Introduction to Credit Risk

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Sources: Jorion, FRM, 19

Introduction to credit risk

Credit risk

- Credit risk is defined as a risk of financial loss due to counterparty's inability to meet obligations.
- It can also be defined as the risk that a debtor will be unable to meet its obligations towards its creditors.

Why speak of credit risk?

- Credit risk is the major cause for serious banking problems. Lax credit standards for borrowers and counterparties, poor portfolio risk management, or a lack of attention to changes in economic or other circumstances can lead to deterioration in the credit standing of a bank's counterparties.
- Innovations in the financial markets like complicated sales contracts and derivatives contracts create credit risk.
- National and global expansion by businesses has given rise to credit risk emerging from ties with new governments and new clients.

Credit Losses

Credit losses can be defined as the potential amount at loss if the counterpart defaults.

Distribution of these losses can be viewed as a compound process driven by the following three variables:

- Probability of default: likelihood that the counterparty will default on its obligation either over the life of the obligation or over some specified horizon, such as a year. Calculated for a one-year horizon, this may be called the expected default frequency.
- Credit exposure, which is the economic value of the claim on the counterparty at the time of default.
- Loss given default (LGD), which represents the fractional loss due to default:

  LGD = 1 - RR

RR: recovery rate. Fraction of the exposure may be recovered through bankruptcy proceedings or some other form of settlement.

Credit Loss

- For an instrument, the credit loss is:

$$Credit\ Loss = b \times Credit\ Exposure \times LGD$$

where,

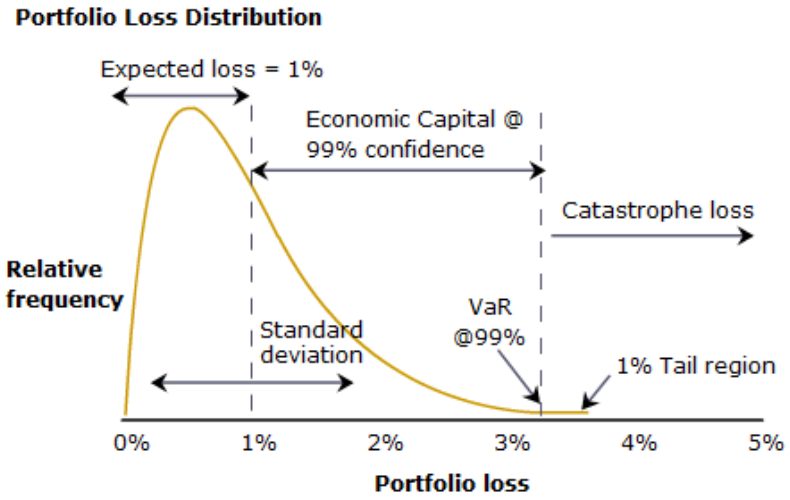
b = is a (Bernoulli) random variable that takes the value of 1 if default occurs and 0 otherwise, with probability p

For a portfolio of N counterparties, the loss is:

$$Credit\ Loss = \sum_{i=1}^{N} b_i \times CE_i \times LGD_i$$

Distribution of Credit Losses

The following graph shows the distribution of credit losses or the probability distribution function (PDF) of credit losses.



Source: Warburg Dion Read

Highly skewed to the left and is fat tailed, i.e., there is a large probability of small losses and a small probability of large losses.

Expected credit loss

Expected credit loss (ECL): The expected credit loss represents the average credit loss. The pricing of the portfolio should be such that it covers the expected loss

Expected credit loss of obligor i:

$$ECL_i = p_i * CE_i * LGD_i$$

p_i: default probability of obligor i

Portfolio expected credit loss:

$$EC = \sum_{i=1}^{n} ECL_i$$

Unexpected credit loss (UCL)

The unexpected credit loss represents the loss that will not be exceeded at some level of confidence.

- It is the deviation from the expected loss.
- Economic capital should cover the unexpected credit loss.

$$UCL = CL_{99\%} - ECL$$

where:

$CL_{99\%}$: portfolio's 99% VAR quantile

Marginal Contribution to risk: The distribution of credit losses can also be used to analyze the incremental effect of a proposed trade on the total portfolio risk.

For the same expected return, a trade that lowers risk should be preferable over one that adds to the portfolio risk.