# RISKY BUSINESS?

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**I recently read an article by a Fleet Street editor who I much admire (and co-incidentally used to play ukulele with) in which he hoped that the UK Met Office wouldn't adopt US style probability weather forecasts, eg there is a 50% chance of rain today. Rather he said he just wants to know if it will rain or not. In a different vein, I remember a senior government minister saying after a major rail crash that he wanted a risk free railway; an admirable ambition. The only problem is that both the editor and the politician are asking for the impossible.**

It is a basic human want to have certainty. Indeed my local vicar once preached that chance was the devil's work. Science used to be predicated on the more you observe, the more you learn and can predict. Even Albert Einstein believed this, famously saying that God does not play dice. It has now been proven that, at a sub-atomic level at least, this is not true. Quantum theory tells us that no matter how much we watch, we can never know what a particular quantum of light will do. Albert Einstein and my vicar were wrong; chance is inherent in creation.

What does this mean to us mortals on Earth? Risk is a fundamental part of the human existence but one which is poorly understood. Almost every day there seems to be a 1 in 100 weather event hitting some part of the world. Is this not evidence of rapid worsening of the climate? Maybe, but it is also due to problems of definition, understanding and data. What do we mean by 1 in 100, the worst flood that that town has seen or the worst that has been seen in the UK, in Europe, the world? More likely it is the first, the worst recorded in that local area. The world is a big place, it would be a surprise if somewhere on Earth did not have a 1 in 100 event for rainfall, drought, wind, flood, earthquake or some other peril almost every week. As global communications increase, more severe events are being recorded and, as the global population increases, their human impacts are worse.

I studied Mathematics at university but wanted a general business career. What better than insurance, an industry based upon appreciation of risk? How wrong can you be? When I started in the industry over 30 years ago, London was the centre of the global insurance and reinsurance industry, and at the heart of that market was Lloyd's of London. It was the age of the star underwriter. These golden men were born not made, with an innate ability to pick risks. In truth the market functioned by collective knowledge and opinion, it was not by any means analytical. But things were stirring. Lloyd's began collectively to make market losses for the first time in its history. It was clear that some risks, eg asbestosis, had not been recognised or properly priced. That time also saw a number of "professional reinsurers" in Europe and later Bermuda defining themselves by use of analytical techniques. Apart from the intriguing implication that the London market was not professional, a real concern was that the "professionals" were cherry-picking good risks by advanced analytics leaving the dross to the London market. What followed was predictable, a Gadarene rush into analytics.

Now, whilst this was good news, especially for a jobbing mathematician, the results were also horribly predictable. Early models were generally poor but implicitly believed. Many, in truth most, senior managers did not understand the models and, vitally, did not understand their limitations. Rather like the newspaper editor wanting to know for certain whether it will rain tomorrow, the systems we were modelling were just too complex to be able to say with any certainty what, say, the average annual windstorm losses for an average UK property insurance company might be, let alone how big a loss they might expect every 100 years.

But 1 in 100 year numbers were what people wanted to hear. Our models came up with 1 in 100 year numbers for senior managers, ratings agencies, reinsurers etc to use, but in truth we, the modellers, let alone the users of the information, had little idea how reliable these estimates were. This is no surprise as the modellers were learning as they went. We were beginning to learn more about how the global climate works, but it is a hugely complex system that our best models even now only approximate. We also knew as little as the insurers themselves about the properties the insurers covered, eg where they were and how they were built. We knew little about flood defences and little about drainage systems, where they were and how well they were maintained. We knew little about how the buildings responded to strong winds or floods as past loss data was sparse.

Over time we have got better; much, much better. For example, London based reinsurance broker Willis Re has created the Willis Research Network (WRN), explicitly to use the best of UK and international science to understand these problems, improve modelling assumptions and reduce the uncertainty around them. The WRN is now the world's largest industry/academic collaboration, now totalling over 50 research partners.

But despite these gains, significant uncertainty remains. On the way to a conference in Hong Kong recently I tallied up 15 major areas of uncertainty in an average catastrophe model, uncertainties we can reduce but can never eliminate. There is now much debate amongst modellers about how best that inherent uncertainty should be represented.

But a typical senior insurance manager still wants to hear one number. They want to know what their 1 in 100 number is so that they can plan accordingly; is it £200m or £250m? They don't want to hear that it could be between £175m and £350m with a 95% confidence interval. They want a certainty that doesn't exist. A modeller who gives him this number without caveats is either a charlatan or a fool.

Over 10 years ago a conference in Cambridge asked the world's leading experts in Extreme Value Theory, the branch of mathematics that tries to estimate the probability of extreme events with limited data, to estimate the likely return period of the major January 1990 UK wind storm. Estimates ranged from 1 in 250 to 1 in 500. The market was working on the assumption of around 1 in 50. At this extreme level of remote probability, uncertainties are immense.

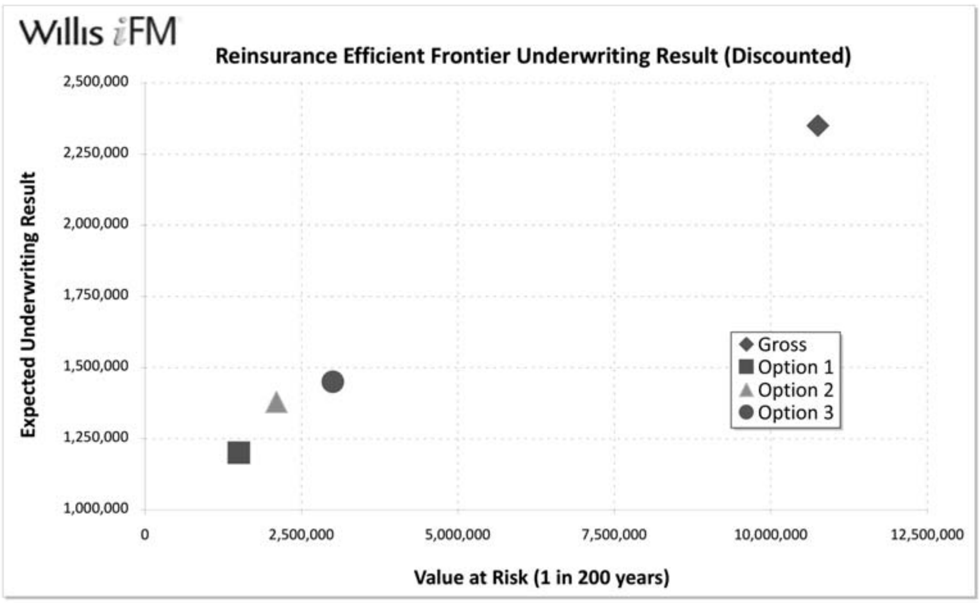
Unfortunately, now regulators want similar numbers. In fact, the new pan-European insurance regulatory regime Solvency II asks insurers to estimate the amount of capital they will require to make full payments to their policyholders for the worst year they can expect every 200 years.

The good news is that the UK insurance industry is now fully aware of risk and uncertainty; the subject is now out in the open. Our regulator, the FSA, is active within the EIOPA (the European regulator) to ensure that this topic is intelligently handled. Greater reliance is now being made for stress tests of model assumptions and scenario modelling used to make sure that foreseeable events are not overlooked within a complex, complicated model. Using Donald Rumsfeld's logical framework, we need to know all we can about what we know, we need to clearly recognise what we know we don't know (or can never know) and we should not delude ourselves that there will not be some complete surprises, the unknown unknowns or black swans.

The insurance industry has similarly learned to understand the relationship between risk and return, the rail safety problem. Much as the minister may wish, he cannot eliminate risk on the railways. He may spend more and more to reduce risk, but there comes a point where the cost is not worth the benefit. For example, say, spending £xbn reducing risk on derailment on one line from 0.5% (1 in 200) to 0.4% (1 in 250) may perhaps be better spent improving local roads with a much greater improvement in number of lives saved at much more likely probability levels. Most would agree that it is better to save 3 lives on average every year than 50 in a rare event that may happen only every 200 years, despite the political embarrassment that would be caused by such a rare event happening on your watch.

The insurance industry now commonly uses this relationship between risk and return to inform decision making. A typical risk return chart is shown below. On one axis, normally the horizontal, we measure risk, the thing we don't want to happen. This could be the number of lives lost, it may be how much capital a company could lose, it could be the probability of missing a target made to shareholders. On the other axis is a measure of return, how much money we make on average, or its flipside, how much the strategy costs on average.

A typical risk return chart is below:



Here the risk on the horizontal axis is the measured 1 in 200 worst case, ie how much capital does the firm need – the further to the left the better. On the vertical axis is the average underwriting result of the company – the higher the better.

So ideally we would want to be at the top left of this chart. The sad truth is that we can't get there. It is generally true in life and business that the more risk we take, the more money we are likely to make. The more we eliminate risk, the more it costs us. The "gross" option (in insurance speak with no risk hedging) gives us the highest average result but also the highest risk as measured by the 1 in 200 year worst case event. Option 1 by contrast reduces the risk by some 85% but sees average profit halve. The company may decide that the gross option is too risky but they can survive losing £2.5m every 200 years. In that case, the gross option and Option 3 are too risky and can be rejected. But which of Options 1 and 2 should they pick? In this case there is no right answer. It is perhaps probable that they would go with Option 2, the risk is still well within their acceptable tolerance and little worse that Option 1 but the average result is 15% higher.

The decision has been rationalised, the choice can be defended, debated and challenged. In reality things can be more complicated, there may be more than one risk measure (eg protecting capital but also minimising earnings volatility), but this framework has revolutionised decision making in insurance risk hedging (reinsurance) over the last 15 years. Yes the issues we debated earlier, uncertainty around our estimates must be considered (eg the bars in the chart), but the process of modelling, forcing a transparency of assumption and a robustness of decision making has been undeniably beneficial.

Can these techniques be used more widely in other areas of decision making? I certainly can see no reason why not. Even the less numerate in the insurance industry (the insurance market remains predominantly a people business though now an increasingly technical one) have now grasped and embraced these concepts and we are certainly beginning to understand best practice around its use. The Willis Research Network has recently been expanded to provide a forum to debate these issues, the WRN Economic Capital Forum.

Serious investment decisions demand proper modelling of the reduction of risk compared to the cost of investment. Without a proper understanding of risk, how can sensible decisions be made?

# WHAT IS SECOND TIER PROTECTION (STP)?

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**In layman's parlance, Second Tier Protection (STP) is a lesser form of Intellectual Property (IP) that is intended for the protection of devices, apparatus and the like where the technical advance is not as high as it might be for obtaining the Grant of a full Patent; nevertheless, STP in its many guises is established in some 77 countries worldwide and finds extensive usage in some European countries but especially in China, Japan and South Korea.**

Presently, STP is called: Utility Model in China; Innovation Patent in Australia; Utility Model in Japan, Italy; Germany (Gebrauchsmuster); France (Certificat d'Utilité) and Spain; Short Term Patent in Holland and Ireland and Short Patent in Belgium.

In some countries the STP is registered without examination although such a procedure has to be undertaken if an infringement action is contemplated. The various forms of STP have different terms depending upon IP Law of the territory; thus, in Belgium a Short Patent has a term of 6 years while a Utility Model in Japan can be for 10 to 15 years.

Over the last two decades there have been several proposals for the implementation in the United Kingdom (and Europe) of STP in the form of a 'Utility Model'. The proposals were from, inter alia, CIPA in 1992 and the Max Planck Institute in 1993; thus, on 6th-8th July 1994, a Symposium was held at Brocket Hall to review the Proposal for a European Utility Model as