Counterparty Credit Risk

Financial Risk is broken down into different types.

Evolution over the last few decades driven by infamous financial disasters:

1) Barings (1995)
2) Long-Term Capital Management (1998)
3) Enron (2001)
4) Worldcom (2002)
5) Parmalat (2003)
6) Lehman Brothers (2008)

Different types:

- Market Risk: short term movement of market prices.
  - Linear
    - Equities
    - interest rates
    - Foreign Exchange Rates
    - Commodity prices
    - Credit Spreads
  - NonLinear
    - Exposure to market volatility in a hedged position
    - Derivatives
    - Leverage

Basel I (1995) was based on using proprietary mathematical models to compute capital requirements to mitigate market risk.

Market risk can be mitigated by taking an offsetting position. However, unless this is done with the same counterparty as the original position, a counterparty risk will be generated with two counterparties.

- Credit Risk : Debtor may be unable or unwilling to make a payment or fulfill contractual obligation.

  Technically this is called "default", although sometimes this depends on the jurisdiction.

  Default probability must be characterised fully throughout the exposure of a position.

  - Bond Exposure until Bond maturity
  - Recovery value (or equivalently loss given default)

  o Credit deterioration (ratings downgrade)
    - could lead to mark-to-market losses due to increase in probability of default.

  o Term structure of Probability Default
    - key aspect

- Liquidity Risk : Two Forms

  o Asset Liquidity - risk that a transaction cannot be executed at market prices due to

    - Size of the position
    - Illiquidity of the underlying

  o Funding Liquidity - risk of the inability to fund contractual payments or collateral requirements, forcing

    - early liquidation of assets
    - losses

  Can manifest itself into a "death spiral" because of negative feedback between losses and cash requirements.

  Can be mitigated by:

  - collateralisation
  - central clearing

- Operational Risk : arise from
  - people
  - systems
  - internal and external events

  - Human Error : trade entry error
  - Failed Systems or Processes : settlement of trades or posting of collateral
  - Model Risk : inaccurate or badly calibrated models
  - Fraud : rogue traders
  - Legal Risk : inability to enforce legal agreements such as those covering netting or collateral terms

  In general, operational risk is difficult to quantify.

- Integration of Risk Types : Lack of focus. Crises tend to involve a combination of different financial risks.

  Counterparty Credit Risk is a combination of market and credit risk.

  However to mitigate, may introduce operational and liquidity risk.

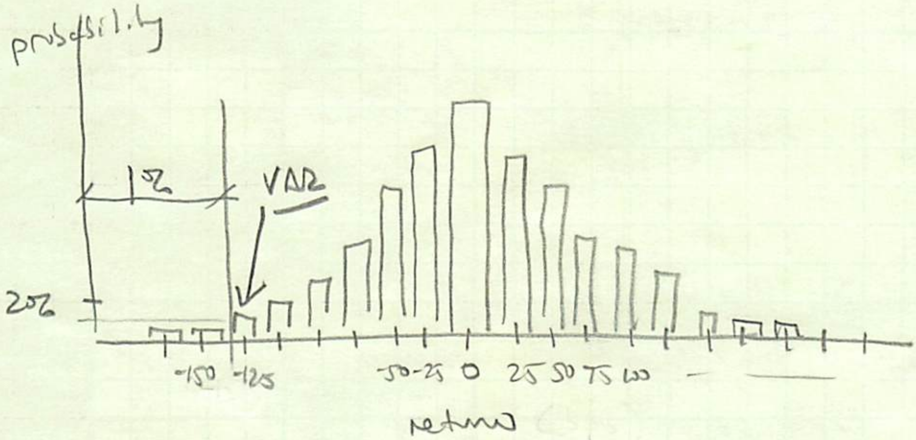
  Note: CCR is the intersection of many financial risks.

Value-at-Risk (VAR)

Initially designed as a metric for market risk.

Used across many financial areas as a means of efficiently summarizing risk via a single quantity.

VAR at the α% confidence level gives a value that will be exceeded with no more than a $(1-\alpha)$% probability.

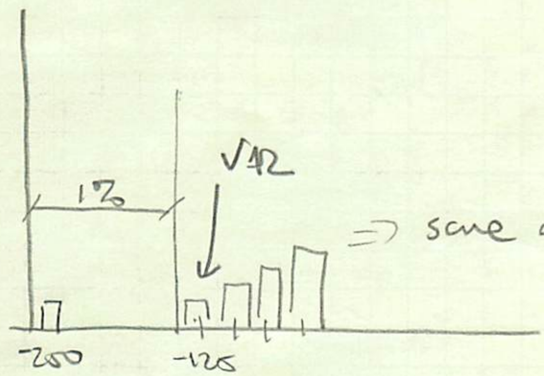


For a continuous distribution, VAR is simply a quantile.

VAR may be used to set regulatory capital requirements.

Capital Requirement = Largest of the {previous day's VAR or average of the last 60 day VAR} times a supervisory factor {usually 3}

Dangers of VAR



⇒ same as before

Reliance on VAR can be counterproductive as it may lead to false confidence.

Many believe that expected shortfall should replace VAR.

VAR - Love/Hate Relationship

- Good times: a great, simple number that everyone can relate to.
- Bad times: realization that VAR and mathematical models are only simple approximations of reality

Risks of Derivatives ("Financial Weapons of Mass Destruction")

- Regulatory Arbitrage - reducing regulatory capital a bank has to keep without reducing its exposures
- Changing the tax or accounting treatment of an asset/position
- OTC derivatives are designed by a dealer to appear more attractive than it is
- Derivative instruments use leverage, i.e. small upfront costs to control large notional amounts

For instance, in the US interest rate market

1) Buy US Treasury Bonds (a cash product)
2) Enter a receiver interest rate swap to effectively have the same exposure to interest rates. (no upfront fee)

Items to consider:

- size of the trade
- effective leverage
- trade counterparty
- regulator

Systemic Risk: Potential failure of one institution that triggers a chain reaction on other institutions.

Threatens the stability of the entire financial market.

Can be caused by perception as well (Flight to Quality) stability of derivative market - OTC derivatives have evolved into a market dominated by a relatively small number of financial intermediaries (dealers)

dealers are counterparties to large number of trading partners

Most people perceived this as "too big to fail"
Not true

- AIG
- Bear Stearns
- Dexia
- Royal Bank of Scotland

all received bailouts

No more "few large institutions" but rather a market with smaller institutions that can and some will fail.

Regulators have begun assigning some entities as SIFI (systemically important financial institution) which is less crude way of saying "too large to fail"

Key reaction has been the development of CCP (Central Counterparties) to mandate central clearing.

Note that a CCP $\Rightarrow$ SIFI

Credit Derivatives: great means of mitigating credit risk,

However, "wrong way risk": counterparty of CDS defaults.

Counterparty risk and CVA (Counter Party Value Adjustment)

CPR ⇒ combination of market and credit risk (counterparty credit quality)

Counterparty
- large p^{def} — Small Exposure
- small p^{def} — Large Exposure

which one is better

CVA values the counterparty risk that an institution takes and potentially allows it to traded, i.e. hedged.

CVA interpreted statistical estimate of the expected future losses from counterparty risk.

CVA banking book item that doesn't change day-to-day but rather actuarially.

CVA analogous to a loan loss reserve, which aims to absorb the future potential credit risk losses on a loan book

BASEL III views CVA as a mark-to-market trading book component

viewed as the cost of hedging CCR.

"Trading Book" CVA
"Banking Book" CVA
fundmentally different

Mitigating Counterparty Credit Risk

- Netting
- Marginning (collateralization)
- Hedging

All mitigate but add operational risk and cost, and:
- liquidity risk
- systemic risk

Defining Counterparty Credit Risk

Arising from two broad classes of financial products:

- OTC
  - interest rate swaps
  - FX forwards
  - CDS
- Securities financing
  - repos and reverse repos
  - securities borrowing and lending

Party A owes Party B

however A may fail to pay some or all due to solvency

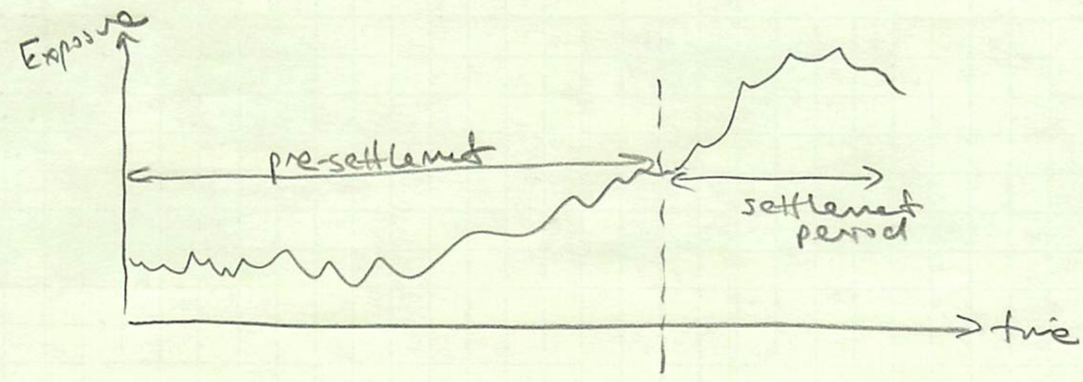
Lending Risk:

Notional Amount ⇒ known with high degree of certainty
Market, ie. Interest Rate ⇒ known with some certainty
Only 1 party takes the lending risk

Credit Risk:

Value of the contract in the future is highly uncertain for a future date
There is bilateral Risk.

Settlement and Pre-settlement Risk



Swaps may have multiple settlement periods

Credit Risk ⇒ usually only concerned with pre-settlement

Settlement Risk ⇒ timing differences between as to when obligations occur.

Components and Terminology

- Credit Exposure = loss in the event of a counterparty defaulting.

  + or −

  − = loss

  + = you owed a cp, but they dissolved.

  - What is current exposure if the cp defaults today?
  - What is the future exposure if the cp defaults on a future date?

  Exposure is conditional on counterparty default.

- Default probability, credit mitigation and credit spreads

  Must consider the credit quality of the counterparty

  - What is the probability of default over a certain time horizon?
  - What is the probability of a decline in credit quality over a certain time horizon?

  Term structure of default probability

  - future default probability
  - hazard rate

- Recovery and Loss Given Default (LGD)

  recovery = percentage of the outstanding claim recovered when a counterparty defaults

  LGD = 1 − recovery rate

- Mark-to-Market and Replacement Cost

  - MTM what could potentially be lost today

  - Replacement Cost
    closeout netting
    termination features