Collateral Management and Counterparty Credit Risk

Summary

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Collateral

Collateral Definition

- Collateral is a property or an asset that a borrower offers as a way for a lender to secure the loan.
- Collateral arrangement is a risk reduction tool that mitigates risk by improving recorvery and reducing credit exposure.
- Collateral doesn’t turn a bad counterparty into a good one and doesn’t eliminate credit risk. Instead, it just reduces the loss at the default time.
- Collateral management is an essential element in the plumbing of the financial system.
- Collateral assets: mainly cash; also equities, bonds, MBS, debt instruments.

Special Treatments in the Derivatives Market

- The Bankruptcy code generally prevents creditors from seizing assets of a firm in bankruptcy. This provision is called the “automatic stay”.
- The code affords a special treatment to financial derivative contracts, which exempts these contracts from the “automatic stay”.
- The special treatment is also called a safe harbor.
- The safe harbor allows counterparties to terminate derivative contracts with a debtor in bankruptcy and seize the underlying collaterals.

Benefits of Collateral Posting

- Reduce credit risk.
- Free credit lines with existing counterparties.
- Increase business with counterparties.
- Expand the range of counterparties.
- Equalize the disparity in counterparty creditworthiness.

Collateral Arrangement Forms

- There are two types of collateral arrangement: pledge and title transfer.
- Pledge
  - The giver posts collateral to the taker.
  - The giver still owns the collateral.
  - If the giver defaults, the taker can take the cash or sell the securities.
  - It is widely used in US.
- Title Transfer
  - The taker owns the collateral.
  - The giver is only entitled to the return of fungible securities and/or repayment of cash.
  - It is widely used in the stock-lending and repo market.

Collateral

Credit Support Annex (CSA)

- CSA (or Margin Agreement or Collateral Agreement) is a legal document that regulates collateral posting.
- It specifies a variety of terms related to collateral posting.
  - Threshold (TH) defines the amount below which no collateral is posted.
  - Minimum transfer amount (MTA) is the minimum amount that can be transferred for any margin call.
  - Independent amount (or initial margin or haircut) is the amount of collateral required to open a position.
- Collateral posting rules
  - If Value > TH + MTA, collateral is called and collateral = Value-TH-MTA
  - If Value $\leq$ TH + MTA, no collateral is called.

Valuation under Collateral Arrangement

- A simple example: a financial contract pays X at maturity T.
- Valuation without collateral arrangement
  - At time T, the contract either defaults or survives.
  - The default probability is p and the survival probability is q where $q = 1-p$.
  - The survival payoff is X and the default value is φX where φ is the recovery rate.
  - The present value of the contract is the discounted expectation of all the possible payoffs, i.e.,

$$V(t) = (p\varphi X + qX)D(t)$$

where $D(t)$ is the discount factor.

Valuation under Collateral Arrangement (Cont)

- Valuation with collateral arrangement
  - At time T, the contract either defaults or survives.
  - If the party survives, the survival payoff is X and the taker returns the collateral to the giver. In this case, collateral has no effect at all.
  - If the party defaults, the default payment is the collateral C.
  - The present value of the contract is the discounted expectation of all the possible payoffs and given by

$$V_c(t) = (pC + qX)D(t)$$

  - Normally $C > p\varphi$, thus $V_c(t) > V(t)$.
  - Conclusions:
    - Collateral affects default payoff only.
    - Collateral improves recovery.
    - Collateral increases value.

Credit Exposure under Collateral Arrangement

- Settlement period (call period) is the time period from the time of the collateral called to the time of the collateral exchanged.
- Liquidation period (cure period) is the time period from the most recent exchange of collateral until the defaulting counterparty is closed out.
- Margin period of risk = settlement period + liquidation period.
- Let $MTM_t = \max(\sum_i MTM_t^i, 0)$ be the portfolio value at time t where MTM_t^i is the value of i-th trade at time t.

Credit Exposure under Collateral Arrangement (Cont)

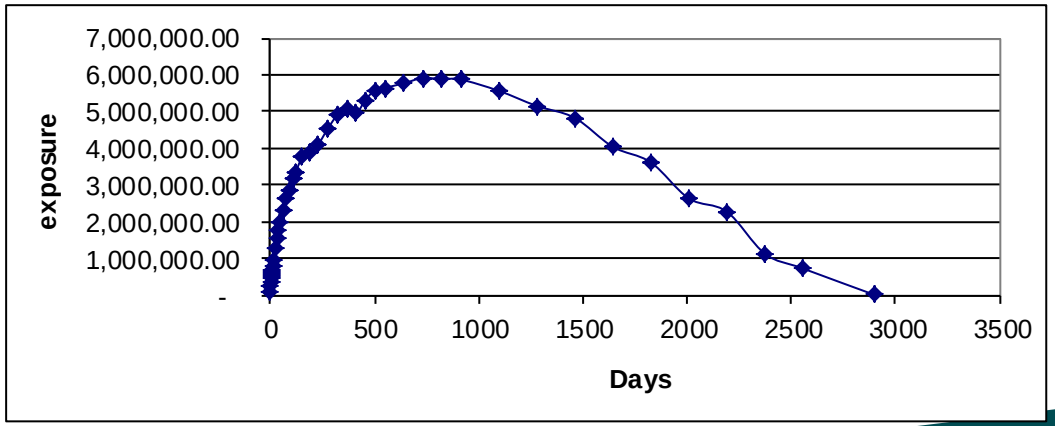
- If we assume that the collateral asset is cash only, the credit exposure is given by

$$E_c(t) = \begin{cases} MTM_t & if\ MTM_t \leq TH + MTA \\ TH + MTA & if\ MTM_t > TH + MTA \end{cases}$$

- If the collateral is non cash, then $MTM_t = \max(\sum_i MTM_t^i, 0) + MTM_t^C$ where MTM_t^C is the value of the collateral asset. In other words, we need to simulate the value change of the collateral asset during the margin period of risk.

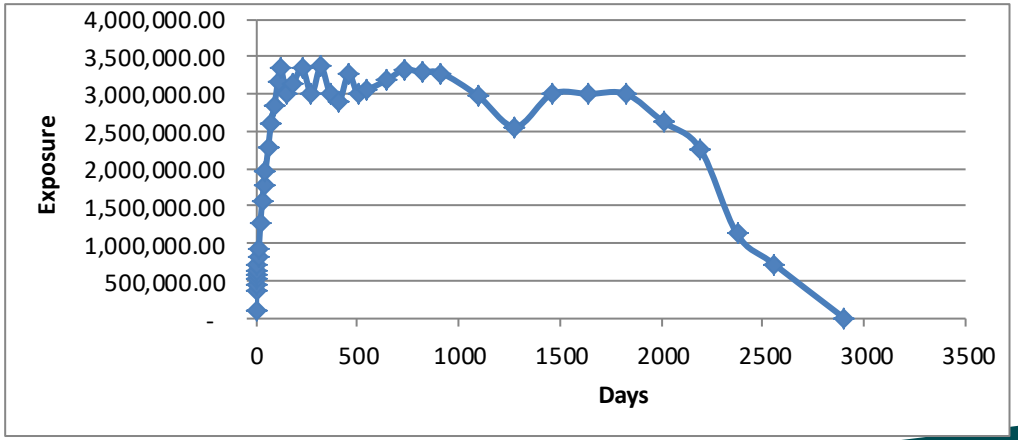
Credit Exposure under Collateral Arrangement (Cont)

- The credit exposure of an uncollateralized interest rate swap is shown below



Credit Exposure under Collateral Arrangement (Cont)

- The credit exposure of a collateralized interest rate swap is shown below



Thanks!

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