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Overcoming the “valley of death” – **Transferring sensitivity analysis** tools and expertise to the **(re)insurance sector**

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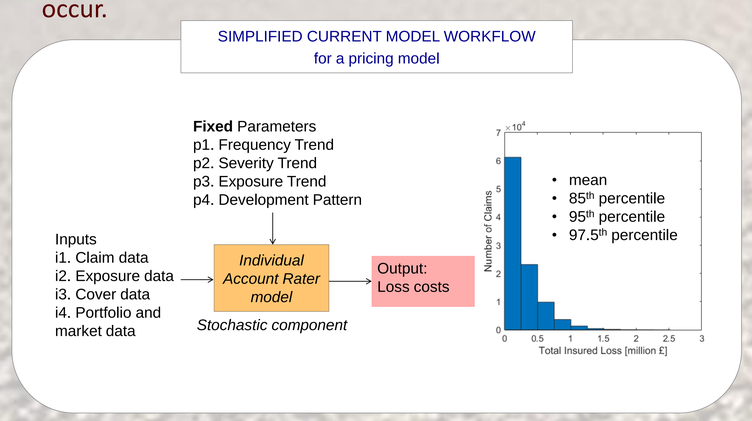
Background on losses from natural disasters and insurance

- Insurance companies provide insurance against a wide range of threats, such as natural hazards.
- Losses from natural disasters are increasing globally (in 2017 they were estimated to be USD 340 billion [1].
- To monitor risk and support investment decisions, insurance companies often use mathematical models to help calculate fair and robust risk premiums, and to ensure appropriate capital allocation, such that there is little risk of the company finding itself in financial trouble should deleterious events occur.



Challenges for (re)insurers:

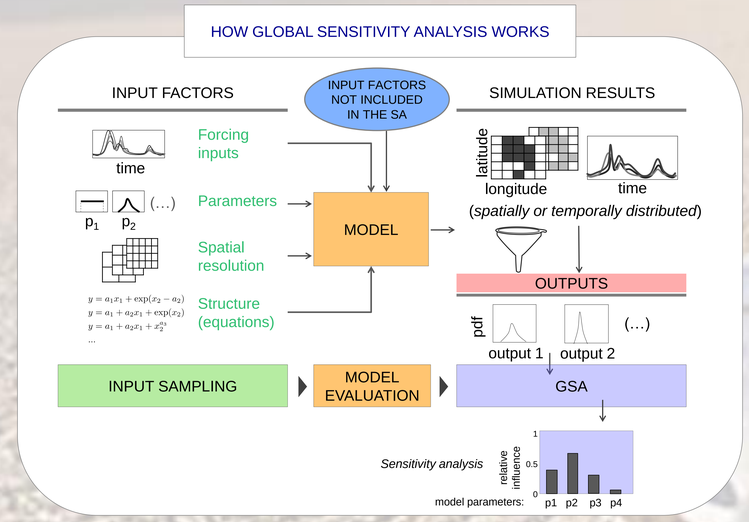
- Costly model development;
- Increased regulation (European Solvency II)[2];
- Lack of standardised regulatory guidelines for model validation.

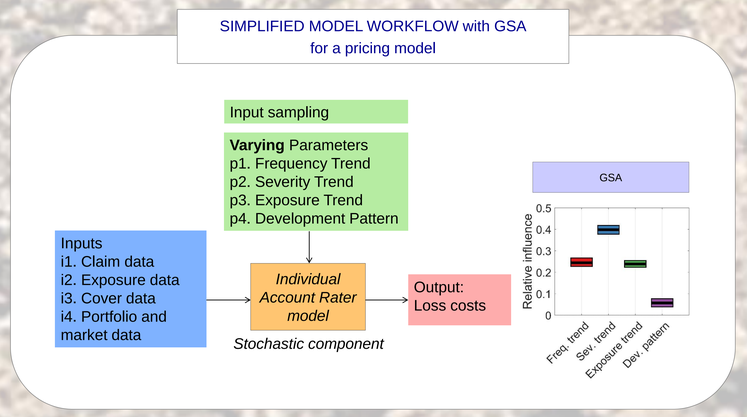
Project’s goal

To improve decision-making under uncertainty by transferring state-of-the-art methods for Global Sensitivity Analysis (GSA), software package for GSA (SAFE) [3,4] and workflows to the (re)insurance sector and catastrophe community.

By better capturing uncertainty, we aim to make decision-making more robust, as the chance of unexpected surprises is reduced.

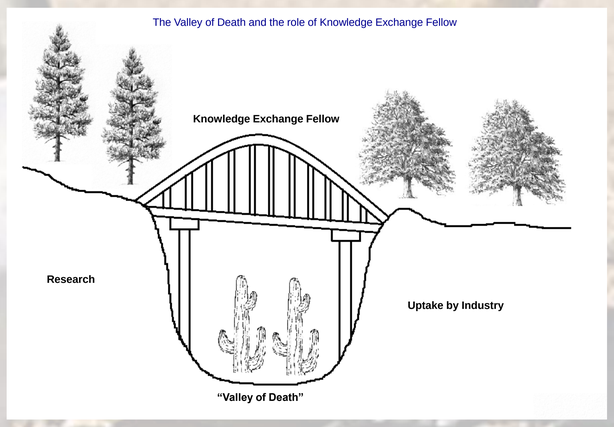
Global Sensitivity Analysis (GSA) is a set of statistical analysis techniques to investigate the complex behaviour of mathematical models in a structured, transparent and comprehensive way [5]. Sensitivity analysis answers the question: how much does varying each input factor contribute to the variability of the model output?

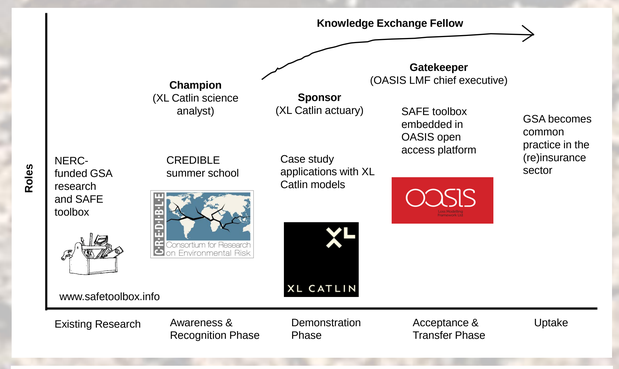




How to overcome the “valley of death”

- Need common language between academia and industry.
- Identify needs of the insurance sector; what tools they already use.
- Identify how they learn about new technologies; how they adopt them.
- Identify barriers preventing the uptake of new technologies.
- Identify “champions”, “sponsors” and “gatekeepers”.
- Understand insurance model workflows; make them explicit.
- Benefits of using GSA need to be communicated clearly.





Roles and Activities to cross the Valley of Death to transfer Sensitivity Analysis to the (re)insurance sector; modified from Markham *et al.* (2010) [6]

[1] Munich Re (2018) https://www.munichre.com/topics-online/en/2018/01/2017-year-in-figures

[2] EC (2009) Directive 2009/138/EC *The taking-up and pursuit of the business of Insurance and Reinsurance* (Solvency II).

[3] Pianosi, F., Sarrazin, F. and Wagener, T. (2015) *An open-source Matlab Toolbox for GSA*. Environmental Modelling & Software 70.

[4] www.safetoolbox.info

[5] Saltelli et al. (2008) *Global Sensitivity Analysis. The Primer.* Wiley

[6] Markham, K., Ward, S. J., Aiman-Smith, L. and Kingon, A. I. (2010) *The Valley of Death as Context for Role Theory in Product Innovation*. *J. Prod. Innov. Manag. 27.*

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