Credit Risk Fundamentals

Probability of default and loss given default modelling

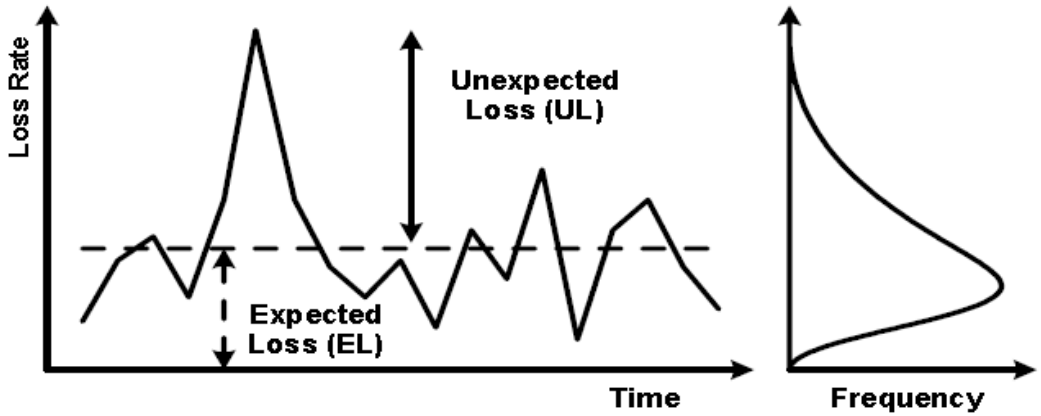
22nd March 2022

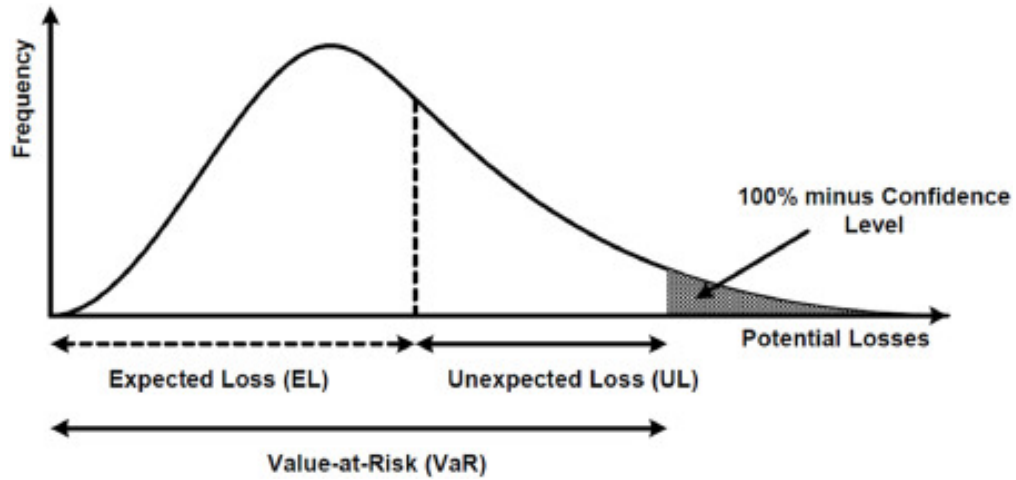
Section 1

Credit Risk - introduction

Credit Risk, Expected and Unexpected Losses

- **Credit Risk** is most simply defined as the '*potential that a bank borrower or counterparty will fail to meet its obligations in accordance with agreed terms*' (BCBS)
- **Unexpected and Expected Losses**





Expected Loss

- The bank assigns to every customer a **Default Probability (PD)**, **Loss Given Default (LGD)** and **Exposure at Default (EAD)**
- For the probability space $(\Omega, \mathcal{F}, \mathbb{P})$, let D denote the event that the obligor defaults at a certain period of time. The **loss** of an obligor defined by a *loss variable*:

$$\widehat{\boldsymbol{L}} = EAD \times LGD \times L,$$

where $L = 1_D$ and $\mathbb{P}(D) = \mathrm{PD}$

- The **Expected Loss (EL)** can be defined as the expectation of its corresponding loss variable $\widehat{\boldsymbol{L}}$, that is:

$$\mathbf{EL} = \mathbb{E}[\hat{L}] = EAD \times LGD \times \mathbb{P}(D) = EAD \times LGD \times PD$$

Section 2

PD & LGD

Probability of Default (PD)

The approaches to estimate default probabilities are:

- Calibrated from market data based on:
  - Merton's Model and Moody's/KMV Model (Expected Default Frequencies)
  - Credit spreads of traded products
- Calibrated from ratings
  - External/Agency ratings (S&P, Moody's, Fitch)
  - Internal methodologies

Loss Given Default (LGD)

- The LGD is defined as *'estimate of the economic loss that would be incurred on am exposure, relative the exposure's EAD, if the exposure wee to default withing one year'* (BCBS)
- The LGD quantifies the portion of loss the bank will suffer in case of default
- In percentage terms, can be defined as the fraction of the loan that is not recovered in case of default

References

- *Principles for the Management of Credit Risk – final document. Basel Committee on Banking Supervision (BCBS). BIS. September 2000*
- Saita Francesco, 2007, *Value at Risk and Bank Capital Management*, Elsevier Monographs
- Bluhm Christian, Overbeck Ludger, Wagner Christoph, 2010, An *Introduction to Credit Risk Modelling, Chapman and Hall*