March, June, September and December. A new series of CDS indices is issued every six months. Investors can also hedge/speculate on a particular tranche of the CDX/iTraxx indices (e.g. 30-40)

Benefits

- Allows party A to invest in a portfolio of bonds within a credit sector (e.g. IG, HY etc), getting a total return, and hedge ONLY the credit exposure of the underlying bond portfolio credit sector (by paying coupon and realizing its price when the swap is unwound)
- Allows party B to sell credit insurance, providing a regular cash flow stream..
- Allows either party to speculate on the direction of the credit sector spreads.

Business Case

Hedge fund A wants to invest in IG credit sector because it sees spreads tightening in the medium term. Bank B, a liquidity provider in a SEF, has exposure in the IG credit sector.



*Settlement fee = Par Value/125 – Defaulted Obligation **

** The ultimate effectiveness of the hedge in the event of default will depend on whether the hedger owns the bond, any difference in recovery values, as well as the funding cost of the latter.*

Credit Default Index - Pricing and Valuation

There are two ways to calculate the theoretical value of an index based on the underlying instruments*:

- *Simple Valuation* - A simplified model using risky duration only for each credit in the index generates a decent approximation. Take each individual credit, and multiply the risky duration of the credit by the difference between the current spread of the credit and the coupon of the index. This gives the PV on each component. The fair value price of the index is 100 minus the sum of all the PV's across all constituents.
  For example, if the first credit is trading at 200 bps, with a risky duration of 3.75 years, vs. an index coupon of 150 bps, then the contribution to the index price is 3.75*50/10,000 = 0.01875. If we assume all other credits are trading at 150 bps (i.e. equal to the index coupon), then the price of the index will be 100 – 0.01875 = 99.98125.

- *Hazard Rate Model* – this model will generate a more accurate value, as it allows for curvature in the credit spread curve.

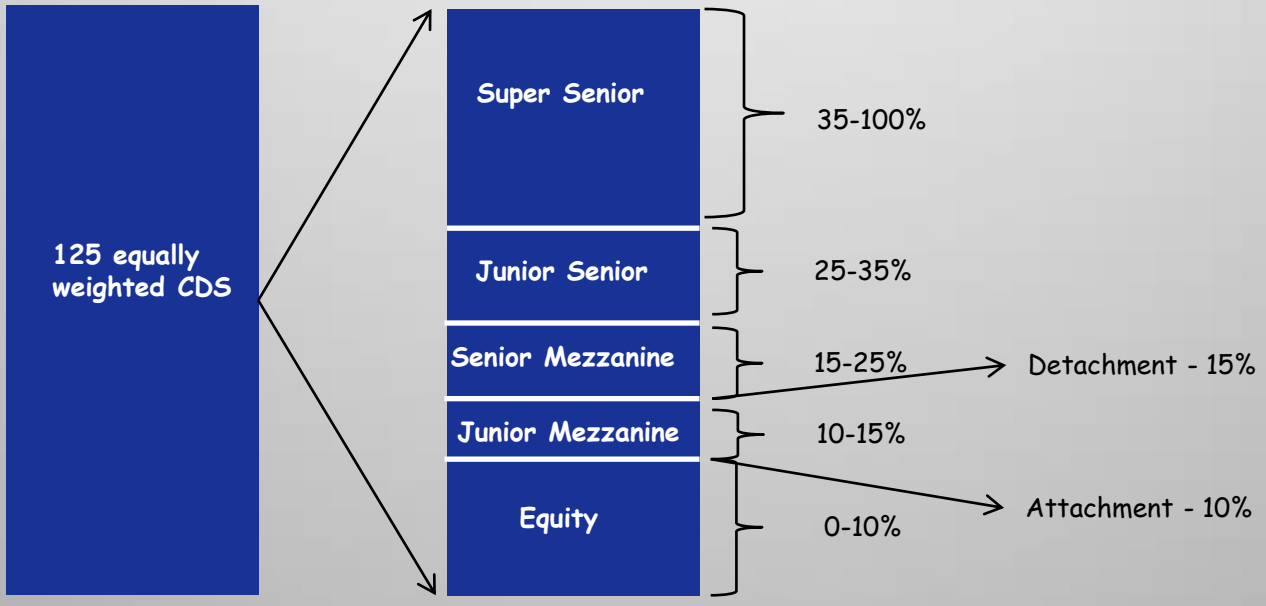
For small differences in fixed and current coupon the two valuation methods will have similar results. The hazard rate model will, on the other hand, give better results for large movements in the spread.

The index will trade away from the intrinsic value, as it is a tradable index, and market supply and demand ultimately dictates where the index trades. However the intrinsic value provides a benchmark. The traded and intrinsic values are both available in Markit's end-of-day data services.

* Source: Wikipedia

Credit Default Index Tranche Swap (CDX/iTraxx)

Some credit default indices allow you to get exposure to a particular tranche of the sector credit structure. In this case, we could think of the index as group of single name CDSs, where an attachment and detachment level within the structure defines where a credit loss starts and ends for an investor. For example, as the example below shows:



Benefits

- Allows investors to speculate on the cheapness or richness of the credit curve of a particular sector.
- Commercial or investment banks, Insurance and pension funds can hedge their credit exposure to a particular part of the credit structure they might have in bonds or loans extended.

For example, a bank wants to hedge out his junior mezzanine loan exposure in a particular Investment Grade rated borrower. It can purchase a $10 million protection on a 5 year CDX.NA.IG.10-15% tranche quoted at 45@100bps. Therefore, the bank would receive an upfront payment (e.g. $2.2 million), and pay 100bps per annum on a quarterly basis.
If enough credits default before the attachment point (i.e. 10%) of the notional of the index, the protection seller starts paying the bank (protection buyer) the following sum for every credit between the 10% and the 15% of the notional:

Default Credit Event
Settlement Amount = (Notional x LGD x Weighting) / Tranche size = $560,000, *where:*
Notional = $10 million
LGD = Loss Given Default = (100 – RV) = 35%, given an RV = Recovery Value = 65%
Weighting = 1/125
Tranche size = 5%

And the running coupon would be adjusted to:

Coupon = Running Coupon * (number of defaulted credits after attachment and before detachment / 125)

Also, assuming all prior credits before the attachment had LGDs of 35%, the this investor's tranche would be modified as:

$DP_1 = DP_0 \times (125-(1+(Attachment\ Point/0.35))) = 15.72\%$
$AP_0 – DP_1 = 10-15.72\%$

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Sources: Wikipedia.org and Markit.com

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