

How can sensitivity analysis improve the robustness of mathematical models utilized by the re/insurance industry?

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Goal

To improve decision-making under uncertainty by transferring state-of-the-art methods for Global Sensitivity Analysis (GSA), software package for GSA (SAFE)^[1,2] and workflows to the (re)insurance sector and catastrophe community.

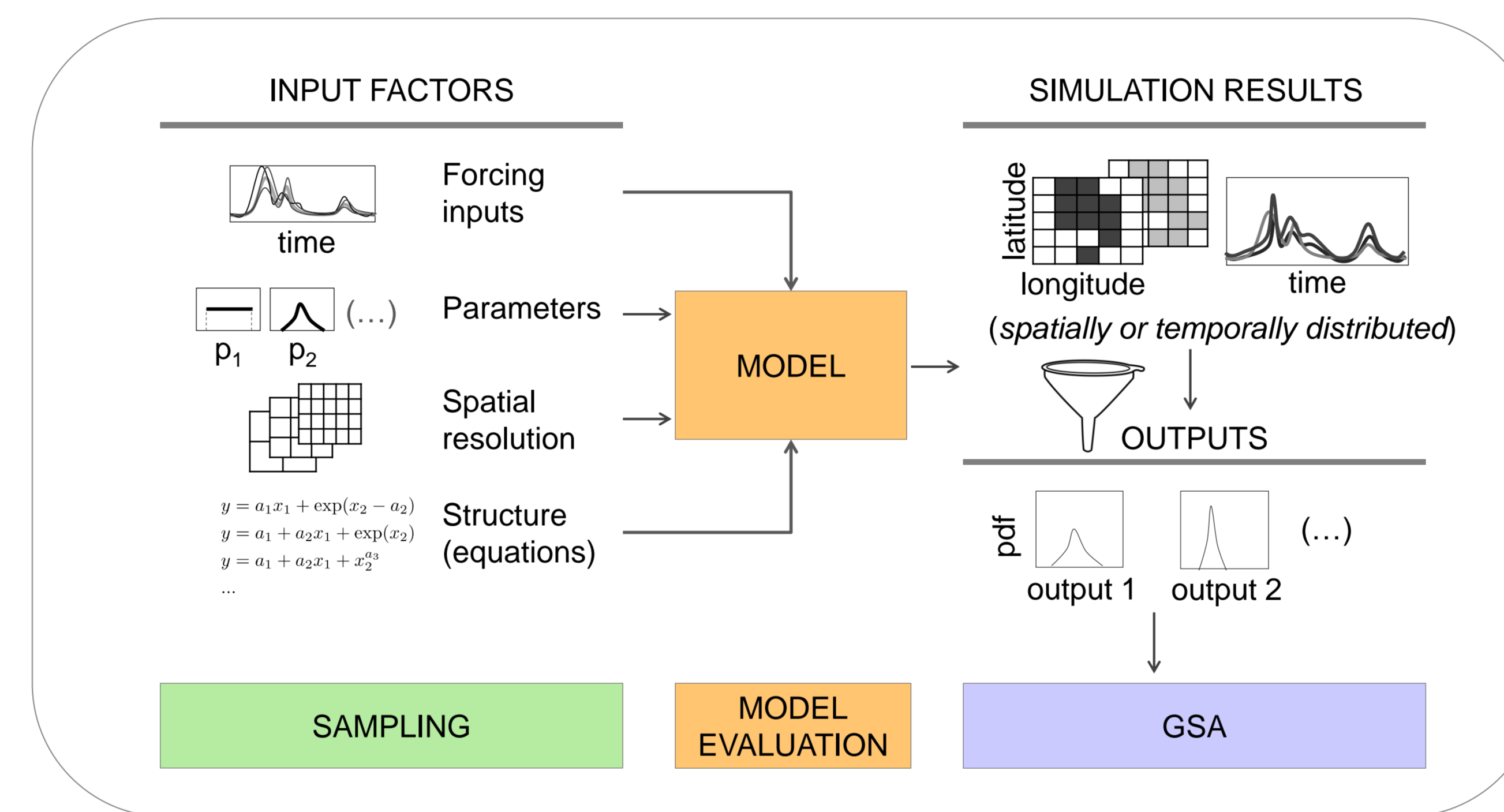
Insurance companies provide insurance against a wide range of threats, such as natural hazards, nuclear incidents and terrorism.

To monitor risk and support investment decisions, mathematical models are often used 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.

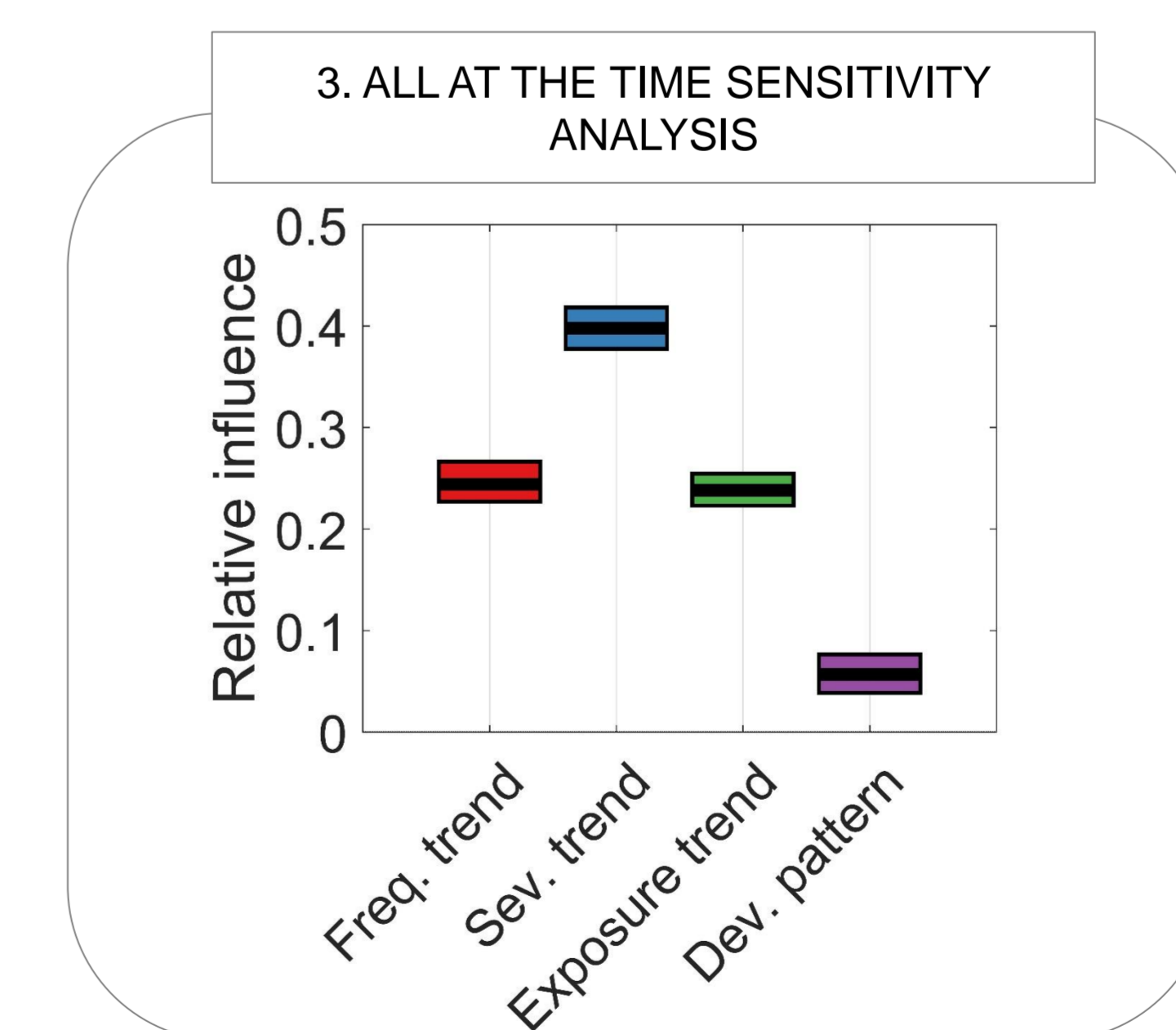
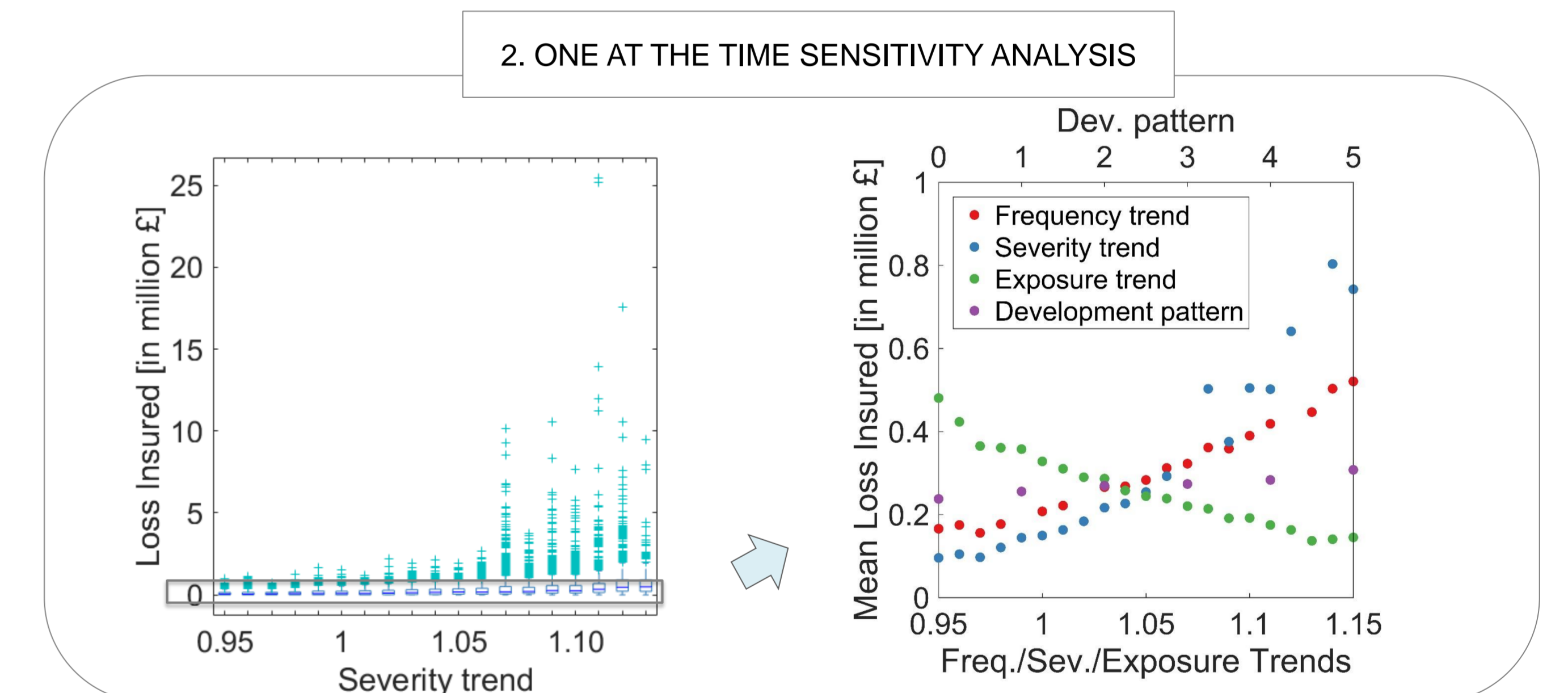
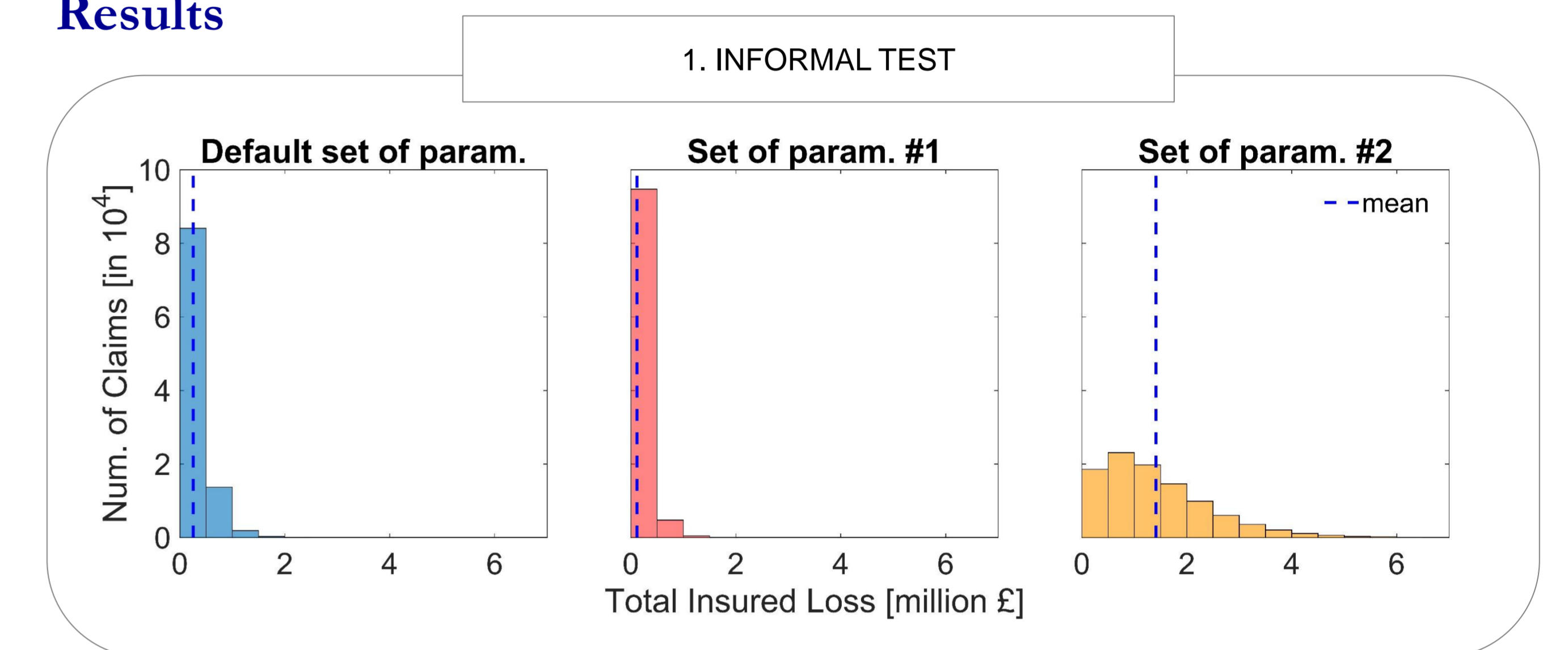
Challenges for re/insurers:

- Costly model development;
- Increased regulation (European Solvency II)[3];
- Model validation procedures could be more straightforward and transparent.

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 [4]. Sensitivity analysis answers: how much does varying each input factor contribute to the variability of the model output?

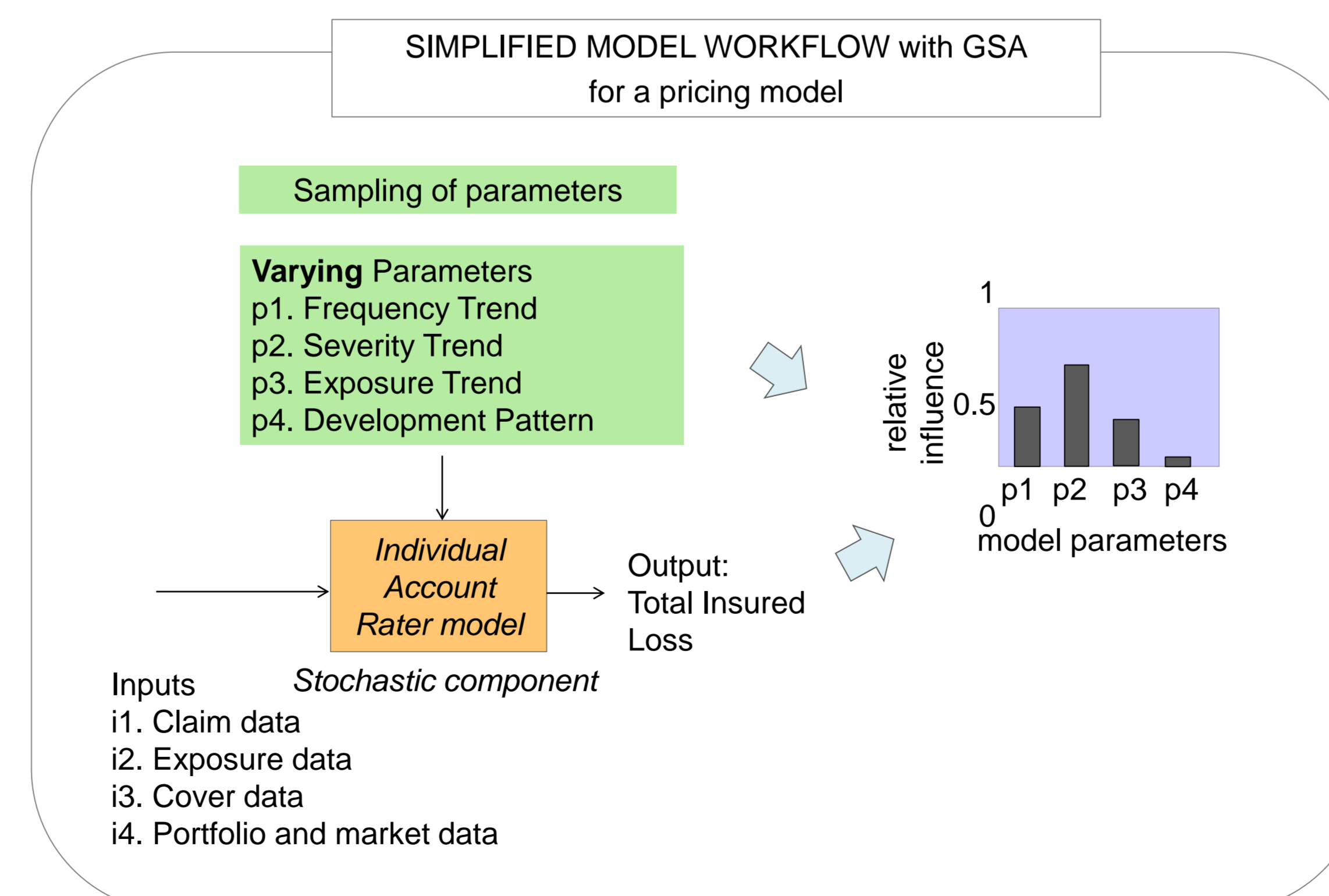
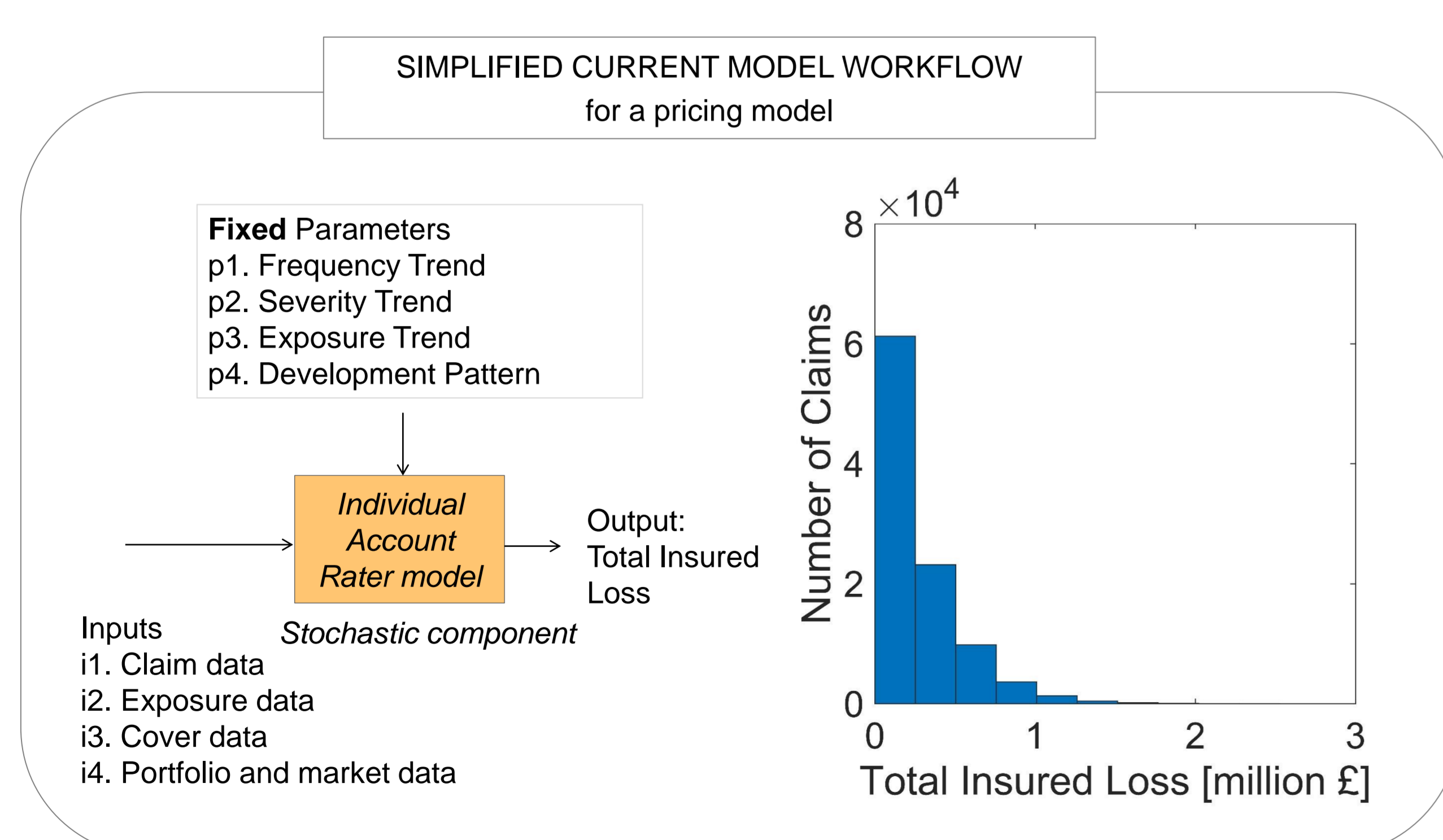


Results



Knowledge gained

1. Model behaviour beyond default set-up.
2. Main impacts of input uncertainty on modeling outcome and thus on decisions.
3. Where to prioritize investment for uncertainty reduction (e.g. acquire data to better estimate severity trend).



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

[2] www.safetoolbox.info

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

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



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