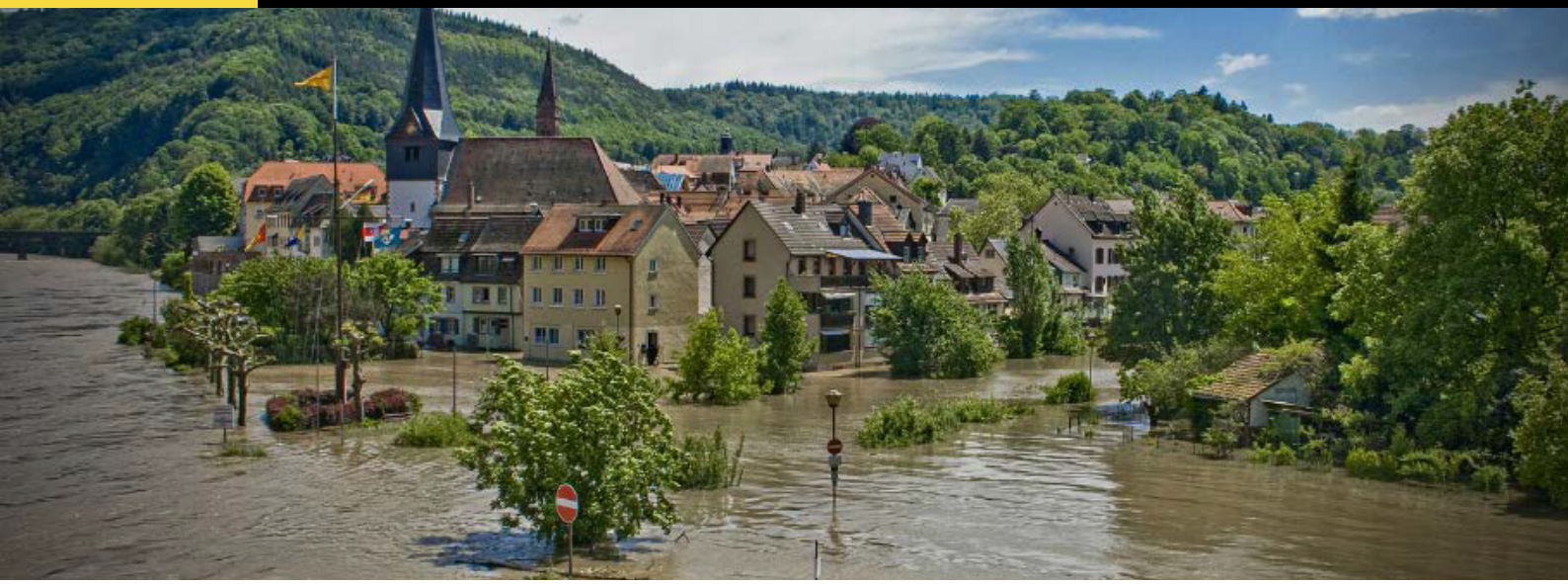
FUTURE FLOOD RISK
AND THE PRA CLIMATE CHANGE STRESS TESTS

2021



In June 2021 the Prudential Regulation Authority (PRA), part of the Bank of England, released its Climate Biennial Exploratory Scenarios (CBES) which requires banks and insurers to explain their future exposure to climate change risk. This is increasing the demands on insurers and banks in how they model and analyse many natural catastrophes. CBES is currently only required for a select number of companies, but regulatory requirements are likely to increase for all insurers in the future. Traditional catastrophe models need to be "climate conditioned" in order to be used to assess future climate risk. The stress tests create new challenges for insurers, but also open up opportunities for data and modelling companies to create new tools to assess these new types of climate risk assessment.

At this event, we were joined by Fathom and Nasdaq to talk about some of the practical steps insurers can take to assess the risk. We reviewed how Fathom's flood models are being climate conditioned and how these will be supported by the Nasdaq catastrophe risk modeling platform. Tom Philp from Maximum Information helped set the scene and brought his experience from talking to and helping insurers address climate change stress tests.

Matthew Grant
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What is happening with climate change and the new PRA stress tests?

AS: As the climate is warming, the frequency and severity of extreme weather events is increasing. Over the past few years, financial regulators have become more interested in potential climate risk. The CBES are designed to explore the exposure of a select group of banks and insurers to climate risks. However, there is a lot of uncertainty within this area. Trying to respond to the requirements of regulators over the next few years will be a huge challenge for the modelling sector.

What challenges are insurers facing in responding to the tests?

AS: Insurers have an advantage over banks - they have been using natural catastrophe models for decades. Nevertheless, projecting climate change impacts and future losses is a significant challenge. This challenge is compounded by the broad scope of the CBES - they incorporate 14 physical variables. Climate-conditioned models are required to answer questions for all these variables. Fathom is now building UK models that are climate-conditioned. They're available on the Nasdaq platform.

In the future, measures of uncertainty need to be incorporated into projections. This includes uncertainty surrounding which scenarios should be selected, and uncertainty within a given scenario.

How different is the resolution of Fathom's models across the world?

AS: The accuracy of Fathom's flood models vary widely depending on location. Data rich areas like the UK can be modelled much better than areas like Africa and Southeast Asia. The problem is amplified when looking at future projections, mostly dependent upon the availability of climate models. In the UK, there are good climate models available - Fathom uses a 12km resolution model to climate condition its flood model. For areas that lack this detail of climate model availability, global climate models have to be used. Applying these in a meaningful way for floods specifically is difficult. There is a lot of uncertainty.

Dr Matthew Jones, Head of Catastrophe Risk Products, Nasdaq

What is Nasdaq doing and how is it collaborating with other modelling companies?

MJ: Nasdaq provides a multi-vendor catastrophe risk modelling platform. Customers have access to a wide range of models within one user interface, making it easy to change models. There are 12 vendors on the platform, including Fathom. 300 country perils are covered, and all models deployed are based on the Oasis Loss Modelling Framework. Fathom is the first vendor to produce a climate conditioned catastrophe model on our platform.

What guidance would you give to those grappling with uncertainty and how they respond to stress tests?

MJ: Developing a view of climate risk and understanding how models have been developed is important. Including inputs from multiple models can be useful. Looking at a range of scenarios can also be of use - companies can think about the business consequences of different outputs within the range.

Dr Tom Philp, Chief Executive Officer, Maximum Information

What is Maximum Information doing?

TP: There are a lot of bridges being built between academia and industry in the catastrophe and climate risk space. But there are still a lot of gaps, so I saw an opportunity to provide targeted analytics. There are gaps between model vendors and users. There are also gaps on the academic side. Although I have set up a private company, it also has a not-for-profit arm to help communicate with universities.

How does the CBES compare to the 2019 stress tests, and how seriously are insurance companies taking it?

TP: They are taking it as seriously as they need to. The 2019 stress tests were a lot more exploratory. Now, the PRA is trying to get the impacts on balance sheets across the board. For insurance, this includes physical risk, transition risk and potential litigation impacts. This needs to be done for multiple time horizons on multiple different emission scenarios. It is a lot of work.

Has the PRA stated which third party models are acceptable?

TP: The PRA wants banks and insurers to make their own judgements. It is trying to challenge firms to fully understand the problem and how to report on the risks. This will require companies to interact with a lot of different model vendors.

There is a lot to tackle. Where should organisations start?

TP: There are a number of challenges. Climate modelling does not easily connect with how catastrophe models have been built. Making the leap is difficult, and climate-conditioned models for every area will not exist within the next few months. Insurers should look at their key peril regions and work out what model vendors currently have to offer.

The three specific emissions scenarios for 2050 that CBES lays out are: early policy, late policy and no policy action. This does not connect well with the scientific representative concentration pathways (RCPs), so it is another leap organisations have to make. RCPs are greenhouse gas concentration trajectories adopted by the Intergovernmental Panel on Climate Change.

Communication is also important. Companies need to be clear that they are only reporting changes in hazard, not reporting on the full future risk that includes for example increases in populations.

Dr Natalie Lord, Senior Climate Change Expert, Fathom

What do you do at Fathom?

NL: My role at Fathom is to develop our climate portfolio. We use data from state-of-the-art climate models to try to understand how precipitation might change in the future, and how this will impact inland flooding and cyclones. The aim is to develop global data products that allow us to account for future climate changes in a way that is flexible and transparent.

What are climate-conditioned models?

NL: In a climate-conditioned model, the outcome is linked to one or more physical climate variables or hazards. Traditionally, these models have been conditioned on the present climate. But as the climate changes, these will become increasingly outdated. Projections of future climate changes need to be incorporated into models so that the changing risk can be assessed.

How is climate change impacting flooding?

NL: Flooding can arise from a number of different sources. Pluvial floods are associated with extreme heavy rainfall, fluvial with river flow and coastal flooding can be caused by sea level rise. Tropical cyclones can cause all of these types of flooding. It is important that models represent all processes.

At Fathom, our models cover three different time horizons and use the Met Office's 2018 UK Climate Projections. We've modelled two emission scenarios: RCP2.6 and RCP8.5. This gives a range of potential trajectories for how climate and flood risk might change in the future. We've also produced a set of models that are appropriate for CBES. They have been specifically conditioned based on the warming scenarios and the time horizons that have been defined by the PRA. They are ready to use now and are available on the Nasdaq platform.

Audience Questions

Is it possible to model flash flooding as climate changes?

AS: Not globally, but in the UK it is getting close. Convective rain cells are often involved in flash flooding, and these kinds of phenomena are not represented in global climate models. The increasing fidelity of climate models in the UK means that progress is being made in representing extreme rainfall over really short durations. In a few years there should be climate models that represent convective rain cells.

Will the PRA expect smaller companies to respond in proportion to their size to the stress tests?

TP: CBES has been aimed at 10 insurers, 10 banks and 10 syndicates within Lloyd's. It will take an assessment of the results by the PRA before it decides if more companies will have to get involved. However, smaller insurers are being asked similar questions by their investors and clients. It is still important to get answers to these questions.

AS: I'd also like to just add that although smaller organisations haven't been required to take part in the CBES, the UK Government and Bank of England have made it clear that all insurers will need to have embedded their approaches to managing climate-related financial risks by the end of 2021. So, although you don't need to follow the exact structure of CBES, it will put you in good stead to align your thinking as closely as possible - and to do this sooner rather than later.

If you have been struggling to find an approach to climate-related financial risk that is in-depth but also proportionate to your business, then platforms like Nasdaq are the middle ground. Models like ours can be accessed as part of a wider ecosystem of perils and once you have uploaded your portfolios, you can download your flood risk information within minutes. So I would recommend getting in touch with their team to talk about what options are available for you to begin to measure the impact of climate on your risks.

Are insurers collaborating on how to respond to the CBES?

TP: Whilst every company has to have an independent strategy, there is a lot of collaboration within the industry. There is some effort to create an open source catastrophe modelling journal. Other initiatives include trying to set up a climate risk research group.

MJ: The Insurance Development Forum is an example of insurance collaboration. The Risk Modelling Steering Group (RMSG) in particular aims to improve global understanding and response to disaster risk.

Any recommendations for those who are using models and want to be able to map the outputs?

MJ: QGIS is an open source GIS package that is exclusively for mapping things, including outputs from catastrophe models. The software R can also be used for mapping.

AS: I would recommend QGIS and Python.

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