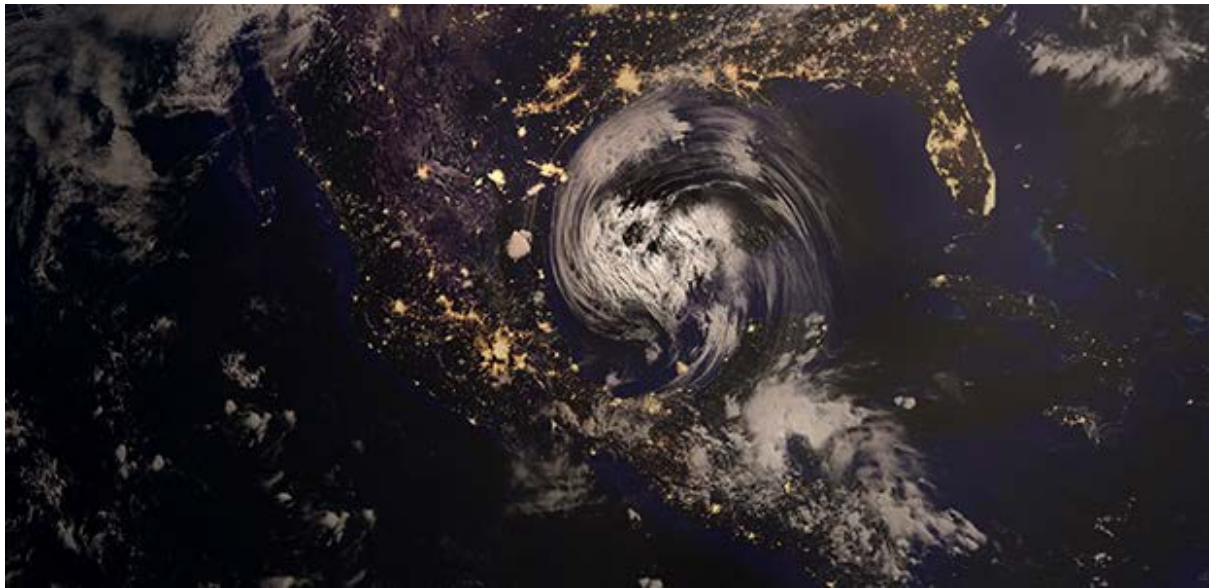


Regulators should encourage cat model diversity, says Oxford University study

Researchers have shown how the re/insurance markets can benefit from using a diversity of catastrophe models to understand and price their risk. So what are regulators doing about it? Christopher Cundy reports



The insurance industry's reliance on a small number of catastrophe models for pricing and managing natural catastrophe risk is creating a "dangerously fragile situation", according to a study by Oxford University academics.

In a paper published in the [*Journal of Economic Interaction & Coordination*](#), researchers suggested it would be "valuable for regulators to incentivise model diversity".

Such action would bring benefits for financial stability including fewer insurer bankruptcies, greater insurance penetration, more competition and more available capital, they said. The findings are based on a model the researchers created that mimics how the insurance industry accepts and shares risk. The "agent-based" model involves insurers, reinsurers and customers as well as capital providers in the form of shareholders and catastrophe bonds.

"If everyone bets on the same risk model - as they often currently do - it significantly raises the risk of a disastrous bankruptcy cascade"

Through hundreds of computer simulations, they observed how the industry would perform when insurers were able to access one, two, three or four different views of catastrophic risk. By having four models available, rather than one, the researchers found the quantity of uninsured risk would halve, capital available for re/insurers would increase by 50% and 20% more insurance firms would survive.

Torsten Heinrich, who co-authored the study, said: "No one knows for sure which catastrophes are around the corner, so of course some losses are unavoidable. But if everyone bets on the same risk model - as they often currently do - it significantly raises the risk of a disastrous bankruptcy cascade.

"There's a fix for this fragility, though: if regulators encouraged the use of a more diverse set of risk models, the industry could be both more robust and more profitable. Using a greater

variety of approved risk models would be better for individual firms and customers, and provide a far more stable foundation for the sector at large."

Heinrich told *InsuranceERM* the researchers had limited computational time that prevented them from looking at the benefits of using more than four models. Among the ideas for future research is introducing a new actor to the model - central banks - to study how interest rates and the availability of money affects the re/insurance sector.

Lack of diversity

Most modelling experts are aware of the risk of relying on one model, but that has not prevented many insurers from doing exactly that.

The paper cites data from the Bermuda Monetary Authority that shows almost all Bermudian firms relying on models from only two vendors - AIR Worldwide and RMS - with a good proportion of firms using just one vendor model.

"With the advent of Solvency II, the cost of approving multiple models has acted as a disincentive to adopting more models"

Dickie Whitaker, chief executive of the Oasis Loss Modelling Framework, an open-source risk modelling system, told *InsuranceERM* the paper's findings "should be of no surprise to anyone".

He added: "Essentially [the issue] applies to all models in all areas where there is significant uncertainty. In the climate space, that's what climate scientists do with the model ensemble approach."

But he said reliance on one model has, if anything, become more prevalent in the last decade.

"With the advent of Solvency II, the cost of approving multiple models has acted as a disincentive to adopting more models," he said.

The diversity of means by which models are used (i.e. the platforms on which they are available) and the lack of standards also hamper multiple model use, Whitaker said.

"Oasis is beginning to change that. We have one platform for all models, more choice of models, and one set of open standards for transmission of exposure and results," he said.

Regulators take steps

The UK's Prudential Regulation Authority (PRA) says it has recognised the risk of model concentration, and uses techniques such as stress and scenario testing to understand if insurers are too reliant on one external (vendor) model.

In such tests, the PRA includes a wider range of cat models that goes beyond the dominant vendors.

The PRA encourages firms to overlay vendor model results with their own view of risk, and applies the Solvency II framework to ensure companies take the necessary steps to validate vendor models against their own portfolios and loss histories.

The PRA undertakes its own research to challenge the dominant vendor models' view

The authority also undertakes its own research to challenge the dominant vendor models' view. For example, in 2018 it published research on US hurricane clustering, and is set to announce research on UK flood and windstorm risks.

Whitaker adds transparency around the key assumptions in vendor models is essential if insurers are to take their own view of risk.

"For models that work with Oasis, we have two that have given away the tools that they use to build the models, which is fantastic. Another publishes using academically peer reviewed papers - again, fantastic transparency."

Quality as well as quantity

The European Insurance and Occupational Pensions Authority (Eiopa) rejected claims Solvency II discourages insurers from using multiple models.

"Solvency II sets the conditions which must be fulfilled by models in order for their results to be approved as a part of an internal model. This is important to safeguard policyholder protection and financial stability," the authority told *InsuranceERM*.

But it acknowledged it too was taking steps to broaden the range of cat models used by insurers.

"The bar to be achieved cannot solely be measured based on the number of models used"

For example, in its discussion paper on including climate change in the Solvency II standard formula, Eiopa introduced the concept of using open-source cat models, such as Climada. The European watchdog emphasised the importance of users understanding the models - and said the transparency often provided by open-source models "can be helpful".

"Eiopa is exploring the possibility to use open-source cat models and also to explore other types of models - such as the ones available on Oasis - to be used in future nat cat calibration," it said.

One challenge will be to balance "the greater diversity at a controlled cost, while safeguarding the quality and reliability of the results.

"The bar to be achieved cannot solely be measured based on the number of models used; it is important that their quality continues to be a core element in the mind of supervisors," Eiopa said.

- *A simulation of the insurance industry: the problem of risk model homogeneity*, by Torsten Heinrich, Juan Sabuco and J. Doyne Farmer, can be downloaded from <https://link.springer.com/article/10.1007/s11403-021-00319-4>