Insurance in the age of Climate Chaos

As the globe warms, weather patterns are becoming more chaotic resulting in more extreme weather events. In such climate chaos, insurance may cease to be a viable risk transfer mechanism for perils that are currently insurable. Droughts, floods, cyclones and bushfires are all perils that are being exacerbated by climate chaos. As the severity of these perils increase due the chaotic weather volatility, insurers will seek to either limit their exposure to these perils or cease to offer insurance.

Predictive powers are not required to support the proposition that climate chaos is causing some insurance market failures. Drought has always been uninsurable—some may quibble with this but read on. Floods and bushfires are becoming uninsurable, and cyclones are becoming insurable only with government intervention.

The tipping point for any peril's slide out of insurability will involve an interplay between the amount of the potential aggregation of losses, the frequency of such losses and the ability to assess affordable risk capital. This interplay can be demonstrated by looking at the peril of earthquake. Earthquakes have a very high aggregation of losses in urban centers, but the risk of earthquake is insurable in Australia. Although Australia is highly urbanized, earthquakes have a low frequency and insurers have access to affordable risk capital.

An understanding of the role of risk capital is important to understanding insurability. The potential severity of an earthquake represents the greatest threat to an Australian insurer's property portfolio. An earthquake with an epicenter in the Sydney basin would likely represent an insurer's worst-case loss scenario. The worst-case loss scenario is important for an insurance portfolio as it determines the amount of risk capital that the insurer must have to be able to meet all claims. The underwriter will need to assess the worst likely accumulation of exposed properties in the worst epicenter location at the worst ***probable*** magnitude earthquake and assess the ***probable*** proportional damage to these properties. The aggregate estimate of losses for all properties under this worst-case assessment is referred to as the Maximum ***Probable*** Loss or **MPL**.

This earthquake MPL will be used to set the amount of risk capital required for an insurer's portfolio. An earthquake MPL, and therefore the amount of risk capital required, will be many multiples of the annual premium pool. Fortunately for Australian policyholders, the ground does not shake much or often so insurers can access affordable risk capital from reinsurers—reinsurers are able to pool the the earthquake risk globally, so the MPL is proportional lower than any single country.

In places where the ground shakes a lot and more often, the risk of earthquake is uninsurable—frequency tips the scales. In New Zealand, insurers do not cover earthquake. Instead, the New Zealand government established the Natural Disaster Fund that levies policies to build up a fund to pay for earthquake losses. The fund covers the first NZ$1.75 billion of any earthquake event. Above this the fund accesses additional risk capital from the reinsurance market that covers the next NZ$6.2 billion[1] of any earthquake event. With the help of reinsurers, the fund can absorb the first NZ$7.95 billion of any earthquake. Above this, the New Zealand government would have to pay losses from state revenue or borrowing.

[1] New Zealand Earthquake Commission

To put this into context, it could reasonably be assumed that the MPL for earthquake in New Zealand is around NZ$8 billion. The total Net Assets of the New Zealand general insurance sector is NZ$7.3 billion[2]. The estimated aggregation of earthquake losses in New Zealand is greater than the total net assets of all general insurers in New Zealand. Earthquakes are uninsurable as there is insufficient risk capital without this hybrid risk transfer mechanism.

Under this hybrid risk transfer mechanism, the reinsurance market is accessed where it operates best, above an excess point of NZ$1.75 billion that represents working losses—frequent smaller earthquakes. Earthquakes up to the MPL are paid by the Fund and reinsurers. Above the MPL, the government guarantees claim payments as keeping risk capital for the ***Possible*** Maximum Loss (**PML**) is not an efficient use of capital and would add to the price burden of funding earthquakes.

Australia has risks that are uninsurable and risks that are trending towards becoming uninsurable due to climate chaos. As an example, there have been several attempts over decades to insure the peril of drought for farmers, but these have failed. The reason for this failure is that the aggregation of losses that result from drought requires so much risk capital that an adequately priced insurance would be unaffordable for farmers. Quibbles about the insurability of drought arise from the existence of multi-peril crop insurance (MPCI) around the globe but none of these would exist without government subsidies.

Proving that drought is uninsurable is by looking at how insurance is priced. Pricing insurance starts with estimating the Pure Risk Premium (**PRP**). This is an estimate of an insurance portfolios losses for the coming underwriting year that will need to be collected in premiums. To this will be added the cost of risk capital and administrative expenses. To see how this works let's begin with something that can be insured—crop hail and fire.

For such a portfolio, the PRP will be an estimate of the aggregation of the portfolio's long run average seasonal loses. The prudent level of risk capital required to support the portfolio will be set by determining the MPL for the highest risk of hail. The cost of risk capital and administrative expenses will will be added to the PRP.

Insurance risk capital providers look for a rate of return of around a 10%[3] above the risk-free rate of return. The cost of risk capital that will be added to the PRP is determined by applying this rate of return to the amount of risk capital required. The greater the MPL compared to the PRP, the more risk capital that will be required and therefore the greater the proportion of the premium that will be needed to cover the cost of the risk capital.

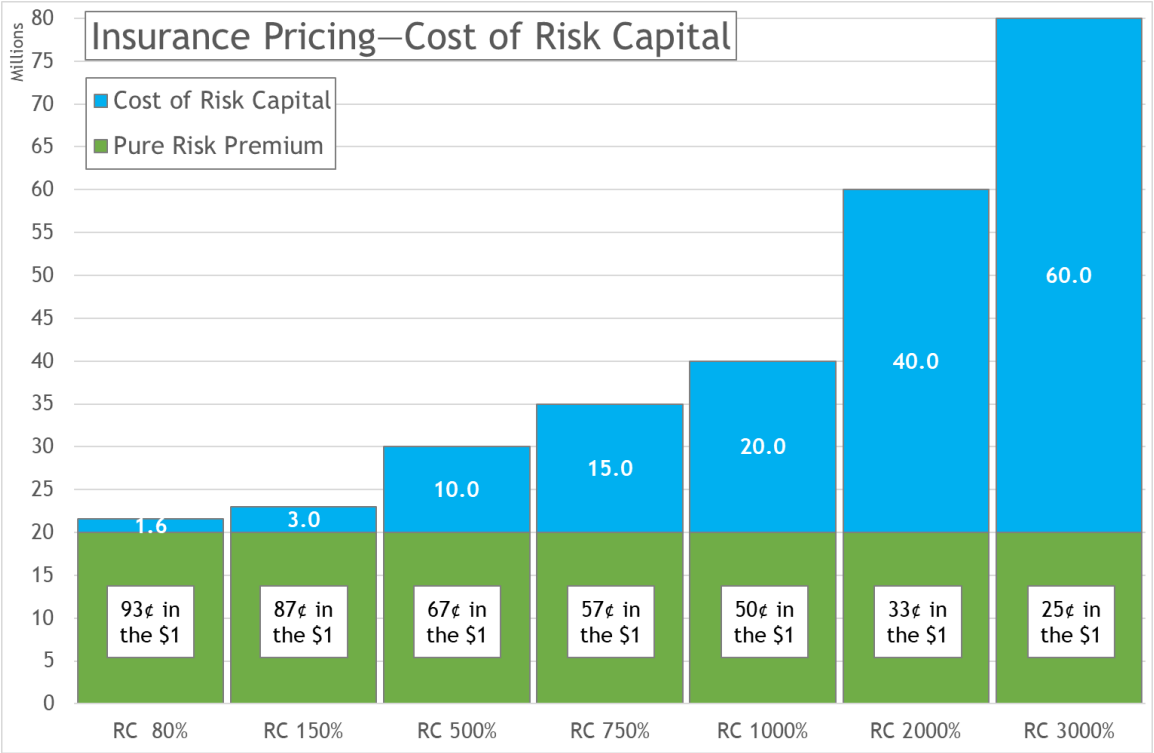
For a winter crop portfolio covering hail and fire, that is geographically well spread, with a PRP of $20 million, the MPL would be in the order 250% or $50 million. The risk capital required to support the portfolio would be $30 million or 150% of the PRP so the cost of risk capital would be $3 million. This is shown in the graph on the next page for a risk capital (**RC**) of 150%.

For this winter crop portfolio, the amount of the premium allocated to the cost of risk capital is 13¢ with 87¢ to pay claims. If the MPL increases, then the proportion of the

[2] Reserve Bank of New Zealand Insurance Balance Sheet as at March 2020

[3] As the risk capital is invested before paying out claims, it earns the risk-free rate of return, so the direct cost to premiums is only 10%.

premium allocated to the cost of risk capital increases as shown in the graph below. For an annual voluntary drought product, RC of at least 3000% of the PRP is likely. At this level, the proportion of the premium that would be required to be allocated to the cost of risk capital is 75¢ leaving only 25¢ to pay claims. But affordability is worse than this, as the administrative expenses have yet to be added.



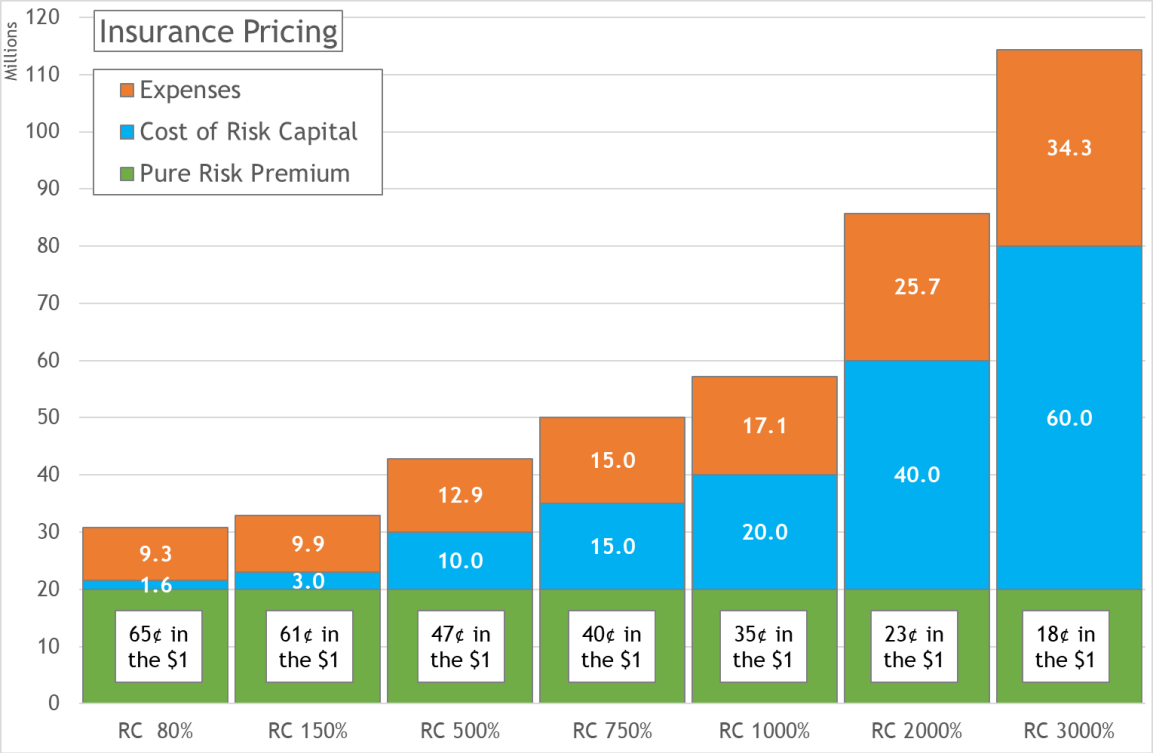
The Australian general insurance sector has an expense ratio of about 25%, this means that 25¢ in a $1 of premium covers administrative expenses. The major expenses for agricultural insurers are the cost to distribute to remote farmers, physically adjust losses and administer the policies and claims. Using the winter crop hail and fire insurance portfolio, the expense ratio would be around 30%. It is higher for agricultural insurance than the industry average due to the remoteness of farmers from insurers and loss adjusters.

Assuming the administrative costs for a drought product would also be 30% then the cost added to the expected cost of losses and the cost of risk capital is shown in the graph on the next page. For the winter crop hail and fire portfolio example, the amount of the total premium, allocated to expenses is 30¢, with 61¢ for paying claims, and a cost of capital of 9¢ in every $1 of premium. For winter crop insurance, the take-up rate is estimated to be in the order of 60% to 70%. Where farmers are getting as much as 61¢ in the $1 back in claims a significant proportion of farmers do not see the value in insuring.

For a drought portfolio with a RC of 3000%, only 18¢ in every $1 of premium would pay claims. While 30¢ would pay for the administrative costs of the insurance and 52¢ for the cost of risk capital required by insurer shareholders. Drought is uninsurable because the very high level of loss aggregation requires very high amounts of risk capital that makes the premiums unaffordable, which was probably the same situation faced by the New Zealand government with earthquake.

Faced with the cost of the high amount of risk capital required, it is not surprising that farmers around the globe put their hands out for government subsidies to "insure" drought. The experience of insurers and reinsurers round the globe have taught them that MPCI

products cannot be supplied at an affordable price without massive government subsidies. These MPCI is not insurance but a very inefficient mechanism to provide a farm subsidy.



This understanding of the pricing of insurance reveals the flaw in the farm subsidy approach. The subsidy does not pay for the farmers drought losses but for the insurer's shareholders by covering their returns on capital and their administrative expenses. It would be more efficient to pay for farmers losses directly.

As this drought insurability example shows, traditional insurance of perils with a very high aggregate losses requires very high amounts of risk capital. As climate chaos increases the severity of weather events, the viability of insurance will reduce as it becomes unaffordable due the cost burden of risk capital. Governments will need to embrace hybrid mechanisms such as that used to insure earthquake in New Zealand.

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About the Author

The author has over forty-five years of insurance experience. For over twenty-five years' he has specialized in agricultural insurance. Having created the Agricultural Underwriting section at GIO Australia in 1995 he introduced several innovative new product and coverage features. After a stint as Senior Underwriter at Agricola Underwriting Management, he setup his own specialist crop insurance broking business and successfully advised farmers on crop insurance for thirteen years. In 2014, Dutch agricultural insurer, Achmea appointed him as their Australian Chief Operating Officer. In this role he had the dual responsibility for insurance operations and underwriting results. He has recently retired but seeks to help introduce a climate risk transfer mechanism for farmers.

He holds a Master of Business in Financial Services majoring in General Insurance and is a Fellow of the Australian and New Zealand Institute of Insurance and Finance.