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AIR Currents Special Edition

Modelling Cyber Risk Probabilistically for Better Decision-Making

A major element affecting many companies' willingness and ability to write cyber risk is the relative scarcity of reliable data on incidents and losses and the evolving nature of the risk.

The AIR Probabilistic Cyber Model, available in the latest release of ARC—AIR's cyber risk modelling platform—helps (re)insurers understand their loss potential to both attritional and extreme events before they occur. This data-driven model leverages vast quantities of a wide array of data, including cyber security insights and data from internet-sensing, as well as incident, business-to-business connectivity, and claims data. Using machine learning and stochastic simulations, the model delivers insights into the likelihood of cyber incidents and the financial impact that those incidents could have on individual risks or books of business. Furthermore, the model enables (re)insurers to keep up with the evolving cyber risk landscape because it has been built with a transparent and flexible modelling framework that allows analysts to study the drivers of modelled loss and test their own views of risk.

Machine Learning, Unique Data Sets Identify Likelihood of Cyber Incident Loss

To determine the likelihood of an organisation experiencing a cyber incident and the factors that drive risk, AIR leveraged machine learning techniques best suited to identify signals in the data. This approach was trained using the model's incident loss database—which comprises data on more than 77,000 cyber incidents, such as lost devices, social engineering scams, computer hacks, unauthorised data disclosures, ransomware, and cloud service downtime—and our industry exposure database (IED), which represents the insurable global cyber market and contains firmographic and technographic information for more than 12 million organizations. In addition, claims data from several cyber insurers was obtained to further validate our view of the likelihood of cyber incident loss. The model accounts for biases due to the underreporting of cyber incidents and is well validated with actual incident and loss experience.

A Tool to Identify Potential Cyber Risk Aggregation

ARC can be used to identify accumulations of cyber risk and the likelihood and loss potential of an incident that triggers multiple losses in a portfolio as well as the likelihood and financial impact of large systemic events. ARC can also be used to determine capital allocation requirements by estimating the likelihood and financial impact of large systemic events.

ARC works with the full range of exposure data—detailed or aggregated—and leverages the underlying IED and region-specific data that can be applied to organisations in the United States, Canada, United Kingdom, Europe, Japan, Australia, and rest of world (RoW) to augment insurers' exposure data. This means, the AIR cyber model also generates industry loss profiles, which can support various forms of risk transfer, including ILS transactions.

Optimise Cyber Underwriting

Data compromise constitutes the most frequent type of cyber incident impacting businesses and, not surprisingly, (re)insurers often resort to limiting their exposure when the risk is not well understood. The AIR Probabilistic Cyber Model provides insurers with the insights they need to overcome this challenge so that these risks can be underwritten more effectively. (Re)insurers can leverage the model's ability to differentiate risk to improve their risk selection and ensure that the most viable risks are underwritten.

AIR provides a range of solutions that support the robust growth of the cyber market with a consistent set of models and tools purpose-built to support the insurance value chain

Contents

Modeling Cyber Risk Probabilistically for Better Decision-Making 1

Letter from Bill 2

Time-Dependant vs. Time-Independant Views 3

Typhoon Jebi: Managing Japan Typhoon Risk Today 4

Monte Carlo

AIR

Letter from Bill

As we meet again for the Monte Carlo Rendez-Vous this year, I wanted to take a moment to reflect on last year as well as share AIR's priorities, which continue to be based on feedback we are hearing from you as well as our read of the trends in the global (re)insurance industry.

In 2018, we ended up with about USD 85 billion in insured losses, far less than the record-breaking USD 130 billion in 2017. And when compared with AIR's 2018 estimate of global insured AAL from natural perils—USD 86 billion—2018 was about average, despite the headline-grabbing events. For many, 2018 may still have seemed like quite a severe loss year, as we had at least 40 events causing more than USD 1 billion in loss, including California wildfires and a series of events that hit Japan, notably Typhoon Jebi, yet the impact on the market remains muted. Years such as 2018 reaffirm our core focus of providing you with the most comprehensive and sophisticated suite of models to help you understand and manage extreme event risk.

As clients embrace digital solutions to stay ahead of the curve, there is growing traction for disruptive new business models that could change how insurance is transacted. But it is also the case that everyone is fighting largely over the same "pie" of risk, as the global insurance protection gap remains stubbornly large. According to AIR's 2019 global modelled loss analysis, modelled insured average annual loss totals USD 91.8 billion based on our global suite of models, which is less than half the insurable amount of USD 191.4 billion. At the 1% exceedance probability, the gap is even more stark, with USD 288.2 billion insured out of the USD 655.2 billion that is insurable. We at AIR are particularly passionate about closing the global protection gap by helping (re)insurers expand and enhance their offerings. To that end we continue to expand beyond natural perils to emerging perils, offering updates to the probabilistic cyber model we released in 2018 and introducing a stochastic casualty model, and expanding our life and health capabilities by adding a longevity model to our existing suite of excess mortality models.

We have continued to execute and deliver on our technology vision as we have since Touchstone® was introduced in 2013 by implementing significant performance, workflow, and user experience improvements in Touchstone, including a direct integration with Impact, one of the flagship products of our sister company Sequel. We have continued to expand expand the functionality of Touchstone Re™ and now provide integration with Analyze Re to offer unparalleled reinsurance and portfolio decision analytics. We're also seeing more clients take advantage of being able to run their analyses on the AIR Cloud.

We have also advanced transparency, flexibility, and open modelling by releasing Model Builder™ to provide an easy way to create custom models and deploy them in Touchstone. A long-time proponent of open exposure data standards going back to our development of the publicly available UNICEDE® format in 1993, AIR continues to explore new ways to facilitate the collection and exchange of high-quality exposure data throughout the insurance value chain. I'm very proud of our latest step to make our CEDE exposure data schema publicly available, removing any workflow barrier that can be exacerbated by a closed proprietary data schema.

A final area of focus, which makes us truly unique, is our work with sister companies across Verisk to deliver enhanced solutions to you. Together, we are working on global InsurTech solutions for enhancing property exposure data, private flood insurance solutions in the US, and cyber risk management tools, just to name a few.

We continue to value the partnerships we've developed with many of you over multiple decades, and we are honored to see many more companies adopt AIR as their primary model. In fact, over the last several years, more than 25 insurers and reinsurers accounting for more than USD 50 billion in global premiums have made AIR their primary model. I see this as good news for all clients—it has never been easier to use AIR's highly respected model output as the currency for transferring risk. I hope you enjoy your time at the Rendezvous and I would love to hear from you here at Monte Carlo and in the coming weeks and months.

Time-Dependent vs. Time-Independent Views of Seismicity

A time-dependent view of seismicity enables more accurate assessments of your earthquake risk than a time-independent view.

Time-Independent View

- Uses a mean recurrence rate
- Recurrence rate is assumed to be constant throughout time
- Does not account for the impact of recent events

Time-Dependent View

- Considers the buildup of strain on faults over time in addition to historical earthquake data
- Allows the recurrence rate to vary with time to reflect changes in the seismic environment
- Uses kinematic modelling of GPS data to identify “locked” faults and the impact of recent events

A time-dependent view of seismicity enables the modelling of changes in rupture potential for faults affected by the 2016 M7.8 Kaikoura earthquake, whereas a time-independent view would not.

For a comprehensive view of earthquake risk, a time-dependent view of seismicity should be used.

The updated AIR Earthquake Model for New Zealand includes:

- **Time-dependent and time-independent views of seismicity for both 10K and 100K simulated years**
- **Shake, tsunami, landslide, liquefaction, and fire-following sub-perils**
- **A trans-ocean basin view of tsunami risk**
- **Explicit modelling of complex multi-fault rupture scenarios**
- **The most detailed soil maps available**
- **Lessons learned from the 2010/2011 Canterbury Earthquake Sequence, the 2016 Kaikoura earthquake, the 2011 M9.0 Tohoku, Japan, earthquake, and other worldwide earthquakes**

Typhoon Jebi: Managing Japan Typhoon Risk Today

The third costliest natural disaster globally last year, Typhoon Jebi is estimated to have caused insured losses of about USD 13 billion at the time of this writing. Although Jebi is firmly established as Japan's biggest typhoon-related insurance and reinsurance loss on record, much greater losses are possible. In this article, we take a look back at historic storms to understand Jebi's losses in context and provide modelling tips to manage Japan typhoon risk.

Typhoon Vera

Typhoon Vera came ashore west of Ise Bay on September 26, 1959, with winds near 240 km/h and tracked quickly across Honshu, losing little strength over land. Much of the damage to more than 1 million homes caused by Vera was in Aichi and Mie prefectures. AIR estimates if Vera were to recur today, it would result in insured losses of approximately JPY 1,943 billion (USD 17.7 billion), caused mostly by wind.[1] Vera became the event used by insurers and reinsurers to define the reserve for a 70-year return period event.

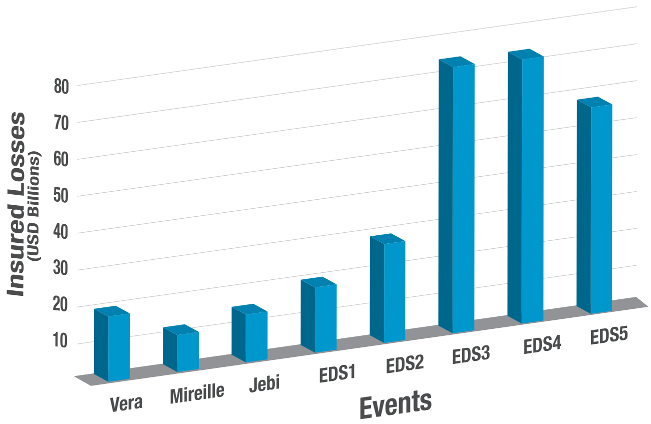
Typhoon Mireille

Typhoon Mireille whipped across Japan on September 27, 1991, with winds in excess of 160 km/h, causing damage in 41 of Japan's 47 prefectures, destroying more than 170,000 houses and resulting in the largest insured loss claim ever paid for a typhoon-related loss in Japan's modern history. AIR estimates Mireille's recurrence today would result in insured losses of JPY 1,115 billion (USD 10.18 billion), caused mostly by wind.

Typhoon Jebi: Managing Japan Typhoon Risk Today

Typhoon Jebi had an intensity the equivalent of a Saffir-Simpson Category 3 hurricane when it struck Shikoku on September 4, 2018. A second landfall followed near the city of Kobe, 30 km west of Osaka, on neighbouring Honshu. Major cities in the Kansai region, among them Osaka, Kyoto, and Kobe, were brought to a halt. The typhoon caused major damage to buildings and infrastructure, seriously impacted shipping and transportation, and led to significant business interruption.

As we can see from the figure, Jebi is not an extreme tail event; far greater losses are possible. The AIR Typhoon Model for Japan includes not only historic typhoons in its catalogue but also Extreme Disaster Scenarios (EDS) that represent unlikely, but scientifically plausible, scenarios that cannot be captured by standard stochastic modelling techniques. (Re)insurers can perform detailed loss analyses against these historical and "grey swan" events to grasp the possible impact on their business.



Modelled insured losses for historic typhoons if they were to recur and modelled insured losses for 5 Extreme Disaster Scenarios in the AIR Typhoon Model for Japan. (Please note: Jebi's losses reflect industry estimates as of May 2019.)

The full range of scenarios a model can generate—simulating several perils that can impact Japan—provide a unique and important perspective on an organisation's risk. The careful analysis of model results can help risk managers prepare for many contingencies—thus ensuring that another Jebi, for example, will not be entirely unexpected. The AIR Typhoon Model for Japan, one of a suite of AIR models for Japan—can help organisations evaluate the full range of potential events so that they can manage their risk effectively.

[1]The insured loss amounts given in this article include only residential, commercial, mutual, and auto lines of business; they exclude loss adjustment expenses, loss from Miscellaneous (e.g. marine, accident, etc.) demand surge, business interruption, etc. The USD amounts given in this article are based on an exchange rate of JPY 1 = USD 0.0091.

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