
By Ryan Crompton

Loss normalisation is the process used to estimate the likely losses sustained if past events were to impact present society; it is a process that must be carried out in order to have an ‘apples-versus-apples’ comparison of losses over time. It is a critical prerequisite to answering questions such as whether or not global climate change is affecting disaster losses or to benchmarking the output of catastrophe loss models.

This report builds upon the previous loss normalisation undertaken by Risk Frontiers for the Insurance Council of Australia (ICA) (Crompton, 2006; Crompton and McAneney, 2008). We have now normalised all insured losses in the ICA Natural Disaster Event List between 1 July 1966 and 30 June 2011 to season 2011 values (where ‘season’ 2011 is defined as the 12-month period beginning 1 July 2011).

Figure 1. (top) Annual aggregate insured losses (AUD$ million) for all events in the Disaster List for years beginning 1 July; (below) as above but with losses normalised to season 2011 values

Our methodology follows that of previous studies by Risk Frontiers but with some refinements that are described later. The process is one of adjusting historical losses for changes in the number and value of dwellings in the areas originally impacted. In the case of tropical cyclones losses, we also apply an event-by-event adjustment for improvements in construction
standards introduced at different times around the country after Cyclone Tracy in 1974. The former adjustments are equivalent to overseas’ studies that correct for changes in population, wealth and inflation, while dealing with changes in construction standards is a unique contribution. The original and new normalised figures are given in Figures 1a and b, while the equivalent results for the weather-dependent perils are shown in Figures 2a and b.

The top 10 normalised losses are listed in Table 1. The highest ranked normalised insured loss is now the 1999 Sydney hailstorm and the average annual normalised insured loss over the 45-year period is AUD$1174 million. In their normalisation of the Disaster List ending at the 2005 season, Crompton and McAneney (2008) noted the low loss activity in the most recent 5 seasons; since that time there has been heightened loss activity with the most recent 5 seasons to 2010 costing double the 45-year average. The annual insured loss over the most recent 10 seasons (2001 – 2010) averaged AUD$1462 million, a figure within 25% of the average annual loss over the full 45-year period of the Disaster List.

Regarding an anthropogenic climate change signal, the story remains unchanged: we do not detect any residual trend after normalisation that might be attributed to climate change, and on the basis of other work (e.g. Crompton et al. 2011), we would not expect to see one for a very long time.

Methodological Refinements to the Normalisation Process

**Dwelling Number Factor**

In our earlier calculation of the *dwelling number factor*, the factor that adjusts the original loss for the increase in exposure since the year of the original event, Crompton and McAneney (2008) used the number of ‘occupied’ dwellings. At that time, we did not have data for the 1971, 1976 and 1991 census years. In our latest deliberations, data for the total number of dwellings (i.e. including ‘unoccupied’ dwellings) and all census data from 1966 are employed.

Crompton and McAneney (2008) also used a single Urban Centre/Locality (UCL) for each event in the calculation of the dwelling number factor, whereas our current approach is to use multiple UCLs when necessary, with up to eight UCLs used to represent each event. (A UCL is a classification structure used by the Australian Bureau of Statistics: in broad terms, an urban locality refers to a population cluster of 1000 or more people and a Locality to a cluster of between 200 and 999 people). The main source of additional information accessed to determine affected locations was Risk Frontiers’ PerilAUS natural disaster database.

**Dwelling Value Factor**

Both our current approach and that of Crompton and McAneney (2008) use the average nominal value of new dwellings to represent the change in replacement value over time – the *dwelling value factor*. However, part of the increase in new dwelling values is due to the increase in the average floor area. The dwelling size adjustment is required as the size of new dwellings increases faster than the size of total dwellings and it is the increase in the size of *total* dwellings that needs to be included in our normalisation. This is what has been done.

Our new approach to calculating the dwelling value factor for each State and Territory is to use our derived average nominal value of new dwellings for seasons 1974-2010 (1973-2010 for Tasmania). We extrapolate to season 2011 using the average growth rate over the seasons 2005-2010 and to season 1966 using the average growth rate over seasons 1974-1994 (1973-1983 for Tasmania). (The 2011 census data is yet to be released.)

**Building Code Adjustment**

Refinements to the building code adjustment also used multiple UCLs. We also allow for demolitions – consistent with the approach used in the dwelling size adjustment – when calculating the proportion of pre- and post-19XX dwellings in the impacted UCL.
Crompton and McAneney (2008) adopted 1981 as a threshold year throughout tropical cyclone-prone areas of Australia for the building code regulation of the wind standard, whereas our updated approach varies the threshold year in Darwin and Townsville. We have also updated our estimated proportion of the insured loss attributable to wind-damaged buildings and contents for each event.

Caveat

While our normalisation methodology quantifies the most important contributory factors driving the increase in the insured cost of natural disasters it is, by design, an approach to be applied to a large number of events and thus will not encompass all of the factors unique to each event. Taking Tropical Cyclone Tracy as an example, since Tracy made landfall in 1974 the extent of government-owned housing in Darwin has fallen and this affects insurance penetration as the government owned homes and flats were not insured through private insurance (Mason and Haynes, 2010). On the other hand, the proportion of pre-1975 dwellings in Darwin in season 2011 will be less than estimated due to the occurrence of Tracy.

References


Table 1: Ten highest ranked normalised insured losses (AUD$ million)

<table>
<thead>
<tr>
<th>Rank</th>
<th>Event</th>
<th>Year</th>
<th>Location</th>
<th>State</th>
<th>Loss (AUD$ million)</th>
<th>Normalised loss (2011) (AUD$ million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Hailstorm</td>
<td>1999</td>
<td>Sydney</td>
<td>NSW</td>
<td>1,000</td>
<td>4,976</td>
</tr>
<tr>
<td>2</td>
<td>Tropical Cyclone Tracy</td>
<td>1974</td>
<td>Darwin</td>
<td>NT</td>
<td>0</td>
<td>4090</td>
</tr>
<tr>
<td>3</td>
<td>Earthquake</td>
<td>1989</td>
<td>Newcastle</td>
<td>NSW</td>
<td>200</td>
<td>3240</td>
</tr>
<tr>
<td>4</td>
<td>Flood</td>
<td>1974</td>
<td>Brisbane</td>
<td>QLD</td>
<td>862</td>
<td>2645</td>
</tr>
<tr>
<td>5</td>
<td>Flood</td>
<td>2010/11</td>
<td>Multiple</td>
<td>QLD</td>
<td>2,400</td>
<td>2,259</td>
</tr>
<tr>
<td>6</td>
<td>Flood</td>
<td>1985</td>
<td>Brisbane</td>
<td>QLD</td>
<td>180</td>
<td>3063</td>
</tr>
<tr>
<td>7</td>
<td>Ash Wednesday Bushfires*</td>
<td>1983</td>
<td>Multiple</td>
<td>VICSA</td>
<td>176</td>
<td>1,796</td>
</tr>
<tr>
<td>8</td>
<td>Severe Storm</td>
<td>2007</td>
<td>Multiple</td>
<td>NSW</td>
<td>50</td>
<td>1,742</td>
</tr>
<tr>
<td>9</td>
<td>Tropical Cyclone Magda</td>
<td>1973</td>
<td>Multiple</td>
<td>QLD/NT/WA</td>
<td>30</td>
<td>1,492</td>
</tr>
<tr>
<td>10</td>
<td>Tropical Cyclone Yasi</td>
<td>2011</td>
<td>Multiple</td>
<td>QLD</td>
<td>1,300</td>
<td>1,352</td>
</tr>
</tbody>
</table>

*The 1974 Brisbane flood resulted from the degeneration of Tropical Cyclone Wanda.

The two separate loss entries in the Disaster List for this event have been combined into a single loss.

Risk Frontiers’ Multi-Peril Workbench Version 2.0

Risk Frontiers’ Multi-Peril Workbench version 2.0 is now available for commercial licensing. It combines all Risk Frontiers’ Australian loss models in a single easy-to-use package. It calculates exceedance probability curves and average annual losses against portfolios of risks at address, postcode or ICA Zone (CRESTA) resolutions. Results may be aggregated or exported as ranked event lists for further analysis. It represents a major new update to the platform, including many often-requested features such as parallel/batch mode processing and more flexible multi-resolution aggregation functions. Further functionality in development includes a financial module to deal with reinsurance structures.

The individual hazard models comprise the following:

- HailAUS 6.0, our widely used Hailstorm loss model, recently expanded to include Melbourne, Adelaide, Canberra and Perth as well as the original Extended Sydney and SE Queensland regions.
- FloodAUS 2.0, an address level flood model that includes inter-catchment correlations and vulnerability curves based on Australian claims experience.
- FireAUS 1.0, the nationwide model for bushfire.
- QuakeAUS 3.0, our national earthquake model now with a completely revised ground motion attenuation function specifically developed for Australia.
- CycIAUS 3.0, a major update to our tropical cyclone model cognizant of recent historical events and including track modelling from genesis, a refined track modelling technique and revised vulnerability functions derived from claims data.

For more information contact riskfrontiers@mq.edu.au
“Bertolaso investigated for culpable homicide”

By Delphine McAneney

Readers of this newsletter will recall last year’s article entitled Scientists Indicted on Manslaughter Charges for Failure to Predict L’Aquila Earthquake by Paul Somerville and Katharine Haynes (Risk Frontiers’ Quarterly Newsletter: Volume 10, July 2011). As it transpired, the issue at hand now is not so much a failure to predict the unpredictable but, rather, the anaesthetizing tone of messages conveyed to the public following a meeting of the Major Risks Committee that downplayed the risk. Six days after that meeting, an earthquake killed 308 people in and around the town.

On 24 January 2012, the newspaper Corriere della Sera revealed further charges had been registered against the former Head of the Italian Civil Protection Agency, Guido Bertolaso, by the Prosecutor of L’Aquila. These charges are of culpable homicide. As reported in the paper:

The registration was brought about in response to a complaint filed last Friday against Bertolaso by L’Aquila Advocate Antonio Valentini, after the release of an intercepted phone call to the former State Councilor Daniela Stati. The transcript of that call ended up in Parliament and was reported by Abruzzi Deputy Gianni Lolli with a question to the President of the Council.

In the conversation of 30 March 2009, the day before the Major Risks Committee meeting, Bertolaso called the convening of the experts a media operation and stated that the meeting was being convened to reassure the people.

We must silence any idiot, allay speculation and worry. I send the prominent earthquake experts, you or the prefecture can decide, I don’t give a damn, it’s more of a media operation. So they, the top earthquake experts, will say: “the situation is normal”.

The intercepted call, according to the newspaper, would be the focus of the investigator and does not exclude further initiatives.

On 7 February, Bertolaso testified as a witness at the trial of members of the Major Risks Committee that met in L’Aquila on 31 March 2009, and is now accused of manslaughter for having reassured the population. In the meantime, threats and criticisms against the former head of Civil Protection have appeared on social networks and on the walls of L’Aquila. One poster reads: Major Risks Commission. Directed by Guido Bertolaso and another: Zero reconstruction, a thousand speculations. Bertolaso we shall not forget.

It remains to be seen if these charges are proven, but it seems likely that the Major Risks Committee was more preoccupied with discrediting claims from non-seismologist Giampaolo Giuliani that a large earthquake was imminent than it was in alerting the population to the risk of large earthquakes in an actively seismic region: especially the risk to those living in old unreinforced masonry buildings.

Giuliani’s predictions were based on radon gas emissions, a method most seismologists dismiss as unreliable. He went so far as to tell the mayor of Sulmona that a quake would strike the town within the next six to 24 hours. His deadline passed and for days nothing happened. According to some reports, some of the population left and then returned by early Monday, when a magnitude-6.3 earthquake struck near the town of L’Aquila, some 30 kilometres away. There was no serious damage reported in Sulmona.

In reality, scientists are unable to predict earthquakes and, although they may be able to say something about an increased probability of larger earthquakes, such probabilities remain too low to justify evacuation. In the absence of skill in predicting magnitude, time and place, it seems unwise for scientists on the committee to have allowed themselves to be used to reassure an already nervous population.

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Hunter-Leigh Scholarship

Risk Frontiers is seeking a suitably qualified applicant for a PhD scholarship at Macquarie University in the area of Global Food Security. The scholarship is in memory of Laraine Hunter and Roy Leigh, two foundation members of Risk Frontiers.

The volcanic eruption of Laki in Iceland (1783-84) and Tambora in Indonesia (1815) led to large scale famine as crops failed. Last year a spike in food prices was one trigger for aggravating political unrest in the Middle East. The 2011 explosion at the Fukushima-Daiichi nuclear power plant in Japan disrupted food supplies as well as affecting supply chains for electronic components and car manufacturing.

This study will examine how resilient today’s agricultural systems and food supply chains are to perturbation by extreme events. The scholarship is open to any suitably qualified student and Macquarie University will provide a further scholarship to cover overseas tuition fees should the successful applicant come from outside Australia or New Zealand. All applicants will be judged on merit but the position may suit a person with previous experience in multi-disciplinary studies and an interest in economics. Risk Frontiers (www.riskfrontiers.com) has in-house expertise in volcanic ash modelling and network analysis and the successful applicant will work in conjunction with these staff members.

Expressions of interest and curriculum vitae should be sent to Carol Robertson (carol.robertson@mq.edu.au)