Swiss Re

Developing and maintaining Swiss Re's Internal Risk Model ICAM in MATLAB

Daniel Meier, Senior Risk Modeller, Group Risk Management, Swiss Re, 19 june 2018, Paris

Key Takeaways

1. Swiss Re has developed a professional enterprise application with MATLAB

2. MATLAB and Swiss Re's internal risk model ICAM have been growing over the last decade

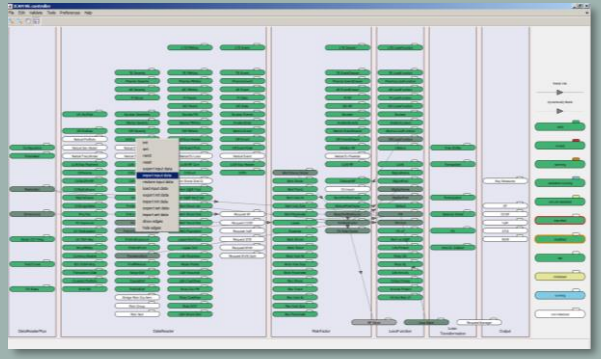
3. Measurable outcome: transparency, flexibility, maintainability

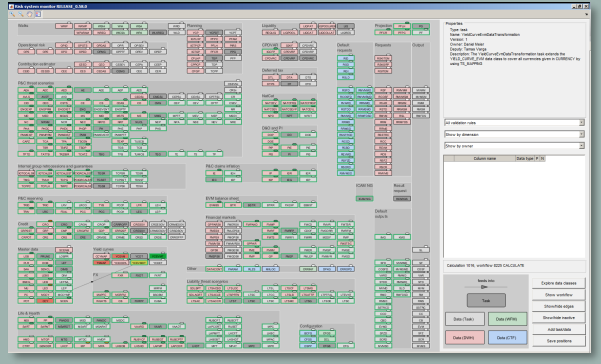
Swiss Re

- Swiss Re is the world's second largest reinsurer
- Founded in 1863, head quarters based in Zurich with offices in 25+ countries and 14'000+ employees
- Shareholders' equity 2016: USD 35.6bn
- Net premiums/fees earned 2016: USD 33.2bn
- CO_2 programme (2013-2020 Greenhouse Neutral Programme)
- Launch of Swiss Re Institute in 2017 (http://institute.swissre.com)

Swiss Re's Internal Risk Model ICAM (internal capital adequacy model)

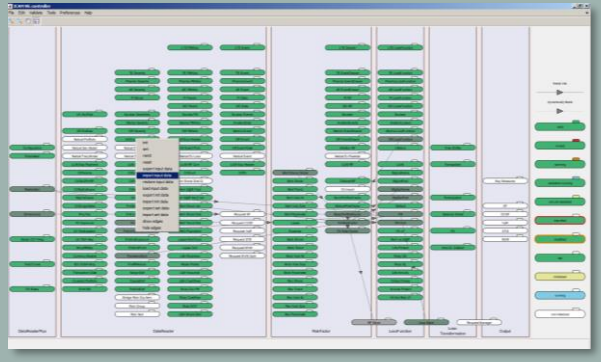
- Long history of using an internal risk model to steer the company and for regulatory purposes: Swiss Solvency Test (SST) and Solvency II
- For a decade, Swiss Re has used **MATLAB** to implement its internal risk model **ICAM**
- ICAM is developed/maintained by **Risk Modelling**, a team of 13 people with a broad range of educational backgrounds

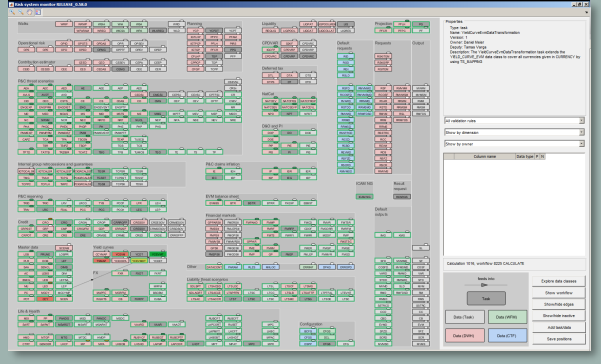




Swiss Re's Internal Risk Model ICAM (internal capital adequacy model)

- In 2017, Swiss Re concluded a major project called **IRAMP** (integrated risk analytics & modelling platform) to overhaul ICAM with key goals
  - transparency
  - flexibility for future developments, maintainability
  - speed
  - precision of risk measures (expected shortfall, value at risk, etc.)





Many different approaches to present ICAM...

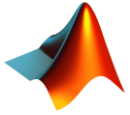
Mathematical/actuarial/algorithmic approach

IT/technical approach

Economic/risk management approach

Educational/training approach

Many different approaches to present ICAM...



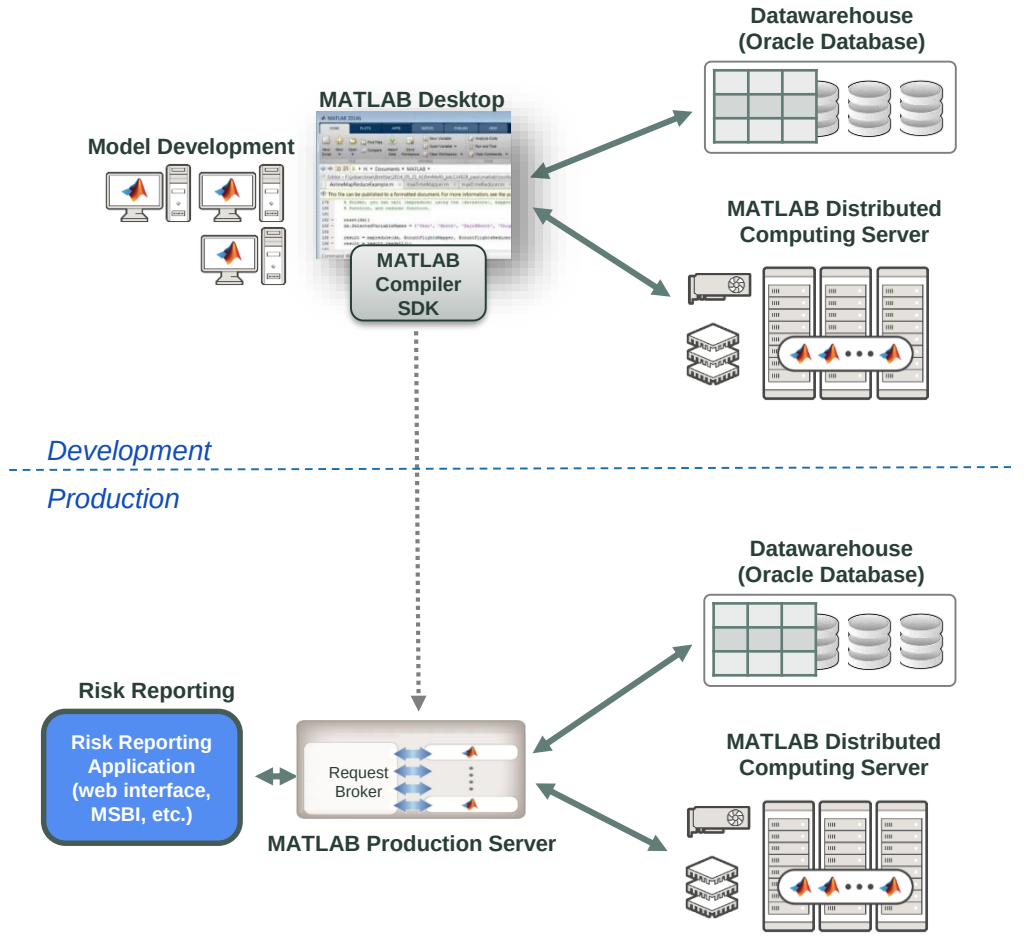
"MATLAB approach" – why and how are we using MATLAB?

- All-in-one solution: parallel computing, data import/export, profiler, debugger, unit testing framework, GUIs, algorithm collection, speed, etc.
- Flexibility for Risk Modellers
- KISS principle (keep it safe, simple, smart, etc.)
- MathWorks is a strong partner to avoid FOMO (fear of missing out) while current tools landscape is growing too fast to follow

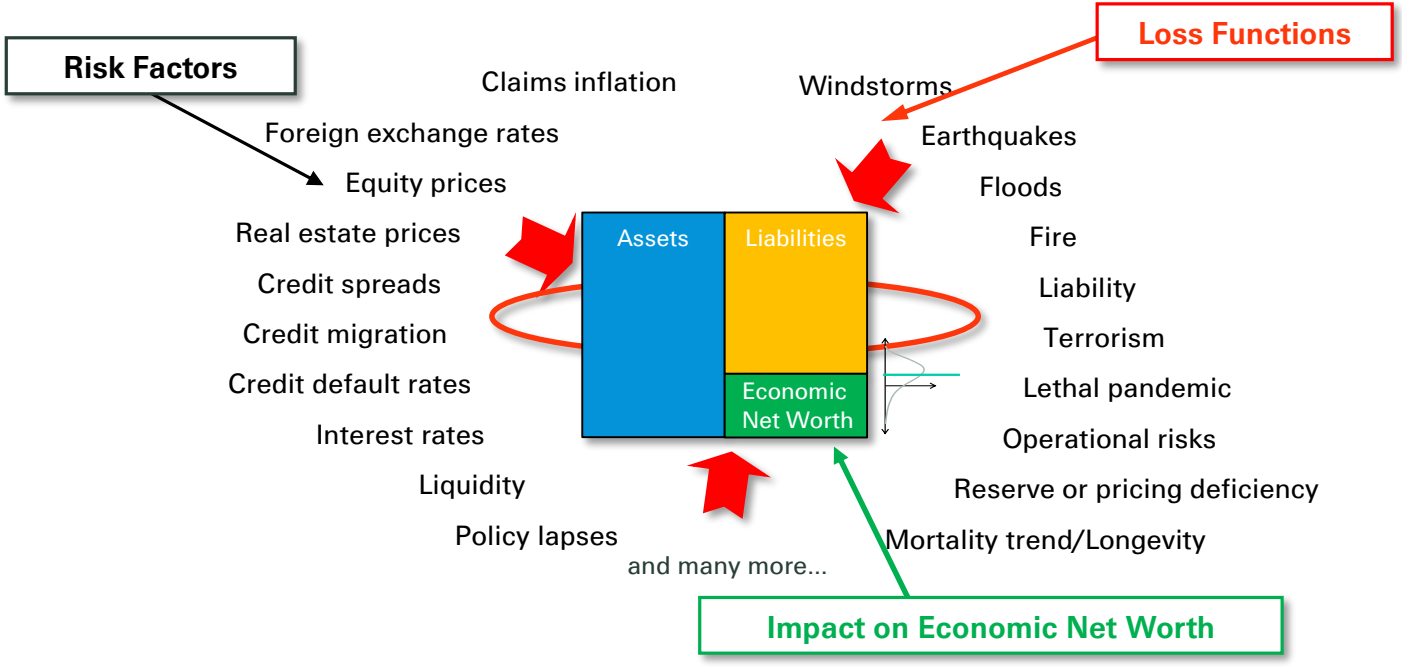
System Architecture

- Model development in development (and training) environment, 160 workers on MDCS, use of Parallel Computing Toolbox, 30+ users working directly with MATLAB

- Generation of risk reports in production environment, 224 workers on MDCS, risk reports essentially are consumed by the whole company as well as external stakeholders, e.g. regulators, auditors, rating agencies, etc.

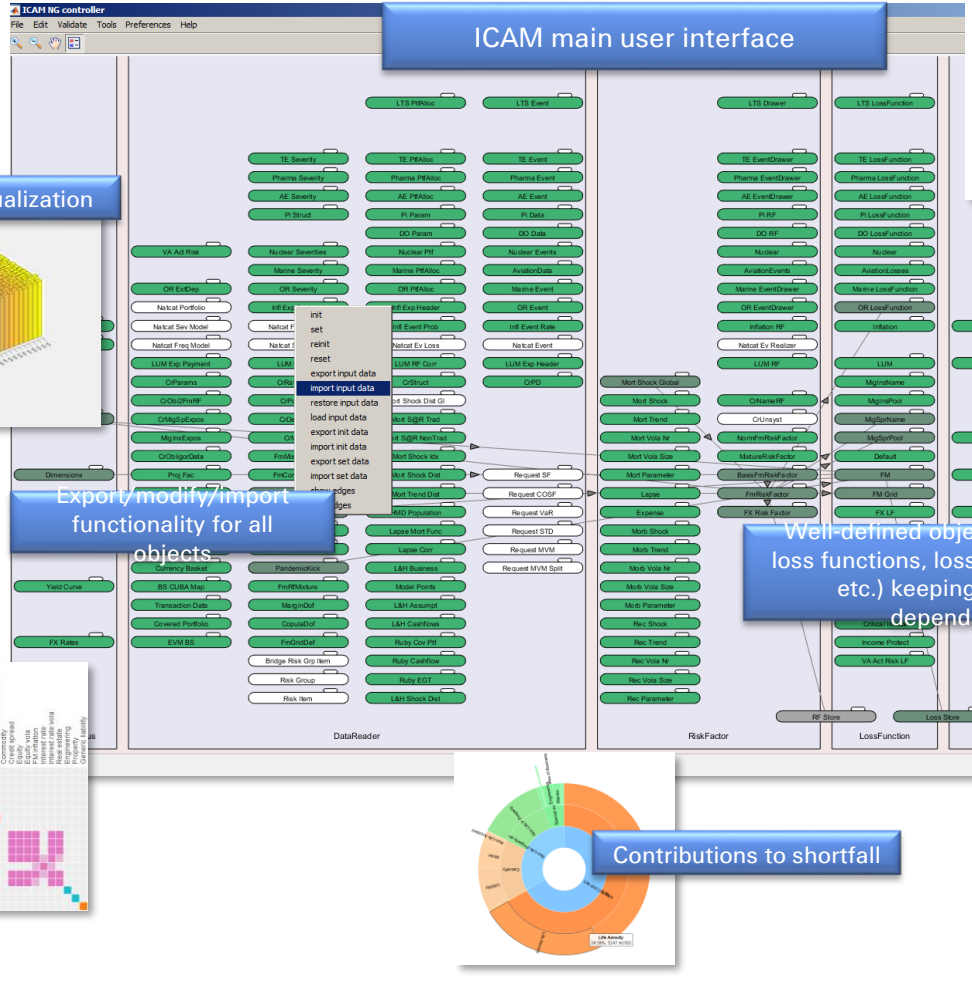


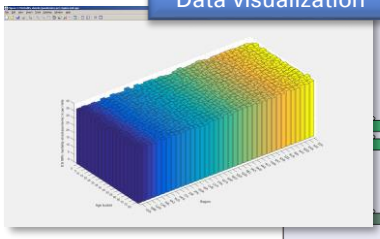
ICAM Overview



An integrated risk model is needed to understand the aggregate **joint** impact of all risk factors on the total economic balance sheet

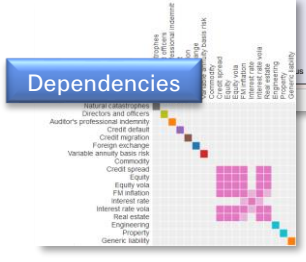
ICAM Demo (running on modified/artificial data)

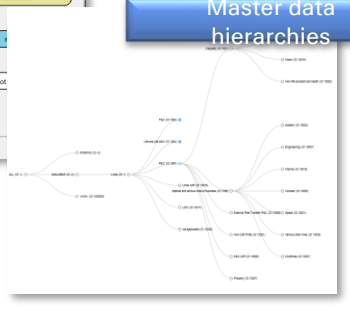




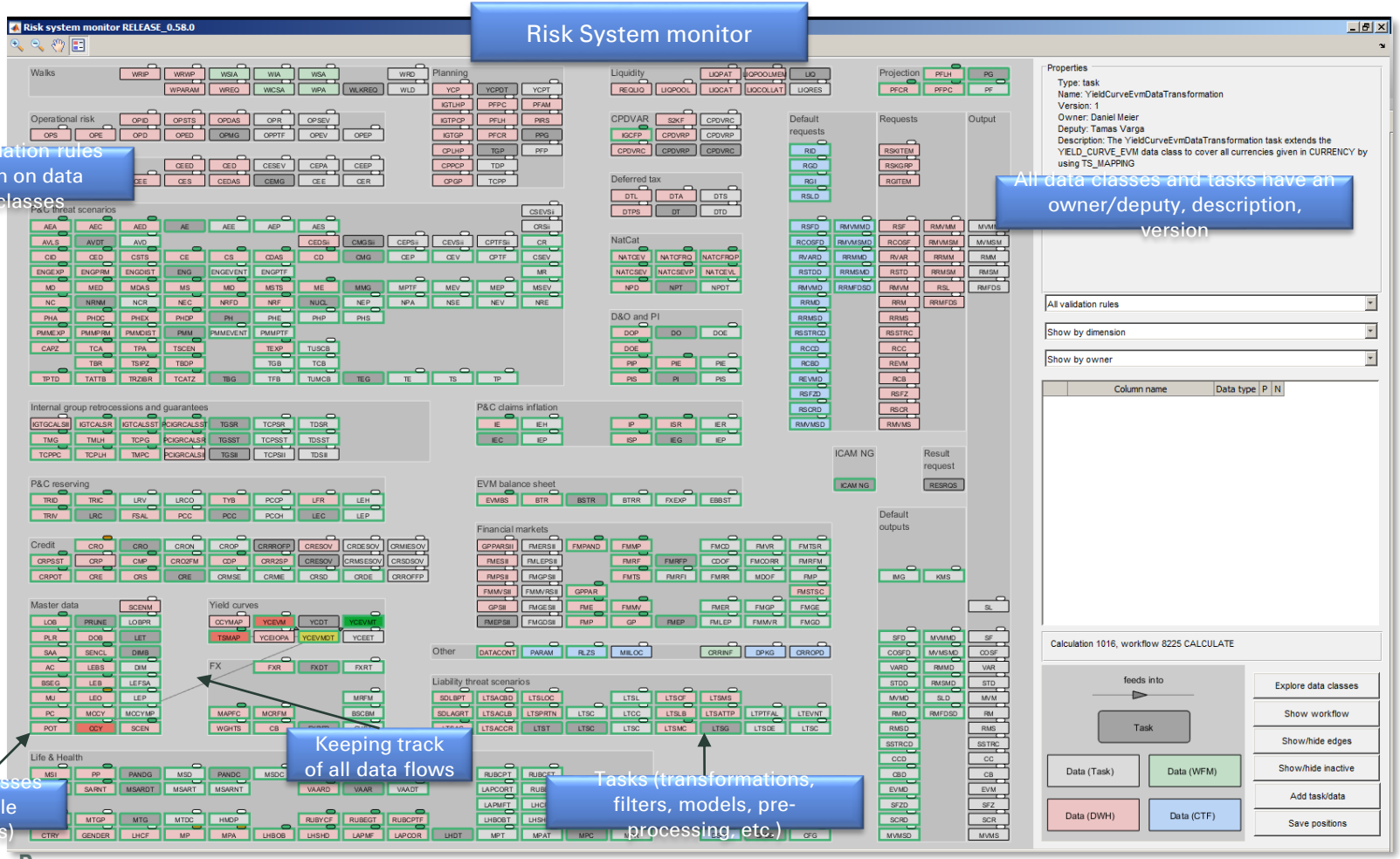
Export/modify/import functionality for all objects

Well-defined objects (risk factors, loss functions, loss transformations, etc.) keeping track of all dependencies

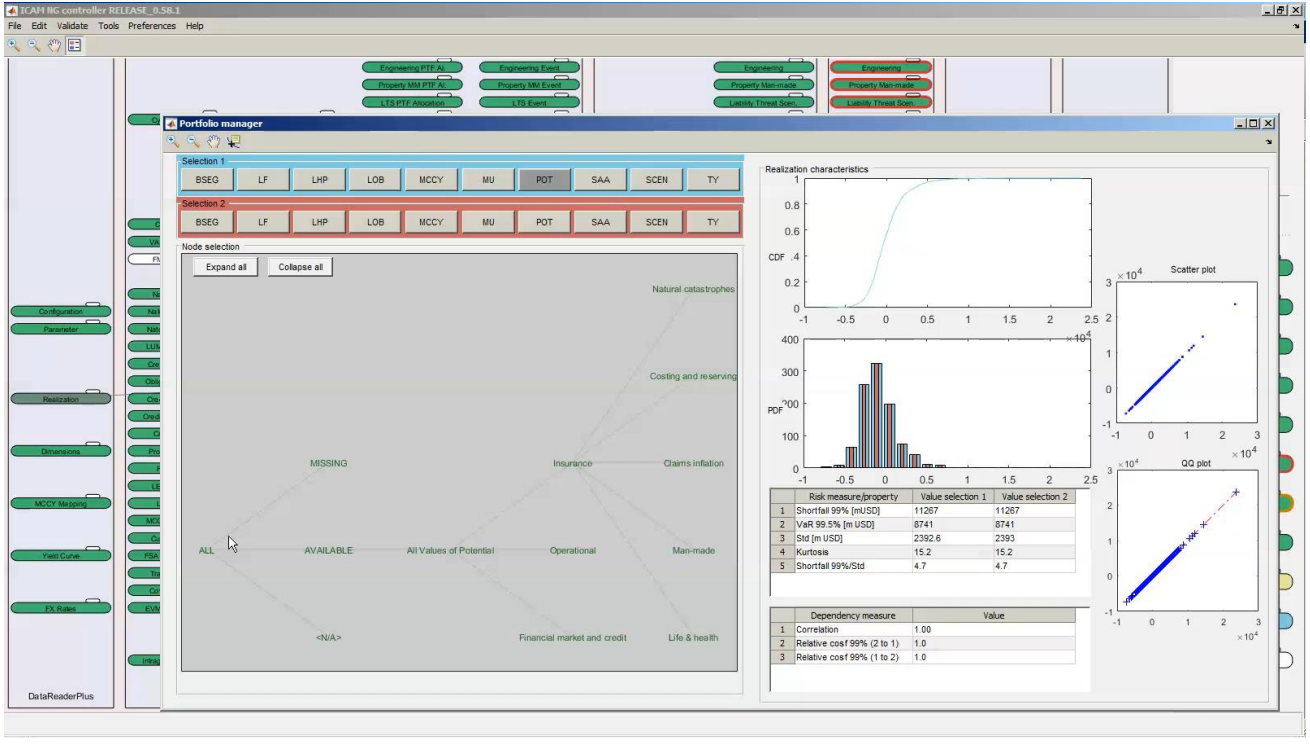




ICAM Demo (running on modified/artificial data)



ICAM Demo (running on modified/artificial data)



ICAM in Numbers

- More than 500 data classes (tables) with about 5’000 data attributes (columns) in total
- About 60 tasks (transformations, pre-processing, etc.)
- About 280 classes for risk factors, loss functions, etc. in ICAM
- Currently about 200 data validation rules – number still growing
- About 450 unit tests
- About 80’000 lines of code
- About 20 user interfaces for risk exploration, as-if calculations, education, etc.

Conclusion and Summary

- Swiss Re has developed a professional enterprise application with MATLAB
  - the key goals transparency, flexibility, maintainability were achieved by making extensive use of what MATLAB offers, e.g. graphical user interfaces, object-oriented programming, unit tests, data exploration tools, profiler, debugger, etc.
- Forward-looking plans
  - further model development
  - internal (and external) trainings
  - explore potential cloud migration

MATLAB is an excellent all-in-one solution for developing and maintaining Swiss Re's complex internal risk model ICAM.

Legal notice

©2017 Swiss Re. All rights reserved. You are not permitted to create any modifications or derivative works of this presentation or to use it for commercial or other public purposes without the prior written permission of Swiss Re.

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.