

Improving the consideration of uncertainty in a flood cat model

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The challenge

Catastrophe models, due to their complexity and computational demand, are mostly pre-compiled, which limits the ability of users to explore what controls the uncertainty in the estimated losses.

We can assess the most influential inputs for the geographical location and portfolio considered, which in turn supports the prioritisation of resources to reduce the uncertainty of the estimated losses.

What was achieved

We were able to test JBA's Global Flood Model behaviour beyond its default set up by varying inputs that are not normally varied in traditional cat models. This enables us to increase our understanding of how different inputs (i.e. **vulnerability curves**, **resolution of exposure data**, and **buffer size for flood hazard maps**) impact the uncertainty of the losses at various return periods.

This work enables model users to better understand which **inputs drive the uncertainty of the losses**, and to **visualise the uncertainty of the estimated losses** for different return periods. This will facilitate more informed decisions about the risks being underwritten and will better accommodate the risk appetite of the user.

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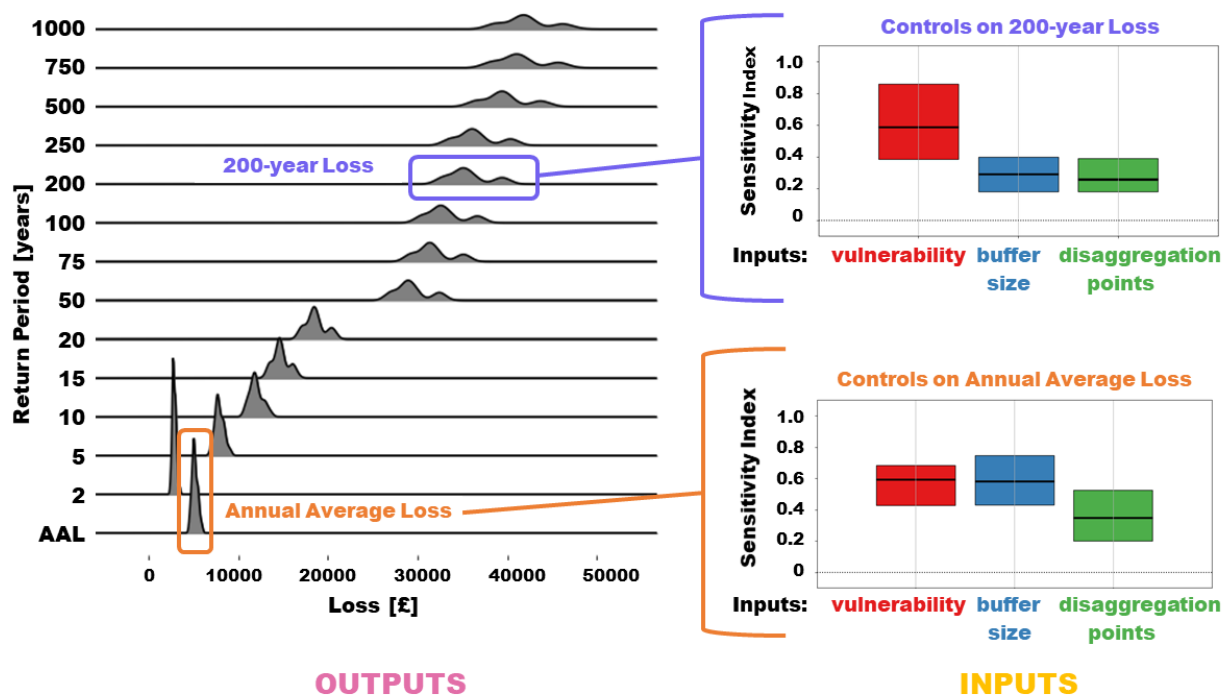
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Understanding the dominant controls on uncertainty in loss for different return periods



How we did it

We used the SAFE toolbox (Pianosi et al. 2015) to apply Global Sensitivity Analysis to JBA's Global Flood Model. We varied the uncertain inputs of interest to understand how their uncertainty propagates into the uncertainty of the output (i.e. losses) (Noacco et al. 2019). This was made possible thanks to the technology and flexibility of the Global Flood Model, which allows interrogation of a cat model in ways not possible in the past.

References

- Pianosi F, Sarrazin F, Wagener T. 2015. A Matlab toolbox for Global Sensitivity Analysis. *Environ. Model. Software* 70. 80–85 DOI: [10.1016/j.envsoft.2015.04.009](https://doi.org/10.1016/j.envsoft.2015.04.009)
- Noacco V, Sarrazin F, Pianosi F, Wagener T. 2019. Matlab/R workflows to assess critical choices in Global Sensitivity Analysis using the SAFE toolbox. *MethodsX* 6. 2258–2280 DOI: [10.1016/j.mex.2019.09.033](https://doi.org/10.1016/j.mex.2019.09.033)
- https://safe-insurance.uk/workflow_GSA_CAT_Model_JBA.html#

“Using SAFE, we have gained great insight into the sensitivity of our model losses to uncertainties in the model datasets and analysis options. It has helped to focus our attention by highlighting parameters that matter less, along with those that matter more.” Dr Kirsty Styles (JBA Risk Management)