AXA

Understanding Risk

AXA XL's Science & Natural Perils team works with a number of academic institutions on a variety of specific projects, in order to further our understanding of natural perils and assist in the accurate pricing, monitoring and assessment of risk.

Wind, flood and vulnerability

1. National Centre for Atmospheric Research (NCAR) Partnership

The aim of this partnership is two-fold: (1) evaluate and propose evidence-based methodological improvements to existing Tropical Cyclone Induced Precipitation (TCIP) methodology across hurricane-prone regions of the US and the Caribbean, under current and future climate conditions, and (2) produce multi-hazard deterministic scenarios comprising wind, rain, and surge information to explore relationships between sub-perils during hurricane events, and how these relationships may evolve under climate change.

2. Colorado State University (CSU) / Barcelona Supercomputing Centre (BSC) Collaboration

AXA XL sponsor a market-recognized website for seasonal storm activity in the Atlantic, as put together by experts from CSU and the BSC. Our collaborators collate and publish seasonal hurricane predictions from all major forecasting agencies, universities and research groups. Through this process we have first-hand account and easy access to most, if not all, of the various views on the upcoming/developing hurricane season in the Atlantic, while also benefiting from extremely valuable insights provided by the scientists involved, on why and how the season is likely to develop.

3. Lambda Ltd Climate Research Partnership

The collaboration with Lambda is mainly around climate change and how we can more efficiently and meaningfully use current catastrophe models to gauge future changes in risk, particularly from a hazard perspective. The analysis so far has focused on tropical cyclones in the Atlantic, Western North Pacific as well as Australia. The project aims to develop a more sophisticated implementation of scientific information in order to support our risk assessment tools.

4. Internal AXA XL Project: Assessing impacts from Climate Change Sea Level Rise Tipping Points

The IPCC defines a tipping point as "critical thresholds in a [climate] system that, when exceeded, can lead to a significant change in the state of the system, often with an understanding that the change is irreversible [on human time-scales]". As global warming continues, the likelihood of these climate change tipping points occurring increases. AXA XL is currently quantifying the potential financial impacts of these tipping points, mainly focusing on the global sea level rise, which may be influenced by the Greenland and Antarctic Ice Sheet Tipping Point occurring.

5. ENSO Monitoring and Communication

ENSO (El Niño-Southern Oscillation) describes the naturally occurring oscillation in sea surface temperatures over the central and eastern equatorial Pacific Ocean. ENSO impacts global weather and the frequency of some natural perils. To inform internal stakeholders on the current state and forecasts of ENSO and how this may impact expected upcoming losses, AXA XL's Science and Natural Perils Team quarterly publishes 'ENSO Bulletins' for the US and Australia.

6. University of Reading Projects – Refine Saffir Simpson Scale and US Winterstorm Risk

One of project aims to improve our ability to represent and forecast hurricane damage, by better understanding the hazard, exposure and vulnerability attributes that influence historical damage, and use this approach to refine the Saffir Simpson Scale, which currently is solely based on hurricane wind intensity. Another partnership with the University of Reading aims to quantify the collective risk across North America from extreme winds, freezing, snow and ice. This project explores how best to identify and capture these phenomena in atmospheric datasets, so that these methods can be used in better evaluating catastrophe models to ensure AXA XL has a more realistic view of risk.

7. University of Reading – Counterfactual Research

Counterfactual analysis looks at the 'what if' events in the historical record with the goal of developing a more profound understanding of all possible events. Due to objective constraints on available instrumentation and observing the atmosphere in the past, the most reliable hurricane record is generally limited to the last 70 years or so. The counterfactual approach allows the extension of this short historical record to determine the full spectrum of possible events and possible 'counterfactual hotspots', with high potential for damage and possible (re)insurance payouts.

8. Coastal Risk Index (CRI)

Assessing the importance of marine ecosystems and the impact of increased sea levels on coastal communities, both now and in the future, is part of the broad 'Coastal Risk Index' project. Led by the AXA XL Sustainability team and the Ocean Risk & Resilience Action Alliance (ORRAA), the CRI project aims to enable ocean risk transfer for coastal communities and to build economic resilience against flood risk and degradation of coastal natural capital. The project supports risk management and consulting solutions and the development of pragmatic blue economy insurance products. AXA XL is also using the CRI data to identify portfolio hotspots that could be particularly exposed to sea level rise and/or protected by existing natural barriers like mangrove forests.

9. IRIS – The Imperial College Storm Model

Given the infrequency of landfalling tropical cyclones and the short period of reliable observations, assessing tropical cyclone risk on a global scale remains a challenge. Synthetic tropical cyclone datasets can help overcome some of these problems. AXA XL has partnered with the Lighthill Network for the improvement of the ImpeRIal College Storm (IRIS) model as well as use for climate sensitivity testing. Model takes input from 42 years of observed tropical cyclones and creates a 10,000 year synthetic dataset.

Earthquakes, wildfire and exposure

1. Global Earthquake Model (GEM) Partnership

We are extending our partnership with the Global Earthquake Model (GEM) Foundation, a globally accepted standard for seismic risk assessment, for academic work and public and private organizations. AXA XL will benefit from using global databases, tools, and standards for internal work, such as model evaluation, risk consulting as well as earthquake risk mapping and risk management worldwide.

2. Internal AXA XL Project: Earthquake Clustering and Aftershocks

A less documented limitation of earthquake CAT models is that they only include mainshock events. Aftershocks are effectively a non-modelled peril. Recent worldwide earthquake events (e.g., 2010-2011 Christchurch sequence in New Zealand, 2023 Turkey-Syria sequence) have highlighted the need to account for the aftershocks in earthquake CAT models. This project establishes a methodology for modifying the stochastic catalogue to account for aftershocks and to quantify their impact on insured losses.

3. International Seismological Center (ISC) Project

AXA XL is sponsoring ISC to develop their product called "Comprehensive Earthquake Catalogue", along with new tools through the use cases and feedback from AXA XL. A more consistent and complete earthquake catalogue is certainly helpful for our model evaluation work and the development of our view of risk.

4. University College London (UCL) & Birkbeck

Our partnership with UCL and Birkbeck University aims to explain the irregular frequencies and severities of past earthquakes. The frequency of earthquakes varies due to temporal clusters of damaging earthquakes lasting hundreds to thousands of years, and longer-term fault quiescence lasting tens to hundreds of millennia. AXA XL participates in regular discussions and advises the investigators on useful ways to engage their work directly with the industry, ensuring knowledge exchange within the (re)insurance sector.

5. University College London (UCL) – Flood and Wind Vulnerability Project

In collaboration with AXA XL's Risk Consulting team, the UCL project aims to develop and expand our internal database of vulnerability functions for hydrological (i.e., rain-driven, flood) and meteorological (i.e., wind-driven) perils. There is a clear gap in the market's general ability to validate vulnerability functions for these perils (functions usually included within cat-models but also within other tools). This work is aimed at filling that gap, mainly in order to support our model evaluation and risk consulting work in developing our view of risk.

6. University College London (UCL) – Future Built Environment

Although normally considered constant in future risk assessments, vulnerability and exposure are hardly constant. This PhD project with University College London (UCL) examines possible future changes in vulnerability and exposure (the built environment), thus providing a clearer understanding of how these elements drive changes in risk in the present time as well as future time. This project will focus on hurricane wind as the primary driver of losses, and the geographic scope of the study is mainly focused on the hurricane States in the US, given its relevance to the (re)insurance industry as a whole.

7. Journal of Catastrophe Risk and Resilience Sponsorship

The AXA XL Science Team are on the editorial board of the first diamond open-access, peer-reviewed journal of catastrophe research - the Journal of Catastrophe Risk and Resilience. This is a unique space for debate and discussion for insurance-related science. Free to publish and read, the Journal of Catastrophe Risk and Resilience features online, peer-reviewed research, and opinion articles from industry experts and academics globally.

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