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Efficient Location Uncertainty Treatment for Probabilistic Modelling of Portfolio Loss from Earthquake Events

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Probabilistic seismic risk analysis (PSRA) is a well-established method for modelling loss from earthquake events. In the insurance industry, it is widely employed for probabilistic modelling of loss to a distributed portfolio. In this context, precise exposure locations are often unknown, which results in considerable loss uncertainty. The treatment of exposure uncertainty has already been identified as an area where PSRA would benefit from increased research attention. However, so far, epistemic location uncertainty has not been in the focus of a large amount of research.

We propose a new framework for efficient treatment of location uncertainty. To demonstrate the usefulness of this novel method, a large number of synthetic portfolios resembling real-world portfolios is systematically analyzed.
We investigate the effect of portfolio characteristics such as value distribution, portfolio size, or proportion of risk items with unknown coordinates on loss variability.

Several sampling criteria to increase the computational efficiency of the framework are proposed and put into the wider context of well-established Monte-Carlo variance reduction techniques. The performance of each of the proposed criteria is analyzed.