Climate change and insurance:
The evolving role of scenario modelling

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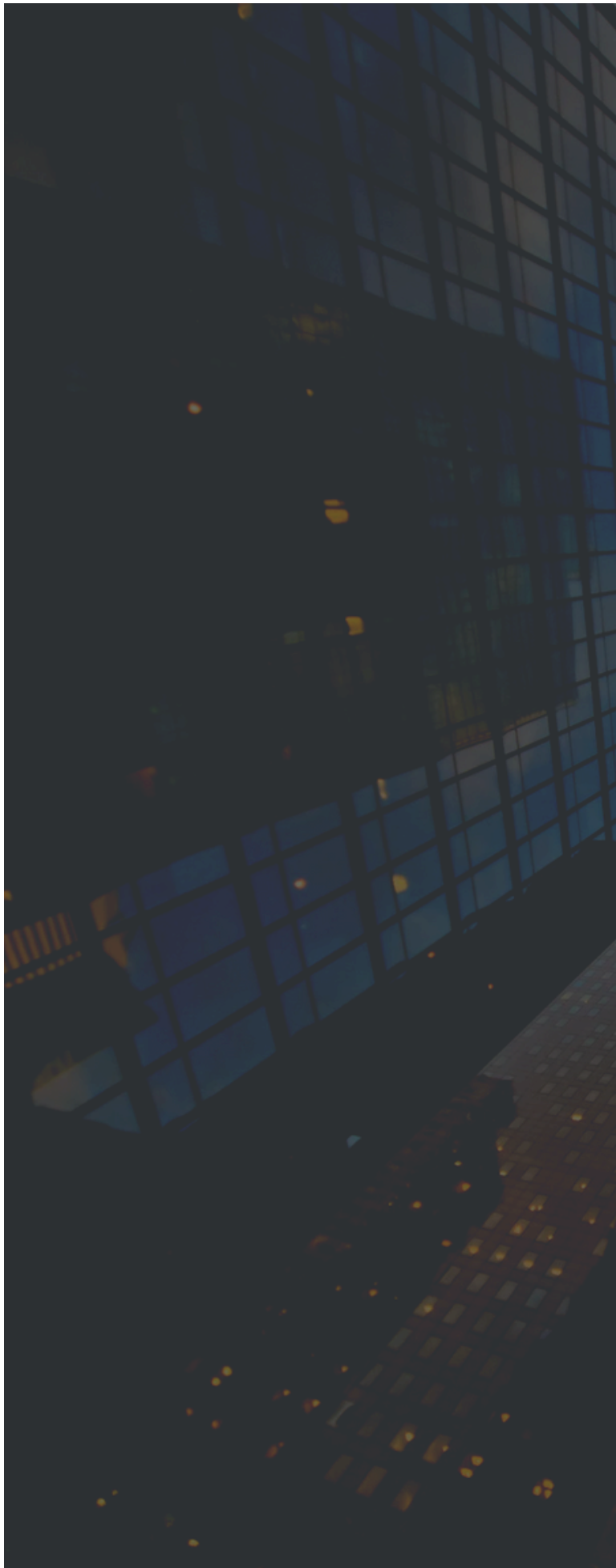
Climate change is a major emerging risk that has the potential to impact both sides of an insurer's balance sheet and one that risk and capital teams will have to integrate into their modelling. As well as exploring the impact of the physical risks from climate change, the modelling should also consider the transition risks that arise as we move from a carbon-intensive economy to a lower-polluting, greener economy. The transition to a net-zero economy brings financial risks for insurers, and regulators are urging them to explore those risks. In a podcast with The Actuary magazine, Moody's experts discuss the common approaches to modelling climate change. The podcast discusses the sources of climate scenarios as well as how insurers' assessment of climate risk is shifting from a qualitative approach to quantitative.

Scenario analysis has long been a core element of an insurer's risk modelling framework. Many use tens of thousands of short-term stochastic scenarios to model loss distributions arising from both natural catastrophe and financial market events. Therefore, climate scenario analysis is the natural approach for most insurers to take. In the UK, the Bank of England's Climate Biennial Exploratory Scenario (CBES) exercise was the first exercise most UK-based risk teams experienced. The CBES exercise was long-term in nature, with the projection horizon being decades into the future. Although climate change is undoubtedly a long-term issue, we see shorter-term impacts as a significant earnings risk. Examples like increased hazards, pressure on pricing, and the potential for short-term market adjustments have the potential to impact the industry as severely as the events of 2022.

Creating short-term stresses from long-term scenarios

There are different approaches to incorporating the shorter-term impact of climate risk into the scenario analysis. Our view is that the insurance industry can benefit from harnessing the scientific financial economic expertise it has built in the last few decades. There are new methodologies that apply shorter-term stresses to the long-term scenarios from expert groups like the Intergovernmental Panel on Climate Change (IPCC), International Energy Agency (IEA), and Network for Greening the Financial System (NGFS). Applying this short-term scenario analysis to granular liability and credit risk, and systematic economic and market risks, gives a 360° view of impacts to the business and its different operating functions. The challenge is to make the modelling consistent across different systems, like market risk and underwriting, for consistent results. Luckily, scenario analysis is ideal for creating this consistency.

The NGFS climate scenarios, which integrate transition risk with acute and chronic physical impacts, provide an industry standard and the multidimensional approach needed to achieve consistent modelling. In their podcast, Nick Jessop and Riccardo Rebonato discuss how standard climate scenarios can be used to create short-term stresses for financial markets.



Turning uncertainties into practical application

So, what does this all mean in practice? It means looking across three investment horizons (short, medium, and long), which span 1-10 years into the future.

On the liability side of the balance sheet, it is possible to condition catastrophe risk models on different climate scenarios to understand how different perils, such as those modelled by Moody's RMS, will evolve. If producing stochastic analysis, insurers can stress not just earnings and loss expectations but also capital and reinsurance requirements.

On the asset side, awareness is growing around the economic and market risks likely to impact insurers. These include climate inflation, changes to broad market valuation level, and shifts in yield curves and spread levels. Sectoral impacts could also include significant stranded assets. From a capital perspective, it is important to realise that these business risks are likely to manifest because of short-term market adjustments like those witnessed in 2022, and more severely in 2007.

As highlighted in the recently published Institute & Faculty of Actuaries paper *Climate Scorpion – the sting is in the tail*, there is great uncertainty in climate modelling, probably more so than in any other area of actuarial modelling. One of the key assumptions is the climate sensitivity, which is the degree of warming if the concentration of GHG emissions in the atmosphere doubles. However, there are many other sources of uncertainty, including government policy, the speed of technological change, and the extent of carbon capture usage. This makes the analysis challenging, particularly when trying to model how financial markets will react. Arguably it is this uncertainty which makes it more important to model the potential impact quantitatively. This type of modelling will give insurers a better understanding of their exposure and the potential impact climate change will have on their projected earnings and solvency ratio.

As the impacts of climate change are expected to become increasingly prevalent, it is important to determine best practices around capital modelling as well as consider transition risks and opportunities. Moody's Climate Pathways scenario service translates climate pathways into financial variables for input into an insurer's asset and liability projection to support the incorporation of transition and physical risks into their own risk and solvency assessment (ORSA). At the LMA, please reach out to Sanjiv Sharma if you would like to hear more about the work being done on climate change modelling in actuarial and exposure management, and Alex Koukoudis to hear more about transition risks and the LMA Climate Risk Working Group.