A SHORT REVIEW OF THE IMPACT OF TECHNOLOGY ON INSURANCE

AND PRICING OF REINSURANCE

Before addressing the more finite issue of the impact on flood loss and pricing, we should first at least briefly, examine the impact of Artificial Intelligence (AI) or Machine Learning on the insurance industry overall. In the past few years, AI has advanced at spectacular speed in many areas including medicine, finance, auto industry, agriculture, marketing and the insurance industry has been no different. For our industry care must be taken to not to focus merely on the benefits, but the risks as well. For Insurance, those risks include exposures created by technology such as autonomous cars, cyber-attacks and breaches, and questions of whether it can in fact improve competitiveness. Can it improve or hurt customer experience? Will it reduce risk exposures? Improve profits? Today we will focus on the benefits.

Weather by the Numbers[1]

Against this brief backdrop, let us turn to weather and more specifically, flood. It is no secret that insurers in 2017 paid out a record $132 Billion in weather related damage. Global natural catastrophes (including other than weather related events) caused $353 Billion in economic losses, with losses covered by private and public insurers reaching in excess of $134 Billion. This was just behind the record of $137 Billion paid by insurers as a result of catastrophic events in 2011, and only the third time ever that insured losses from natural events exceeded $100 Billion. There were 31 events around the world with insured loss of greater than $1 Billion, 16 in the United States alone. For just weather related events, economic losses totaled $344 Billion with $132 Billion covered by insurance. The previous weather related record was $128 Billion. 51% of catastrophic losses occurred in the continental United States and 63% of insured catastrophic events occurred in the continental United States.

As weather related events grow more volatile in their size and potential impact and we continue to move to and build in vulnerable areas of the world, it becomes more and more imperative that we must be able to identify ways to increase awareness, improve communication and lower the insurance protection gap. Natural disasters will occur. They always have and always will. The question is how are we going to be prepared when the next event hits and how will we respond.

About 62% of global weather related losses in 2017 related to hurricanes Harvey, Irma and Maria. They all occurred between August and September and struck the US and Caribbean. About $220 Billion in damage was caused by the three storms with about $80 Billion covered by insurance companies. That equates to 60% of global insurance payouts being the result of the three storms. Thunderstorms around the world accounted for $35 Billion ($24 Billion covered) and United States wildfires caused $14

[1] Aon Benfield “Weather, Climate and Catastrophic Insight” 2017 Annual Report

Billion of insurance losses which was by far the costliest year on record for that peril. The largest loss before that was less than $3 Billion in 2007.

Economic losses in 2017 were 93% higher than the average of the same losses in years 2000-2016. The percentage of insured economic loss in 2017 was 163% higher than the same losses in years 2000-2016.

The most significant non-weather related events were caused by earthquakes in Mexico which caused $6 Billion in damage.

Not surprisingly, 2017 was the third warmest year on record dating back to 1880 for combined land and ocean temperatures.

Impact of Technology

Technology and machine learning enables insurers and reinsurers to assess and quantify risk more accurately thus increasing revenue and reducing loss. For underwriting, it can detect and measure key features for commercial and residential structures including for example, roof quality, presences of onsite storage and perimeter fencing. For flood detection, it can and will directly observe flood waters using both Optical and Synthetic Aperture Radar (SAR) satellites to derive and create comprehensive flood mapping. SAR or Synthetic-Aperture Radar is a form of radar that is used to create two- or three-dimensional images of objects, such as landscapes. In Marine Cargo-Specialty lines it monitors and tracks assets across the supply chain from port to port, to manage potentially costly and his risk scenarios and to refine and improve marine cargo insurance pricing models.

This technology must still be partnered with industry expertise. The technology provides the intelligence that the industry can then use to resolve key business challenges. The approach tracks and monitors physical assets on a global, regional, and local and hyperlocal scale. The benefits include improved pricing and risk selection during the underwriting process (using consistent and precise data); a streamlined renewal process through persistent monitoring of an insurer's entire book of business; and an increased visibility into losses immediately following catastrophic events such as inland floods or hurricanes. Considering the scope of losses reviewed above, this is obviously a key benefit to both insurers and reinsurers.

How is this done? Technology accesses the entire planet from anywhere on Earth through cloud based software and some 16,000 satellites orbiting the globe. They used geospatial data to include every major commercial satellite constellation at scale to provide a macroscopic view of the Earth. Then using artificial intelligence and machine learning to quickly digest the petabytes of data they consume, give the industry a better idea of what is happening vis-a-vis losses and the industry as a whole. But the data is not just accumulated from satellites. Drone aerial imagery is uses as is financial, manufacturing and ship location data as appropriate to the industry. One company I am aware of predicted which retailers missed their estimates last quarter. They knew about it even before the retailers knew. In that case, they accomplished to goal by simply counting cars in parking lots using SAR technology.

Flood and Other Mapping

To get a better understanding of area and timing of potential flooding, Artificial Intelligence companies utilize a time series from something called the CREST river stream flow simulation. CREST is an acronym for Coupled Routing and Excess Storage. This is a hydrologic modeling tool which provides water managers with information about recent precipitation amounts and the resulting flood likelihood for watersheds. This information enables better decision-making related to water resources, floods, and agriculture. Currently, a government joint venture known as SERVIR is running the tool in several renditions, including historical model runs, near real-time, short-term forecast, and long-term forecast to quantify the impacts of climate scenarios on regional water resources. SERVIR is a joint venture between NASA and the U.S. Agency for International Development, which provides state-of-the-art, satellite-based Earth monitoring data, geospatial information and tools to help improve environmental decision-making among developing nations in Eastern and Southern Africa, the Hindu-Kush-Himalaya region, Lower Mekong, and Mesoamerica and help manage challenges in the areas of food security, water resources, land use change, and natural disasters.

Using these tools, AI companies detected flood extents long before local reporting or traditional satellite imagery. The detail related not only to extent but to height of flood waters as well. Imagery is then created to visually show where the waters extended, what "assets" were located in those areas, and in detail, project the nature and scope of loss. At this early stage, flood extents are much more reliable than heights.

As this technology advances, flood development prediction and solutions will become easier and more accurate. There will undoubtedly be cooperation with the Army Corp of Engineers for high resolution images of urban areas and as new more modern satellites are deployed, there will be more providers to coordinate with and to validate predictive algorithms. Specifically, there will be better water detecting algorithms, local thresholding instead of universal thresholding which will again result in better observed flood extents.

Flood mapping is not the only advantage. Anything on Earth can be mapped and is mapped. This will allow insurers and reinsurers to better understand the scope and breadth of any risk insured.

Damages

Lidar (light detection and ranging) is an optical remote sensing technique that uses laser light to densely sample the surface of the earth, producing highly accurate measurements. It is primarily used in airborne laser mapping applications and has emerged as a cost effective alternative to traditional surveying techniques such as photogrammetry[2]. It produces mass point cloud datasets that can be managed, visualized, analyzed and shared. Many may have seen this technology demonstrated by engineers inside a conference room. Artificial Intelligence companies use Aerial (often unmanned aircraft such as drones) and LIDAR data to detect and classify underwriting characteristics and feature extraction on properties. In this way, they can provide periodic updates for all homes, buildings,

[2] Photogrammetry is the science of making measurements from photographs, especially for recovering the exact positions of surface points.

structures within a given area and detect new home or other buildings starts for more targeted marketing and for more complete analysis of potential exposures in a given area.

Impact forecasting uses all of this data to understand the impact of catastrophic events in real time. After an event has passed is when loss estimates from insurance companies can test vulnerabilities within impact forecasting. Whether it is high tech satellite technology enhanced by machine learning and artificial intelligence or weather station records or even human observations, Impact Forecasting will improve existing models and ultimately develop new and better products.

In one case study I was able to find involving an auto import export facility in China an exposure analysis provided critical. In August of 2015 and large explosion in a container storage facility in this very busy port occurred. Damages were estimated as high as $6 Billion. It was the worst Marine Cargo loss ever and highlighted the massive exposure that can exist if companies do not accurately know the geographic dispersion of all their assets. Technology was able to help the company automatically count and geo-locate some 72,000 cars stored in the facility prior to the explosion.

Insurance and Reinsurance

Using all of these tools and financial management, insurers and reinsurers can improve catastrophic modeling and analyze the financial implications of natural and man-made catastrophes before they occur. They can better understand the risks from hurricanes, tornadoes, earthquakes, floods, wildfires and terrorist attacks on property.

One key area of impact on reinsurers as well as insurers was that after Harvey, Irma and Maria, discussions between the two about potential pre-funding of paid losses without formal proof of loss reports were prominent. Almost all markets were able to pre-fund losses in lower layers of catastrophe programs and one of the key reasons was the availability of predictive analysis from imagery discussed above. There were many variables that arose for each catastrophic event in 2017. They included the "hours clause", flood versus wind damage with Hurricane Harvey, and aggregation issues. The California wildfires' 168 hour clause[3] highlighted issues raised around when the burning started and ended and whether the individual fires counted as one event or several. Imaging was invaluable once gain. In 2011, places like Thailand, which had floods that lasted 2-3 months and many reinsurance contracts did not have aggregate caps to limit the number of losses.

Following any catastrophe, technology will be used to visit the impacted sites to not merely survey the damage but to assess how each event evolved to impact both people and properties with the ultimate goal of enhancing catastrophe models and identifying lessons for the future. Governments will be able to help revisit evacuation planning, the utilities sector will be able to reassess how electric power is supplied to various regions, and community awareness campaigns will be enhanced.

[3] Wildfires that last more than 168 hours can be split into two events. Floods cannot. Hurricanes, windstorms etc. have a 72 hours clause.