Incremental Risk Charge
The incremental risk charge is a regulatory requirement from the Basel Committee in response to the financial crisis. It captures risk beyond regular value at risk.

IRC supplements existing Value-at-Risk (VaR) and captures the loss due to default and migration events at a 99.9% confidence level over a one-year capital horizon.
IRC Main Features

◆ Liquidity is explicitly modeled in IRC through liquidity horizon and constant level of risk.

◆ Constant level of risk assumption
  ◆ Hold portfolio constant over liquidity horizon
  ◆ Rebalance any default, downgraded, or upgraded positions at the beginning of each liquidity horizon
  ◆ Roll over any matured positions at the beginning of each horizon

◆ Default and migration need to be simulated for one-year horizon.

◆ Concentration measures the degree of a portfolio diversification.
  For example, if a significant number of issuers belong to a certain category, the portfolio is a concentrated one.
Default and Migration Simulation

Default and credit migration is commonly modeled by an asset model:

\[ z_i = \beta_i \phi + \sqrt{1 - \beta_i^2} \varepsilon_i \]

where

- \( \phi \) is the systematic risk;
- \( \varepsilon_i \) is the idiosyncratic risk for issuer/obligor \( i \);
- \( \beta_i \) is the weighted correlation that systematic risk factor affects issuer/obligor \( i \);
- \( z_i \) is the normalized asset return or creditworthiness indicator for issuer/obligor \( i \).
Default and Migration Simulation (Cont’d)

- Determination of default and credit migration
  - Given historical default and transition probabilities (also called default transition matrix), the thresholds of default and credit migration can be computed.
  - For example, we can compute various rating thresholds for a BBB issuer as $Z^D_{BBB}, Z^{CCC}_{BBB}, Z^B_{BBB}, Z^{BB}_{BBB}, Z^{AAA}_{BBB}, Z^{AA}_{BBB}, Z^{A}_{BBB}$.
  - If the simulated and normalized asset value $z_i$ is between $Z^A_{BBB}$ and $Z^{AA}_{BBB}$, it means the issuer is migrated from BBB to AA, verse vice.
  - Similarly if the simulated asset value $z_i$ is smaller than $Z^D_{BBB}$, the issuer defaults.
Constant level of risk

- The constant level of risk reflects recognition by regulators that securities/derivatives held in the trading book are generally much more liquid than those in the banking book.
- We interpret constant level of risk as constant loss distribution, i.e.,
  - The same loss distribution over each liquidity horizon
  - The same rating over each liquidity horizon
  - The same risk metrics over each liquidity horizon
- For example, the liquidity horizon for a portfolio is 3 months. That means the bank holds its portfolio components constant for 3 months and then rebalances it by replacing any default or downgraded or upgraded positions so that the portfolio is returned to the initial level of risk.
Constant level of risk (Cont’d)

- The process is repeated four times to arrive at 1-year shown as

- In Monte Carlo context, this can be modeled by drawing 4 times from the single-period loss distribution measured over the liquidity horizon.

- The advantages of this assumption
  - Avoid the complexity of rebalancing and roll-over
  - Reduce computation significantly
Implementation

- Find all debt and credit deals.
- Banks can assign a liquidity horizon to each deal under conservative assumption. The liquidity horizon has a floor of 3 months.
- Divide deals into portfolios based on liquidity horizons.
- Assuming that a portfolio has 3-months liquidity horizon, compute 3-month loss distribution as follows:
  - Simulate default and migration at 3 months.
  - If default: \( \text{DefaultLoss}_{i,3m} = \text{Exposure}_{i,3m} \times \text{LGD}_i \)
  - If rating change: \( \text{MigrationLoss}_{i,3m} = \text{MTM}_{i,3m,\text{newRating}} - \text{MTM}_{i,0,\text{oldRating}} \)
  - Total loss: \( \text{loss}_{3m} = \sum_i \text{DefaultLoss}_{i,3m} + \sum_j \text{MigrationLoss}_{j,3m} \)
  - Repeat for all scenarios to generate 3 month loss distribution.
Reference:
https://finpricing.com/lib/EqConvertible.html