FinPricing®

Credit Value Adjustment (CVA) Introduction

CVA Introduction

Credit value adjustment (CVA) is the market price of counterparty credit risk that has become a central part of counterparty credit risk management. By definition, CVA is the difference between the risk-free portfolio value and the true/risky portfolio value. In practice, CVA should be computed at portfolio level. That means calculation should take Master agreement and CSA agreement into account.

CVA not only allows institutions to quantify counterparty risk as a single measurable P&L number, but also offers an opportunity for banks to dynamically manage, price, and hedge counterparty risk. The benefits of CVA are widely acknowledged. Many banks have set up internal credit risk trading desks to manage counterparty risk on derivatives.

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 $\boldsymbol{\varphi X}$ 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!

You can find more details at
https://finpricing.com/lib/EqRainbow.html