Credit Derivatives

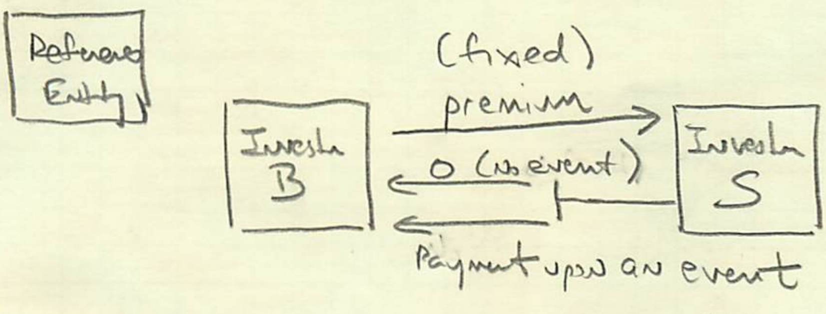
- A financial contract that allows one to take or reduce credit exposure, generally on bonds or loans of a sovereign or corporate entity.
- Contract is between two parties, and is not necessarily involve the bond or loan issuer or issuee.

Uses of Credit Derivatives

1) Express a positive or negative credit view on
   a) a single entity
   b) a portfolio of entities
2) Reduce risk arising from ownership of bonds or loans

The Credit Default Swap

A CDS is an agreement between two parties to exchange the credit risk of the issuer (reference entity)



Buyer: buys default protection
buys CDS
pays periodic payments
"short risk"

Seller: sells default protection
sells CDS
receives periodic payments
"long risk"

1) Periodic fee : Notional × credit spread

2) Notional = Dollar amount of risk being exchanged.

3) Credit spread = Market price of the CDS quoted in (bps) paid annually

IG 10-20 MM
HY 2-5 MM

Periodic fee is usually paid:

a) 20th of March
b) 20th of June
c) 20th of September
d) 20th of December

4) Tenor or Maturity

6M, 1y, 2yr, 3yr, 4yr, 5yr, 7yr, 10yr

Credit Events:

1) Bankruptcy
2) Failure to pay
3) Restructuring
   - MR Instruments eligible is restricted
   - MMR slightly larger range of deliverables than MR

Typically,

US IG MR

European MMR

US HY only bankruptcy and failure to pay

Following a credit event,

Physical Settlement
a) seller receives defaulted bonds (pari passu) from the buyer (cheapest to deliver) (Recovery rate)
b) buyer receives notional amount
c) seller will also recieve any accrued spread since the last payment

Also cash settlement,

Buyer and Seller can agree to settle on the cash price of the defaulted bond. Note that the recovery rate is determined after the credit event.

Monetizing CDS contracts

Market perceives credit risk ↑ S_{CDS} ↑ widens
↓ S_{CDS} ↓ tightens

Investor B buys protection ("short risk")
- 5 years at 50 bp

Say after 1 year, S_{CDS} widens to 75 bps

Two ways to monetize the unrealized profits:

a) enter into an opposite
sell protection at 75 bp for 4 years
Risk exists that a default event occurs, and the 25 bp/year income stops

b) unwind the trade
buyer and seller determine the net of the future cash flows discounted by the risk free and Prob. that the event does not occur.

Valuation Theory and credit curves

Thought of as a Scenario Analysis:

Scenario 1 : Credit Survives
Scenario 2 : Credit Defaults

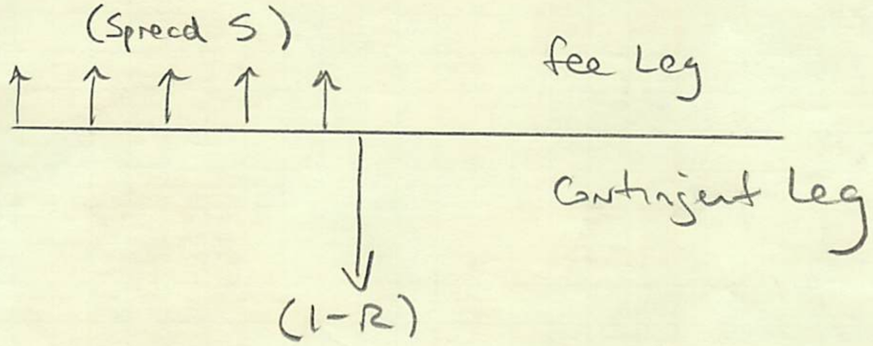
Protection Seller: (Fee Leg)

- Hopes that the credit survives
- Discounts the expected payments by the probability of survival

Protection Buyer: (Contingent Leg)

- Hopes that the credit defaults
- Discounts the expected contingent payment (Notional - recovery rate) by the probability of default.

At the inception of the CDS contract, the CDS value should be zero.



PV(Fee Leg) = PV(Contingent Leg)

therefore,

$$S_n \sum_{i=1}^{n} \Delta_i P_{S_i} DF_i + \text{Accrual on Default} = (1-R) \sum_{i=1}^{n} \left(P_{S(i-1)} - P_{S_i} \right) DF_i$$

where S_n = spread for protection to period n

Δ_i = length of time period i in years

P_{S_i} = probability of survival to time i

DF_i = risk-free discount factor to time i

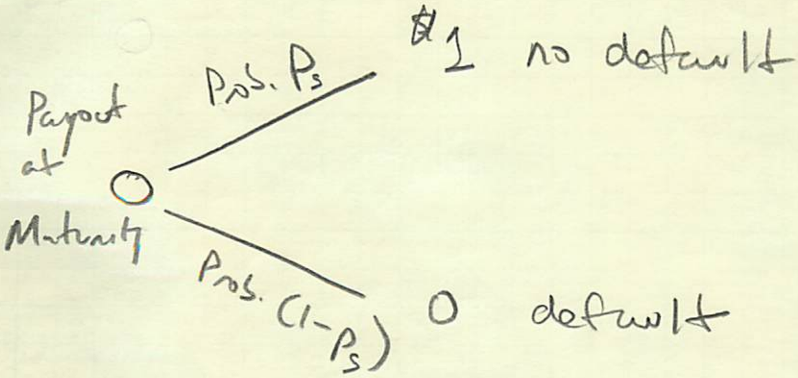
R = recovery rate on default

<u>Zero Coupon Bonds</u>

$$Z(t,T) = 1 \cdot e^{-r(t,T)(T-t)}$$

where $Z(t,T)$ = time t price of a <u>risk-less</u> zero coupon bond that pays out \$1 at future time T.

For a risky bond,



$$E\left[Z_0^d(T,T) \right] = P_s(t,T) \cdot 1 + \left(1 - P_s(t,T)\right) \cdot 0$$
$$= P_s(t,T)$$

As a result, one may want to discount as follows:

$$Z_0^d(t,T) = Z(t,T)\,\tilde{E}_t\left[Z_0^d(T,T)\right]$$

$$\text{Prob}_t\left[\text{default between } T_{i-1} \text{ and } T_i\right]$$
$$= P_s(t,T_{i-1}) - P_s(t,T_i) = \text{Prob Default}\,(T_{i-1}, T_i) \mid \text{No default at } T_{i-1}$$

Between T_{i-1} to T_i, there is a contingent claim,

$$Z(t,T_i)\left[P_s(t,T_{i-1}) - P_s(t,T_i)\right](RR)$$

then,

$$Z^{rec}(t) = \sum_{i=1}^{n} Z(t,T_i)\left[P_s(t,T_{i-1}) - P_s(t,T_i)\right] RR$$