ICT Risk

- Scenario Model

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Contents

Scenario analysis

Scenario analysis is being used by firms to better understand the Information and Communications Technology (ICT) risks they face and assess the possible impacts should they occur. To link scenarios to capital the industry is turning to statistical models to extrapolate the insights of business experts to the confidence level required.

A typical approach

- The Regulator encourages firms to capitalise against such risks at a 99.9% confidence level (banks) or 99.5% (insurers) over a one-year time horizon.

- Most firms do not have sufficient internal data to model historic ICT risk loss to this required confidence level and instead look to scenario analysis.

- Under a scenario analysis approach the most significant ICT risks faced are identified through a process informed by Risk and Senior Management insight.

- For each significant ICT risk key business stakeholders together with Risk will develop an associated scenario. The insights of business experts are informed where available by internal and external loss events, key risk indicators, risk control and internal audit assessments, business plans and business environment variables.

- This provides a forward looking view of the risks faced and an assessment of their severity and expected frequency should they occur.

- The application of a statistical model permits an extrapolation of the frequency and severity estimates provided by the business experts to the confidence level required.
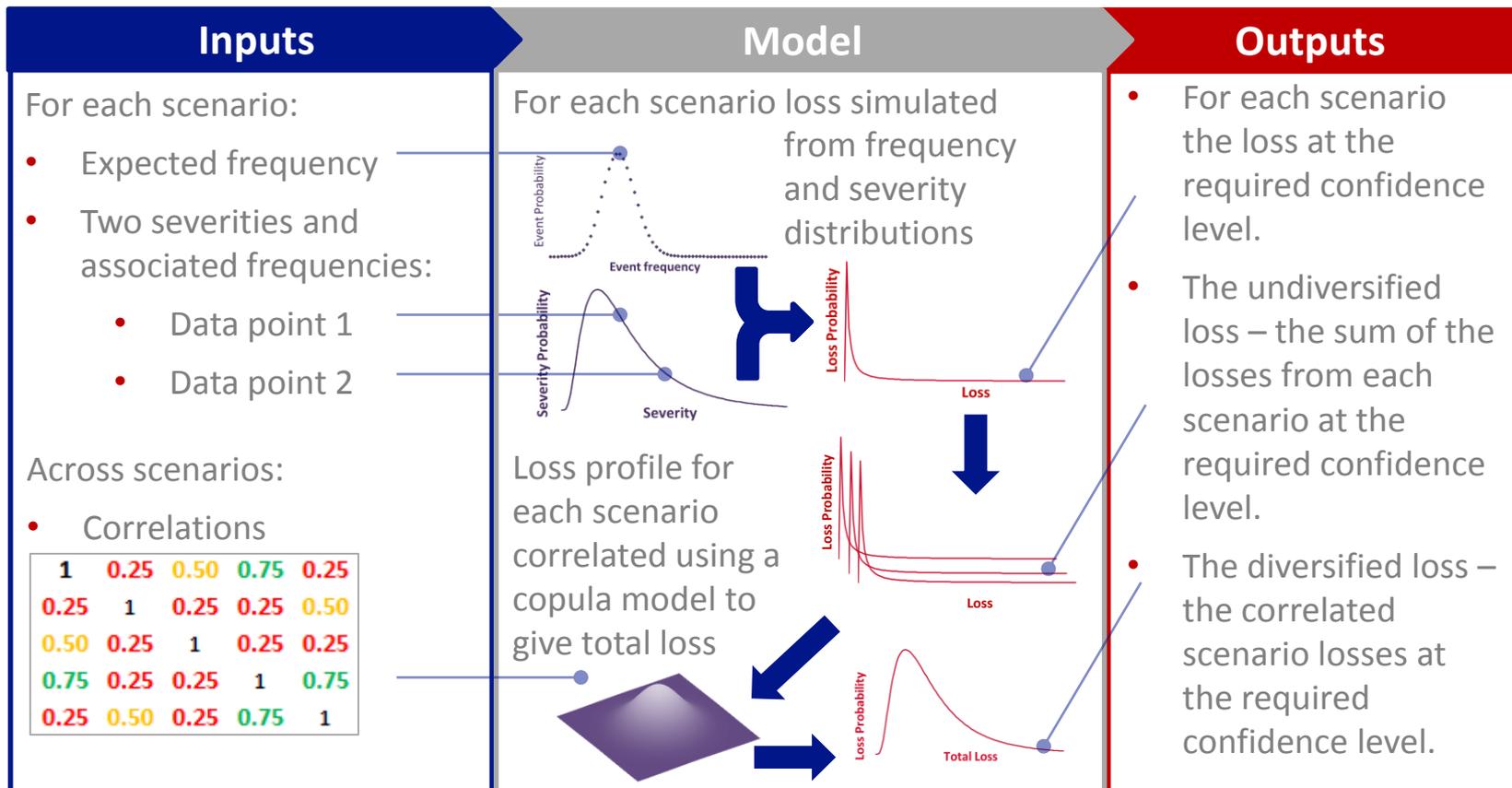
Model inputs and outputs

A common approach to modelling the outcomes from ICT risk scenario analysis is emerging. Such approaches are rapidly being adopted within the within the Financial Services industry as part of Pillar 2 capital assessments for ICT risk.

Model inputs and outputs

- The inputs to the model, taken from the scenario analysis process, are:
    - An expected loss event frequency per year for each scenario.
    - Two estimates of loss severity, and associated frequencies, for each scenario - e.g. a mid-career event (e.g. 1 in 20 years) and a working lifetime event (e.g. 1 in 40 years).
    - An estimate of correlation between each scenario.
- The expected loss event frequency is used to model the frequency of loss events for each scenario
- The loss severities, and associated frequencies, are used to model the severity of loss for each scenario
- The frequency model determines the number of events that occur in a given year and the severity model gives the impact of each event. Summing impacts gives the total loss per year and repeating the process a sufficient number of times gives a loss profile from which the loss at the required confidence level is found.
- The key outputs from the model are:
    - An estimate of loss over a one-year time horizon at the required confidence level for each scenario.
    - The sum of these estimates to give the undiversified estimate of loss at the required confidence level (assumes 100% correlation – all events occur at the same time).
    - The diversified estimate of loss at the required confidence level (less than 100% correlation).
- Correlations between each scenario are used to model the correlation between losses needed to provide an estimate of the diversified loss at the required confidence level.

Model schematic

The process for modelling the outcomes from ICT risk scenario analysis as described in the previous slide is summarised in the schematic below.

Scenario model process

Inputs	Model	Outputs
For each scenario: • Expected frequency • Two severities and associated frequencies: • Data point 1 • Data point 2 Across scenarios: • Correlations	For each scenario loss simulated from frequency and severity distributions Loss profile for each scenario correlated using a copula model to give total loss	• For each scenario the loss at the required confidence level. • The undiversified loss – the sum of the losses from each scenario at the required confidence level. • The diversified loss – the correlated scenario losses at the required confidence level.

Correlation matrix:

1	0.25	0.50	0.75	0.25
0.25	1	0.25	0.25	0.50
0.50	0.25	1	0.25	0.25
0.75	0.25	0.25	1	0.75
0.25	0.50	0.25	0.75	1

Model details

The approach used to model the outcomes from ICT risk scenario analysis is based on the experience of regulatory accepted ICT risk models and typically observed industry practices.

High level methodology

- The loss event frequency can be model using a Poisson distribution, to allow for the possibility of more than one event occurring over the one year time horizon, or a Bernoulli distribution if only a single event per annum is required.

- The loss event severity can be modelled using a lognormal or a Pareto distribution. Both have a heavy tail and are therefore often applied when modelling the high impact nature of ICT risk.

- For each scenario a Monte-Carlo process is used to simulate the number of events that occur in a given year and the severity of each event. Summing impacts gives the total loss per year and repeating the process gives a loss profile for each scenario. Up to 5 million repetitions (simulations) per scenario can be used to give a highly convergent output.

- To calculate the diversified loss the model uses a routine referred to as a 'copula' to impose the correlations between the risk scenarios. A copula is a probability distribution that can be used to model the dependency between multiple variables. The model offers two copulas; the Gaussian Copula and the Student-t Copula.

The elanev Operational Risk Scenario Model technical document provides further details on the above.

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