Swiss Re

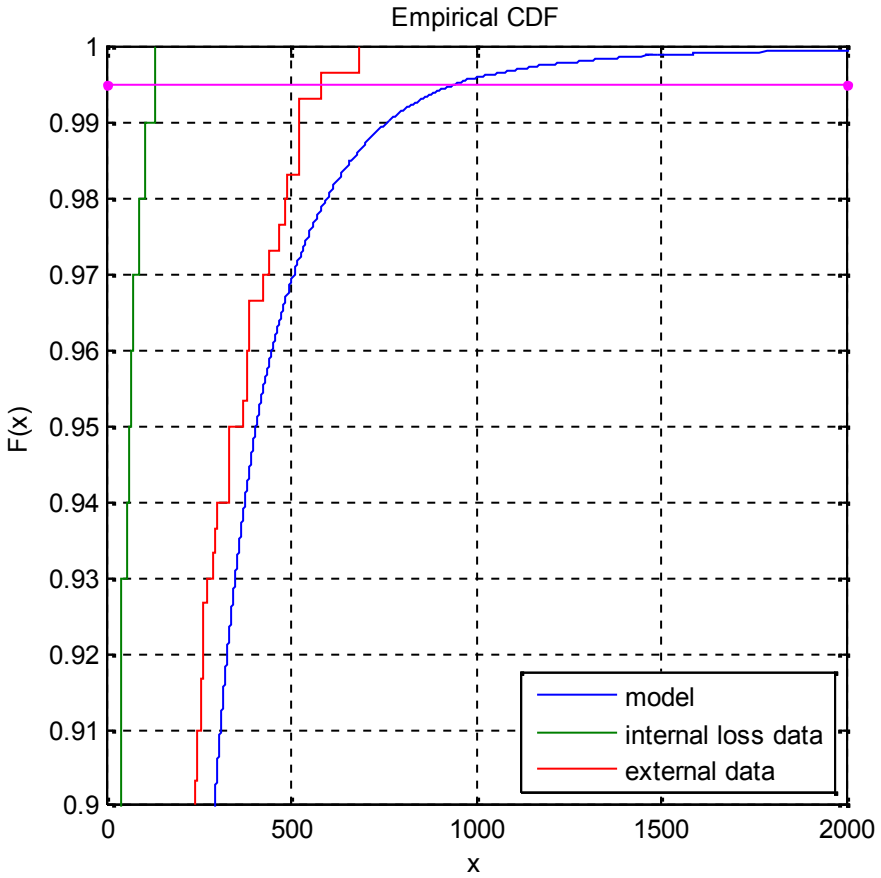
Modeling with small data: Credit and Operational Risk

13th congrès des actuaires, Peter Middelkamp, Small Data

Example 1: Operational Risk

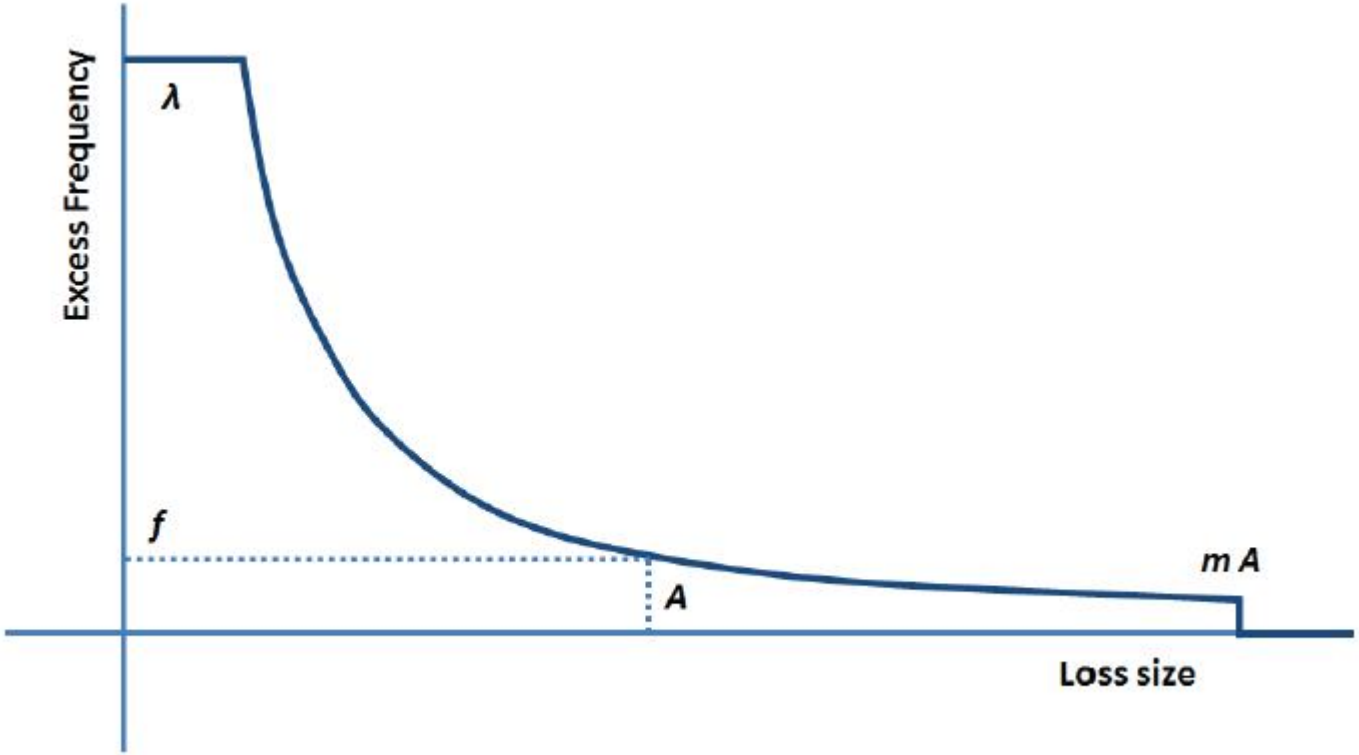
Operational Risk1 : (typically) Available Data

- Internal sources:
  - Own loss history collected over the past 5-10 years
  - Expert judgement of loss potentials
- External sources:
  - Industry loss data from loss data exchanges (eg: ORX)
  - Public information (eg: corporate filings, rating agencies, news, Algo First)



severity distribution per scenario and legal entity

- truncated Pareto with one important input: A = Anticipated Loss Potential for a given confidence level e.g. f = 99.5%.



aggregation with dependence

- Dependence within operational risk:
  - Dependence between legal entities
  - Dependence between event categories
- External dependencies:
  - Dependence to financial markets (more prevailing in banks)
  - Dependence to pandemic events

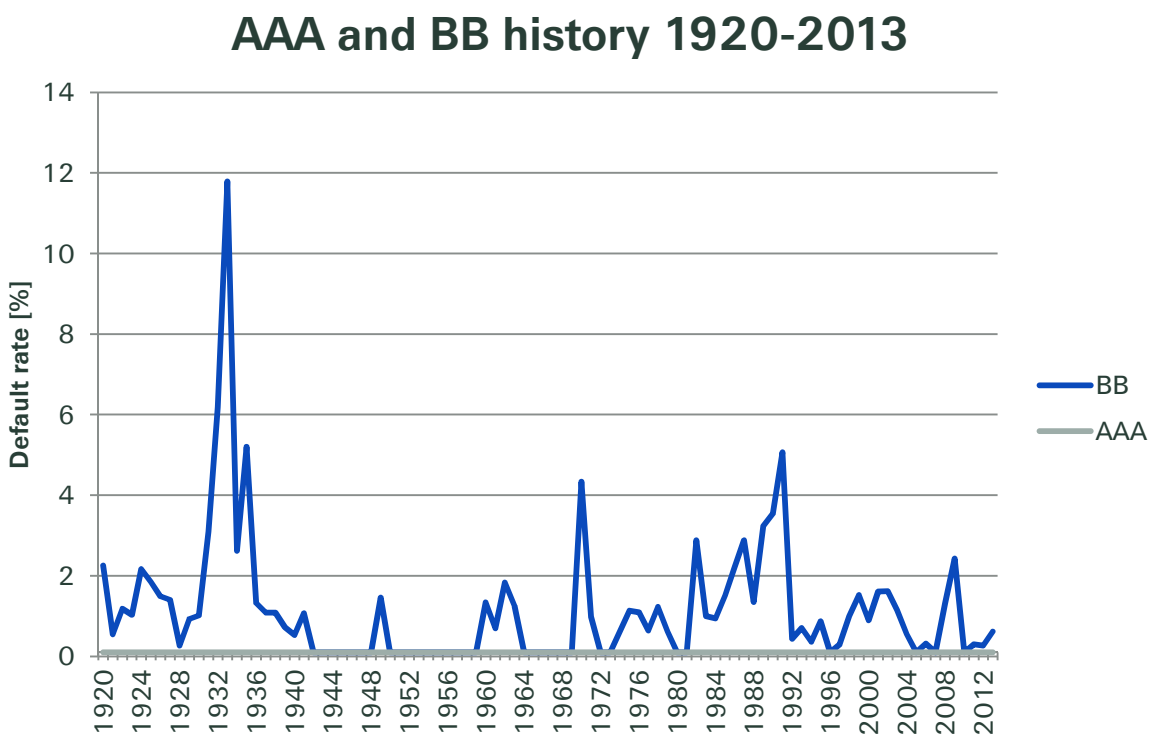
Conclusion Operational risk

- All parameters are mainly based on expert judgement that might be inspired by historic events in the firm and that happened to peers.
- A simple dependence method is a must (e.g. mixture of full dependence, independence)
- Number of parameters should be kept at a minimum to have a stable, easy to understand "well behaved" model.
- Continue to collect data and use it as benchmark for the model.
- Model alternatives (rejected):
  - LDA (not enough data)
  - Standard Formula (based on industry averages)
  - causal models with explicit control modelling (complicated, potentially unstable)
  - combining loss data sources and expert judgement using Bayesian inference (potentially unstable)

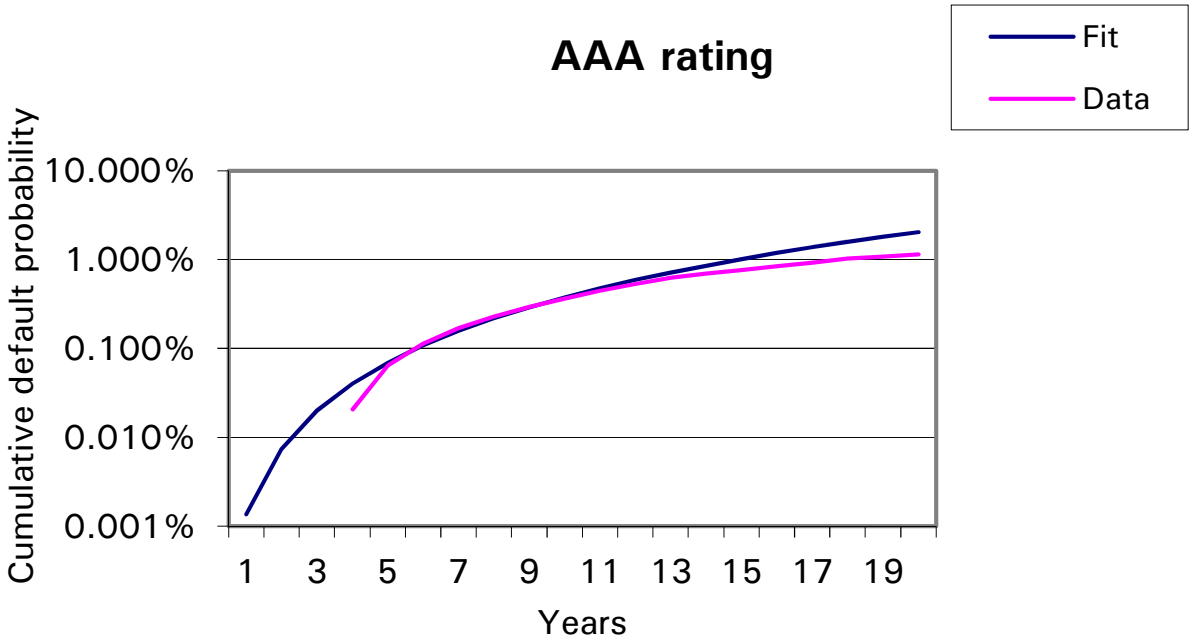
Example 2: Credit Risk

Compared to operational risk, there is plenty of data

- Default history exposes large spikes.
- Some rating categories never experienced a default within one year
- Rating information alone is not enough to determine default risk



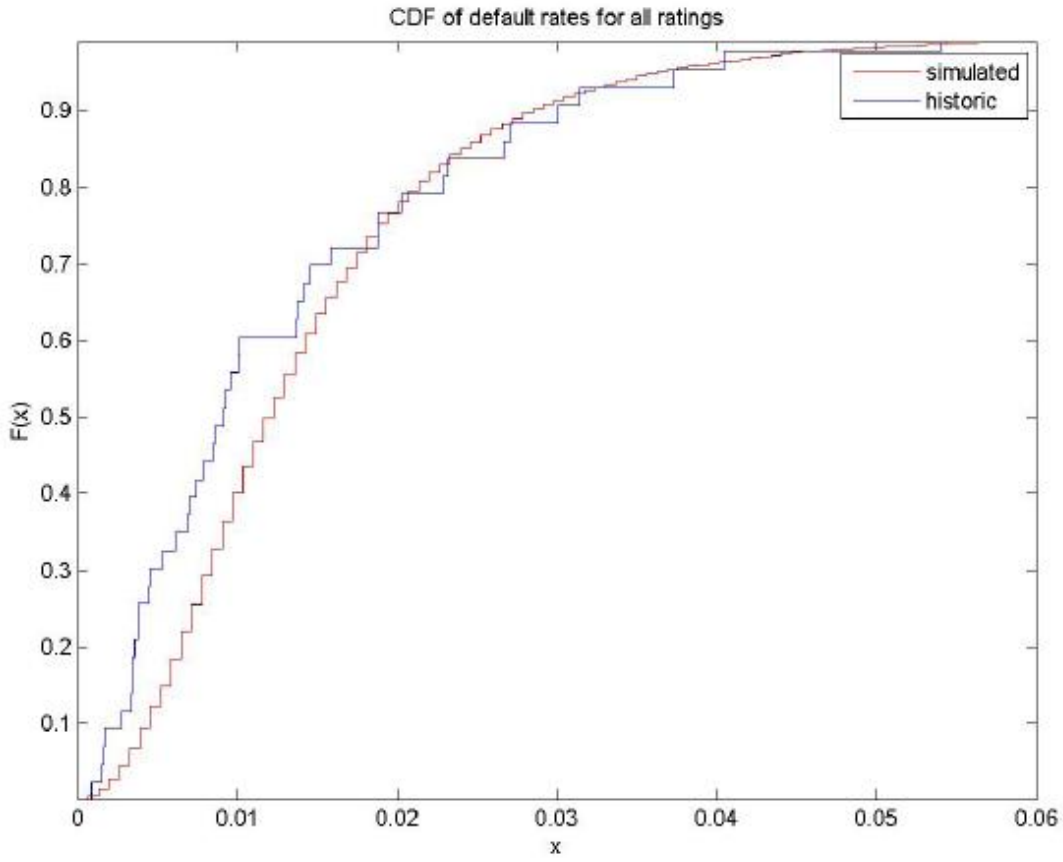
Multi year default probabilities can be used to estimate one year default probabilities



- Note that a minimum default probability of 0.03% is applied to corporates, 0.01% to sovereigns.

Modelled default probabilities should be able to reproduce and go beyond historic realisations

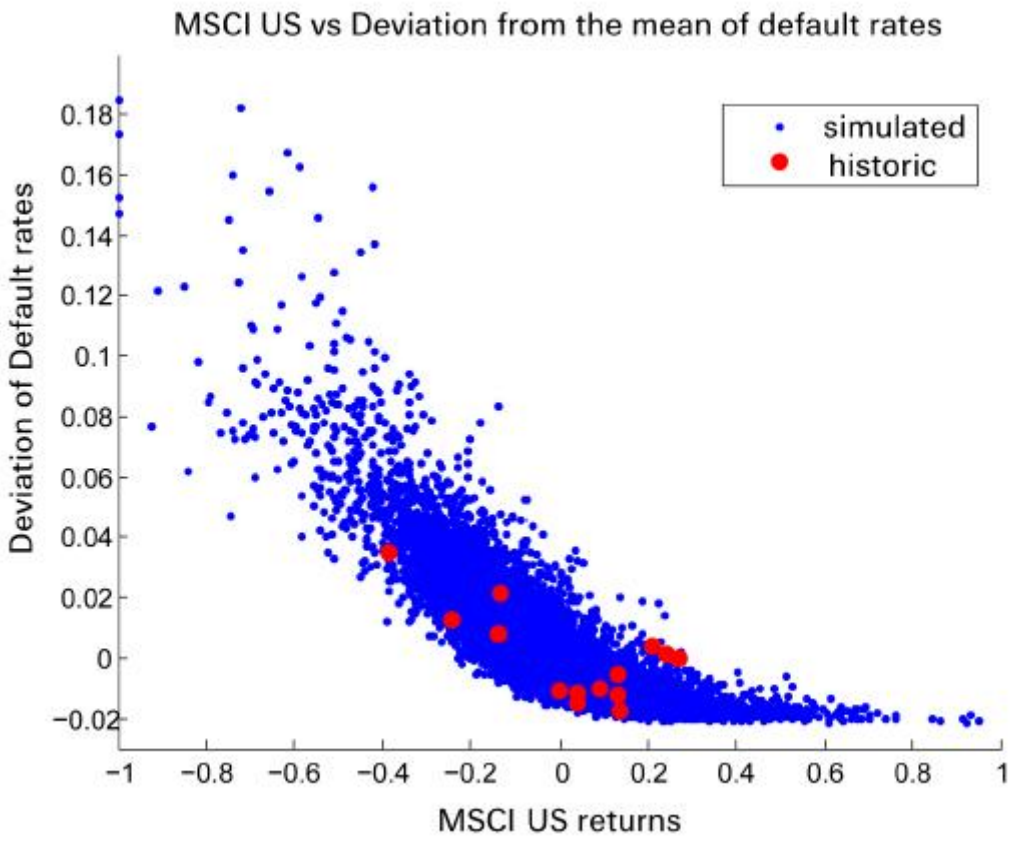
- Credit portfolio risk models capture historic default history (back-test)



DP

Credit portfolio risk models should also capture historic dependencies to financial markets (back-test)

- Default rates are higher when equity markets are down/ credit spreads widen (not that there is sometimes the default rate lags behind financial markets)



Legal notice

The information and opinions contained in the presentation are provided as at the date of the presentation and are subject to change without notice. Although the information used was taken from reliable sources, Swiss Re does not accept any responsibility for the accuracy or comprehensiveness of the details given. All liability for the accuracy and completeness thereof or for any damage or loss resulting from the use of the information contained in this presentation is expressly excluded. Under no circumstances shall Swiss Re or its Group companies be liable for any financial or consequential loss relating to this presentation.