Credit Value Adjustment (CVA) Introduction

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Summary

- CVA History
- CVA Definition
- Risk Free Valuation
- Risky Valuation

CVA History

- Current market practice
  - Discounting using the LIBOR or risk-free curves
  - Using risk-free value for pricing, hedging, P&L
- Real counterparty reality
  - Having different credit qualities from LIBOR
  - Having risk of default
- ISA 39 (International Accounting Standard)
  - Requiring CVA in 2000 (mandatory)
  - Finance and Accounting owning CVA
  - Receiving a little attention in the beginning
  - Becoming significant risk after financial crises

CVA Definition

- Definition

  CVA = Risk free value – True (risky) value

- Benefits
  - Quantifying counterparty risk as a single P&L number
  - Dynamically managing, pricing, and hedging counterparty risk
- Notes
  - CVA is a topic of valuation and requires accurate pricing and risk-neutral measure
  - Risk-free valuation is what we use every day. Risky valuation is less explored and less transparent

Risk-Free Valuation

- The risk-free valuation is what brokers quote or what trading systems or models normally report.
- A simple example to illustrate
  - A zero coupon bond paying X at T
- The risk-free value

$$V^F(0) = X\exp(-rT) = D(T)X$$

where r is risk-free interest rate and

$D(T) = \exp(-rT)$ is risk-free discount factor

Risky Valuation

- Default Modeling
  - Structural models
    - Studying default based on capital structure of a firm
  - Reduced form models
    - Characterizing default as a jump (Poisson) process
  - Market practitioners prefer the reduced form models due to
    - Mathematical tractability
    - Consistency with market observations as risk-neutral default probabilities can be backed out from bond prices and CDS spreads

CVA Introduction

Risky Valuation (Continuously Defaultable)

- The same simple example: a zero coupon bond paying X at T
- The risk value

$$V^R(0) = X\exp[-(r+s)T) = D^*(0,T)X$$

where

r is risk-free interest rate and s is credit spread

$D^*(T) = \exp[-(r+s)T)$ is risk adjusted discounting factor

- CVA by defintion

$$CVA(0) = V^F(0) - V^R(0) = \left(D(T) - D^*(0,T)\right)X$$

Risky Valuation (Discrete Defaultable)

- Assumption
  - default may happen only at the payment date
  - At time T, the bond either survives with payoff X or defaults with payoff φX where φ is the recovery rate
- Risk value

$$V^R(0) = D(T)(pX + q\varphi X) = D(T)[1 - q(1-\varphi)]X$$

where p is default probability and $q=1-p$ is the survival probability

- CVA

$$CVA = V^F(0) - V^R(0) = q(1-\varphi)X$$

Thanks!

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http://www.finpricing.com/paperList.html