

Unexpected flood loss correlations across Europe

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Floods don't observe country borders, as highlighted by major events across Europe that resulted in heavy economic and insured losses in 1999, 2002, 2009 and 2013. Flood loss correlations between some countries occur along multi-country river systems or between neighbouring nations affected by the same weather systems. However, correlations are not so obvious and whilst flooding in multiple locations across Europe may appear independent, for a re/insurer providing cover across the continent, these unexpected correlations can lead to high loss accumulations. A consistent, continental-scale method that allows quantification and comparison of losses, and identifies correlations in loss between European countries is therefore essential.

A probabilistic model for European river flooding was developed that allows estimation of potential losses to pan-European property portfolios. By combining flood hazard and exposure information in a catastrophe modelling platform, we can consider correlations between river basins across Europe rather than being restricted to country boundaries. A key feature of the model is its statistical event set based on extreme value theory. Using historical river flow data, the event set captures spatial and temporal patterns of flooding across Europe and simulates thousands of events representing a full range of possible scenarios.

Some known correlations were identified, such as between neighbouring Belgium and Luxembourg where 28% of events that affect either country produce a loss in both. However, our model identified some unexpected correlations including between Austria and Poland, and Poland and France, which are geographically distant. These correlations in flood loss may be missed by traditional methods and are key for re/insurers with risks in multiple countries. The model also identified that 46% of European river flood events affect more than one country. For more extreme events with a return period higher than 200 years, all events impact more than one country. These tail events also demonstrate that it is unlikely for the market to experience an extreme event which does not affect at least five European countries.