# THE EUROPEAN ACTUARY



VOLUME 4
NUMBER 1
OCT 2013

## Dear reader,

Pierre Miehe

**Your professional European publication on actuarial subjects, The European Actuary, is pleased to celebrate its fourth birthday with this new issue focused for the first time on Non-life, with a special focus on recent natural catastrophe events in Europe.**

Floods have shown they know no frontiers. It is the same for actuarial models, and for the actuarial profession. It requires that, in our globalised world, we organize our profession with an international perspective; and we have to be a constant force of innovation and excellence at the service of an international long-term balance of (re)insurance operations.

Natural catastrophes may be seen as the equivalent for insurance of the market “shocks” or “crises” endured by the financial industry. The challenges they set to actuaries are similar: both are very difficult to predict in terms of timing and costs. But actuaries have to work hard in terms of extending their fields of expertise beyond actuarial, modelling, reserving and pricing to limit excessive exposures and avoid bankruptcies in the (re)insurance world.

Looking into other fields of knowledge is central in the opening interview with Rainer Fürhaupter, the new president of the DAV (the German actuarial association), and in the article from Oliver Bettis, the chairman of the Resource and Environment Board of the profession in London, on environmental issues. They underline the major role of actuaries to ensure insurance viability before and after such Natcat “shocks”.

The article from Henry Bovy, Deputy head of Cat Pricing and Methodology at SCOR, is focused on modelling and gives a synthetic review of the day to day work of Cat Modellers.
Reserving is covered by the article of Marion Gremillet, consultant at Actuaris International Paris, who presents a way to save capital through innovation in reserving methods.

But before risk management and reserving, actuarial work is also about pricing. The massive change imposed on pricing techniques by the growth of new technologies and its consequences known as telematics or Big Data is detailed by Peter Franken and Niels van der Laan, consultants at Milliman Amsterdam.
Climate changes are discussed by Oliver Bettis, the chairman of the UK Actuarial Profession's Resource & Environment Group.

I hope you will enjoy this issue focused on non-life, a new frontier for actuaries.
As usual, we would be very interested to have your feedback and ideas.

With my kind regards,
**Pierre Miehe**


# FLOODING

**Rainer Fürhaupter is the new president of the Deutsche Aktuarvereinigung e.V. (DAV). He was interviewed by our German members of the Editorial Board on the subject of Non-Life Insurance, and especially on flooding. Mr. Fürhaupter pleads for a holistic water policy.**

***The flooding this year seems to be quite similar to the occurrences ten years ago. Is it in your assessment a random accumulation or the manifestation of a systematic trend that eventually is linked to climate change?***
'My assessment is consistent with the climate study of the GDV (Gesamtverband der Deutschen Versicherungswirtschaft e.V.) which was created in collaboration with leading climate scientists. Dr. Alexander Erdland, GDV President, explains the core elements of the study: 'In the coming years, we have to be prepared for more frequent and increasingly intensive weather extremes. A duplication of flood damage in the future is possible. Certainly – as with all scientific studies – all assumptions depend on the underlying climate model. In the end, nobody can predict or even calculate when and in which region a flood will occur and how serious it will be'.'

***Is flooding at least partly a man-made problem? Has the government done too little in flood prevention or is the occurrence probability too high in vulnerable areas?***
'Surely, we all contribute with our daily lifestyle directly to CO2 emissions, which are very likely linked to extreme weather conditions that again play a key role in flooding. The flood prevention schemes and the designation of high-risk areas as inundation zones instead of settlement areas have long been neglected. At the latest after the 2002 flood, it was clear to everybody that measures must be taken to prevent future flooding. Regrettably, many good ideas from that time are still in the planning stages; a proper implementation of those ideas would have if not prevented then at least lowered the claims arising from actual flood disaster. Ultimately, all parties have to pull together. A holistic water policy is necessary where politics, science, water economy, communities, insurance companies, consumer protection authorities and last but not least the citizens have to play their part.'

## Insurability is not the real problem

***What can the insurance industry do? Are these risks insurable?***
'My company, the Versicherungskammer Bayern (VKB), is doing intensive and conscientious preparation of the data, fitting together the mathematical models and methods with the real conditions and - very important - inter-communicating with third parties (professional associations, politics, communes, etc.). We are on the right way as our figures demonstrate: according to an internal classification of VKB only 5.800 of the 2.9 million insured buildings in our homeowners insurance are currently not insurable in the insurance against natural hazards. For these buildings it is still possible to find an insurance option through cooperation with the owners. Where for the small number of cases the risk is still not insurable after extensive examination, public assistance is the appropriate and practical solution. Insurability – as the figures show – is not the real problem; the real problem is the willingness to insure an appropriate flood prevention. Herein lies the potential for insurance companies – also in their own interest: their capability is to raise awareness and in parallel initiate prevention measures because with each prevention step the costs in case of a flood decrease. But whatever we do we need the cooperation of all other parties.'

***Has the time come for compulsory insurance?***
'In my opinion, we have to intensify discussions about how a sustainable solution to the problem of increasing insurance density can be found in order to improve the current unsatisfactory situation. Based on the experience of the recent flood, the case again can be argued as to whether or not compulsory insurance is the right way forward. The previous appeal and information campaign was not sufficient to strengthen individual responsibility for self-protection. The high number of reported but uninsured losses only at VKB indicates that there is no way out of the discussion in order to come up to a requirement for subsistence. However, municipal functions like the expansion of flood control or the designation of inundation zones instead of settlement areas cannot be ignored. All in all, the policy should promote the personal responsibility of citizens. Finally, I wish to point out that previous discussions about compulsory insurance brought up strong legal and realistic arguments against it, so that the issue does not lend itself to a "yes/no" answer at this point in time.'

***Do such flood disasters show in your judgement the limit of actuarial modelling options or rather the need for further research efforts?***
'Each model is only as good as the data base used. The VKB therefore sets a high priority on bringing the existing data as near as possible to the actual conditions. For example, in the in-house zoning system we also take information gathered from potential policyholders relating to the insurance object, if their information can contribute to a more adequate assessment of the terrain characteristics and of flood prevention methods. So I see clearly the need for additional research efforts; as an actuary, I am convinced that modelling in the framework of appropriate margins is possible – indeed already a good implementing of that is done. The actual occurrences show once more, however, that a continual re-modelling and the constant cooperation of all related parties are necessary to achieve lasting satisfactory results.'

# FROM EXTREME WEATHER TO INSURED LOSSES: FLOOD IS A VERY COMPLEX PERIL TO MODEL


By Henry Bovy

**The opportunity for human intervention to manage the risks of flood by defending important societal assets adds complexity to an already challenging hazard from a modeling perspective. While we typically see flood *events* as an excess of rain that triggers high water levels or discharge in river systems, flood losses only occur if the excess water reaches properties, and if that property has flood coverage included under an insurance policy.**

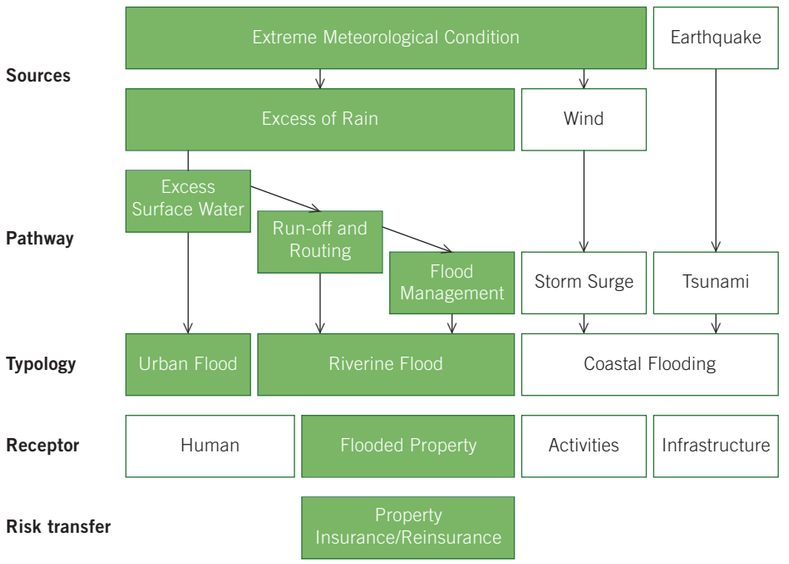



**Figure 1** Schematic representation showing the components of a flood loss

**Therefore not all flood events generate flood *losses*, and indeed other types of events can also give rise to flood losses. This article will focus on the green boxes of Figure 1, namely flash floods and burst river banks as the main type of events, and property as the receptor and subject of insurance risk transfer.** >

A meteorological condition leading to an excess of rain is a combination of *spatial extent* (contrast the large systems like the 2013 or 2002 flood events with the local system for the Copenhagen cloudburst), *intensity* of the rain in both duration and *antecedent conditions*, i.e. saturated or frozen soil which changes how well the soil can absorb the excess rain amount.

Surface Water Runoff and resulting urban flooding are flood events where the river system does not play a role; it is the volume of excess rain together with the local soil conditions that contribute to flooding.

Riverine Flood is triggered by this excess rain flowing into river systems, according to runoff conditions and the river network, leading to high water levels. This excess water level can be constrained or controlled, up to a certain point, by flood management features.

Flood extents can be very localized, i.e. one property might be flooded and the one next to it not. Therefore a high level of accuracy of data is required in order to correctly describe this phenomenon.

We can see through this brief overview that a resulting flood loss is a combination of several superposition of phenomena: weather conditions, runoff conditions and the configuration of the river network, flood management features and urban concentration.  This highlights the complexity of flooding.

**Natural or man-made hazards: current and future trends**
Although the flood hazard is natural in origin, flood losses in their magnitude can strongly be impacted by man-made features:

1. Urbanization and land usage itself: most cities in Europe have developed along rivers because up to the 19th century it was the main transportation system. Currently, urban development remains strong along river or flood prone areas.

2. Flood management along most rivers in Europe is heavily controlled essentially because of the land usage:
   a. Dams (retaining flood discharge, lakes can be used as such as well),
   b. Flood defense (protection parallel to the river that prevents flooding),
   c. Reservoirs (areas along the river that are designed to be flooded and where urbanism is limited),
   d. Moveable flood barriers (supplementary flood defenses that are put in place essentially in cities).

   As examples: The Rhine river from nearly Basel to the sea is controlled by a series of flood defenses and reservoirs where the land use allows it. The Seine river has a set of reservoirs upstream of Paris in order to control water level. On the Elbe river basin there is a composite set of flood management features. Dams are being built upstream; a moveable flood barrier in Prague; and flood defenses and reservoirs differently in Germany.

All these measures are designed to significantly reduce the risk, but it can sometimes make it worse like in the Rhine flood events in 1993 and 1995 where flood risk improvement upstream did change the behavior of the flood downstream.

The constant evolution of flood management (from design and implementation to maintenance) keeps flood risk in constant evolution and especially after a large flood event where large flood infrastructure is built. Therefore assessing flood risk greatly depends on the knowledge and assumptions given to flood management features.

Usually flood management features are designed using past observations and retaining a critical level, such as the 1 in 100 year return period flood event safety criteria. Under the impact of climate change, small changes in precipitation, soil moisture or size of precipitation can strongly impact that perceived design for flood management feature and hence considerably change the potential for failure and therefore flood losses.

**Risk transfer: Various responses in the EU**
The part which is being transferred through insurance and reinsurance varies greatly by country in Europe.

*Flood Coverage*: Urban, Riverine or Coastal flooding may not have the same scheme (in the Netherlands, Riverine and Coastal are part of the calamity fund where Urban flooding is part of the standard fire policy. In Germany, Urban and Riverine are an optional cover, where Coastal is part of Federal Pool).

*Market Penetration*: it varies from an optional cover to a compulsory coverage.

*Insurance Condition*: in the case of optional cover, flooding can be strongly anti-selected (i.e. flood prone property is being excluded or the insurance price being unaffordable). Another practice can be that the cover is strongly limited, either by a large deductible or a flood sub limit.

*Reinsurance transfer*: flood is either transferred along with other perils in standard treaties, or being pooled in national schemes and sometimes transferred to reinsurers. (See Figure 2)

**Assessing the risk: maturity of cat model for reinsurer**
A global reinsurer will have flood exposure in Europe via a set of treaties, either reinsuring a national pool at country level or in standard inclusion of a cedant (mainly at country level, but a few large European insurers span several countries and therefore have country flood insurance specificities).

While river basin and precipitation do not follow country borders (note the recent flooding in Central Europe), cross country correlation needs to be assessed to evaluate the overall risk that a reinsurer bears.

In order to capture all the above considerations to assess flood risk, a cat model is a useful tool. But much transparency around the assumptions is required to understand the weight and choices of all assumptions about the sources of flood events to the resulting risk transfer to reinsurer.

*Flood* is the peril that is least cat modelled when compared to *Earthquake* or *Windstorms*, but recent experience demonstrates the materiality of this peril. While access, availability and affordability of the large data volume has been an issue for some time, particularly digital terrain models and data models of the built environment, much progress has been made over the last 5 years. Flood models are very sensitive to assumptions around the modelled performance of flood defences and this aspect needs to be made more transparent to model users and decision makers. While modelling flooding in Europe will continue to be challenging, interest and demand for improvements along with new data following recent events means that the state-of-the-art of flood modelling is likely to take a step forward in the coming years.

**Henry Bovy** is Deputy head of Cat Pricing and Methodology at SCOR

| Country | Flood Type | Coverage | Market Penetration | Insurance Condition | Reinsurance transfer |
|---|---|---|---|---|---|
| **Austria** | All flood types | Optional cover | Low, less than 25% | Specific flood limit | Included in standard treaty transfer |
| **Czech Republic** | All flood types | Optional cover for Industrial risk, automatic for residential except in flood prone area | About 50% | Sublimited or anti selected in flood prone area | Included in standard treaty transfer |
| **France** | All flood types | Compulsory for all risks | Compulsary System, therefore 100% | Deductible increase in frequent flooded area | Very limited reinsurance transfer, kept by the CCR with State provision |
| **United Kingdom** | All flood types | Optional in standard policy, but required for loans | High, more than 75% | No specific limit or deductible | Included in standard treaty transfer |
| **Germany** | Surface and riverine in optional policy. Government Indemnity fund for coastal flood | Optional or extended cover for all type of risks for non coastal | About 25% | Anti selected in flood prone area | Included in standard treaty transfer |
| **Belgium** | All flood types | Compulsory for residential policy since 2005, Optional for professional risks | High almost 75% (ie 100% for residiential) | No specific limit or deductible | Included in standard treaty transfer up to a certain level where state fund start to cover |
| **The Netherlands** | Surface flood included in fire policy, Riverine and coastal flood included in a state fund | Optional in standard policy for surface flood | High, close to 100% | No specific limit or deductible | Included in standard treaty only for Surface flood, no reinsurance transfer for riverine and coastal |
| **Denmark** | Surface flood included in standard fire policy, Riverine and coastal included in a state fund | Optional in Fire policy, compulsory for coastal and riverine | High, close to 100% | No specific limit or deductible | Included in standard treaty transfer for Surface flood, no reinsurance transfer for riverine and coastal |
| **Italy** | All flood types | Optional cover | Low, Less than 25% | Specific flood limit | Included in standard treaty transfer |
| **Norway** | All flood types | Compulsory in standard policy | High, close to 100% | No specific limit or deductible | Reinsure via a standard pool (NNPP) |
| **Switzerland** | All flood types | Compulsory in standard policy for building within the Intercantonal Reinsurance canton (19 out of 26), Optional inclusion for the rest | High, close to 100% | No specific limit or deductible | Reinsurance transfer for both the intercantonal reinsurance and private market |

**Figure 2:** Main risk transfer characteristics for flood in selected European countries

# REVERSIBLE JUMP MARKOV CHAIN MONTE CARLO: A REVOLUTION IN CLAIMS RESERVES VALUATION?


**French Actuary Marion Gremillet unveils here the results of her deep research on a new non-life stochastic reserving valuation method: the Reversible Jump Markov Chain Monte Carlo (RJMCMC) applied to triangles. We asked her about her research.**

***How did you come to study RJMCMC reserving methods?***
'Today, calculating deterministic reserves is no longer sufficient in a world of enhanced Risk Management. Indeed insurers strive to have a complete view of the risk underlying reserves valuation: therefore stochastic projection methods become central to today's actuaries. It is even more the case with the Solvency II European Regulation which requires a VaR99.5% valuation… and consequently a very robust stochastic model to achieve a credible tail valuation.

I had the feeling that the Reversible Jump Markov Chain Monte Carlo method had many advantages over traditional approaches mostly based on Chain Ladder. This is what I wanted to check, basing my initial work on the RJMCMC paper by Verrall and Wüthrich in 2012.'

***What is for you the main weakness of current traditional reserving methods?***
'Traditional methods like Chain Ladder evaluate, column by column, each element of the lower triangle, according to the upper triangle data. In the case of the Chain Ladder method, this evaluation is based on an estimated development factor which determines one column's data from earlier ones. The paradox is that the estimates for the columns on the left-hand side use a lot of data in order to project just a few points, whereas the right-hand columns contain relatively little data to project a lot of points. All that seems counter-intuitive and leads to a potentially significant estimation error.'

***How does RJMCMC remedy these weaknesses?***
'On the contrary, the RJMCMC method consists in applying two different models: one for the left part of the triangle, based on a large set of parameters, which allows a better fit to the data, and one for the right part of the triangle, based on only two parameters and on reference statistical curves. This allows a more robust evaluation of the tail, the last columns corresponding mainly to the development of the claims that have already occurred which can more easily fit a simple parametric model.'

***What is the main issue you face when applying RJMCMC?***
'One of the main issues is to decide in what column we should switch from one methodology to the other. The RJMCMC method answers this question with a solution that is admittedly complex, but pragmatic.

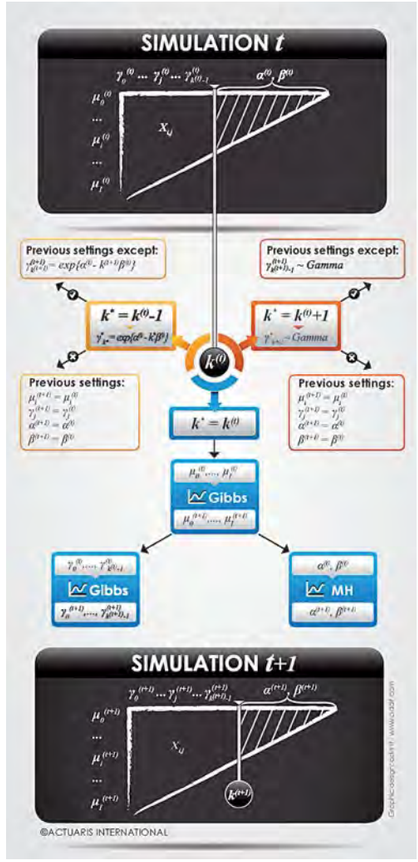
Indeed, the method is a mix of several algorithms which have proved themselves in the fields of biology and computational physics: Bayesian statistical analysis; Markov chains for the iterations; Monte Carlo techniques for the simulation of the models' truncation index; Gibbs sampling for the left-hand side of the triangle; and the Metropolis Hastings algorithm to estimate the parameters for the right-hand side.'

***And what about the assumptions behind it?***
'The fundamental assumption of the method supposes that the incremental values follow an over-dispersed Poisson distribution with different row and column parameters. The basic aim of RJMCMC is to estimate these parameters using different models.

The row parameters in the run-off triangle are modeled by a gamma distribution.

As for the column parameters $\gamma_j$, there are two cases. First: if the column is in the left part of the triangle: the column parameter follows a gamma distribution; and secondly: if the column is in the right part of the triangle: the column parameter is estimated by one of the classical parametric distributions, for example an exponential decay in the Verrall and Wüthrich paper.'

***How do you find the best triangle limit? How can you handle it?***
'The aim of RJMCMC is to estimate the parameters by testing algorithmically different values for the limit. Indeed the algorithm will go to all possible values and will converge to the most probable distribution, using acceptance probabilities, as shown in the box.' >




Each step of the algorithm consists of choosing a new truncation index $k^*$ according to the previous step $k^{(t)}$. To achieve this, we use a uniform distribution which allows us to get the $k^{(t-1)}$, $k^{(t)}$, $k^{(t+1)}$ values, each with 1/3 probabilities.

If $k^*$ is different from $k^{(t)}$ the RJMCMC algorithm consists of proposing a new value for the unique column parameter which migrates from one model to another, while the values of the other parameters remain unchanged from the previous state of the Markov chain. This proposed value can then be accepted or rejected; in the latter case, the value used is the same as in the previous state.

If $k^*$ is equal to $k^{(t)}$ the RJMCMC algorithm consists of updating parameters block after block. At first the row parameters are updated by using Gibbs sampling, then the same technique is used for the column parameters. Finally, the parameters of the exponential decay will be updated using the Metropolis Hastings algorithm.

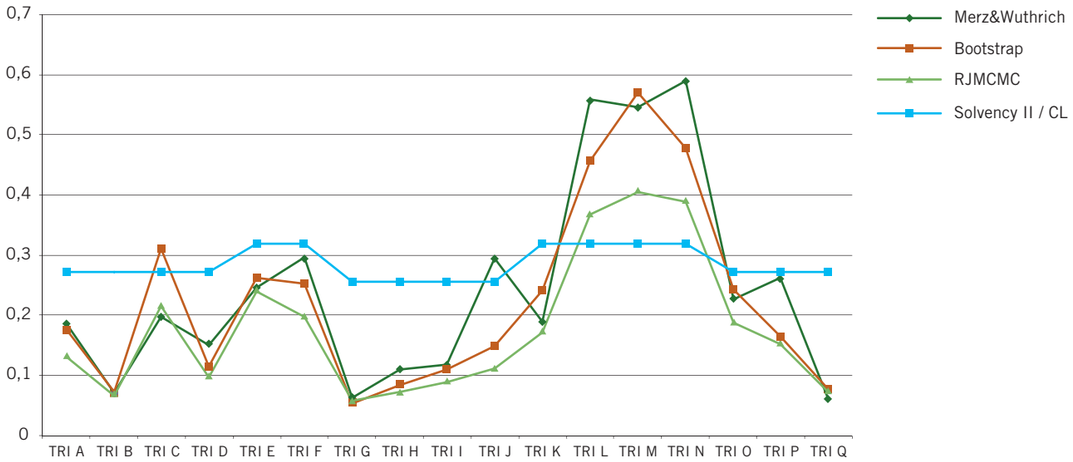
Thus, in each case we obtain a new vector of parameters. The diagram presents, for a given iteration, the RJMCMC methodology.

Through the use of complex algorithms based on Monte-Carlo techniques, the methodology requires a high number of iterations. In general, several iterations are necessary before the algorithm become stable – the so- called "burn-in" stage. Results from the iterations before this stationary distribution is achieved have to be excluded from later calculations.

***Solvency II has set the one year volatility as the new valuation standard. How can you deal with it?***
'I have simply applied the "Actuary in the box" method to the RJMCMC algorithm as exposed in the paper from D DIERS (2010): Stochastic re-reserving in multi-year models. This is the method also traditionally used for getting Bootstrapping results.'

***Have you applied RJMCMC to the "real world"? Does it help save capital for companies?***
'I have applied the 1 year RJMCMC to a set of 17 market triangles kindly provided by the Belgium Supervisor, and then compared it to the commonly used methods for the estimate of the reserving risk: Solvency II standard formula, Chain Ladder/ Merz & Wüthrich, and Bootstrap/Actuary in the box.'

The graph below shows the comparison of the capital requirements calculated with these methodologies applied to the seventeen triangles (listed from A to Q):




**Graph** representing capital as a percentage of the reserves for the different triangles

The table below represents the capital (as percentage of the mean of the reserves) obtained over the seventeen triangles and for each method. On the second row, a comparison is done with the results obtained with Solvency II.

| | Mack | Bootstrap | RJMCMC | Solvency II |
|---|---|---|---|---|
| **Capital Mean of reserves** | 23 % | 20 % | 16 % | 28 % |
| **Differences with Solvency II** | – 20 % | – 29 % | – 42 % | – |

**Table** summarizing the mean of capital obtained over the 17 triangles for the different methods

The capital saved with the RJMCMC method is quite significant: 42% capital saved in comparison to the application of the Solvency II standard calibration, or 29% capital saved compared to the Bootstrap/Actuary in the box method, and again 20% capital saved compared to the Chain Ladder/Merz & Wüthrich method.

***As a conclusion, would you say RJMCMC will revolutionize the science of reserving?***
'It is perhaps too early to state that it will supersede the well-established chain ladder or bootstrap methods. There are different limitations that have to be overcome:
– The high number of iterations which makes it sometimes difficult to interpret;
– Not all data are fitting an over dispersed Poisson;
– The difficulties for non-actuaries to understand part of the method.

But all insurers understand well that applying different methods depending on the amount of data available, namely on the left or right part of the triangle, makes sense and should return better results. However explaining in simple terms such a complex methodology will be key to its adoption in companies. And it will require efforts of actuaries to make the methodology accessible to all concerned parties.'

# Vehicle telematics will change the world of motor insurance pricing

By Peter Franken and Niels van der Laan

**Without a doubt vehicle telematics will have a big effect on the insurance industry. Actually, it already has. But before we go further into details, let us first explain what we mean by telematics. Wikipedia defines telematics as typically being any integrated use of telecommunications and informatics: "*The technology of sending, receiving and storing information via telecommunication devices in conjunction with affecting control on remote objects*". Strictly stated, the term has evolved to refer to the use of such systems within road vehicles, in which case the term vehicle telematics may be used.**

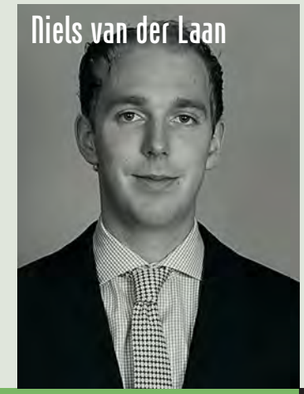
So how do telematics already affect our daily lives? In the broadest definition of tracking remote objects, receiving and storing information, the use of social media like Facebook/Twitter and also the use of a cell phone is already well established in our daily routines. Many people are willing to tell the world where they are and what they do. Even if people don't share it deliberately, information is collected and used for all kind of commercial purposes (think for instance of the advertisements on Google which are based on your search history).

**Open to sharing**
Although privacy is a hot topic, people share more and more of their personal life to the outside world. We believe this is a trend that will continue. Within 10 years many of us will probably be sharing information even more easily than today. And even though there is also a lot of resistance to these developments, in general we are getting more used to the fact that we can be followed and tracked anywhere. With sufficient guarantees that our information is not 'misused', we think that many of us will be open to sharing certain personal information such as our location at any moment in time.

Back to vehicle telematics: what does this trend mean in relation to insurance, and more specifically, motor insurance? Are people willing to share information about their driving behaviour in return for a lower price? How rapidly will telematics be used to influence current motor insurance pricing?

**Trust**
In our view, the market will move in the direction that telematics becomes commonly used in non-life pricing. However the question is how rapidly people are willing to embrace vehicle telematics. It's not the technical side that is the critical factor for the speed at which this evolves. We are already technically capable of implementing it. If policyholders are willing to share more detailed information on where, when and how they drive, insurers will be able to take that into account in their tariffs resulting in more differentiation with reduced prices for the better drivers and increased prices for the malicious ones. In our view the critical factor for success of vehicle telematics will first of all depend on the trust people have in insurance companies not misusing the data and secondly the difference in price (partly as a trade-off for the risk that the insurer will actually misuse this trust).

**Common practice**
As a result of the financial crisis, trust in the financial industry including insurers is low, which takes time to overcome. Although in the US and UK the market for telematics is slowly developing, especially for specific groups of insured such as younger drivers, we don't expect telematics to take off significantly before trust is restored. In the meantime each insurer will need to form a view on how and when to start using the existing potential of vehicle telematics in their day to day business. In our view it is not so much a question of whether telematics will become common practice in motor insurance pricing, but when.


**Peter Franken** is Principal & Consulting Actuary at Milliman and
**Niels van der Laan** is Consulting Actuary at Milliman

# CLIMATE CHANGES

By Oliver Bettis

**A recent article in the New York Times[1] pointed out that "No one understands risk better than the insurance industry — except, perhaps, the reinsurance industry, the companies that sell insurance to insurers" and that reinsurers follow climate change "obsessively". As a pricing actuary in a large reinsurance company, I would say this is fair comment.**


Oliver Bettis

The reason for this close interest is that climate change undercuts the foundation of insurance, which is that future loss experience can be predicted from past experience. In theory, general insurance can adapt to climate change, because the vast majority of policies are only one year in length. Premium rates can be adjusted to allow for changes in risk. In practice, it takes a lot of work to estimate how much the risk has changed. If the amount by which the risk has changed is not known, then setting premium rates becomes much more difficult. And competitive pressures make increasing premium rates difficult. In the long term, if premium rates are not adequate for the risk the company will go out of business, so this is a matter of survival for reinsurers.

Scientists have begun to estimate the effect of climate change on extreme weather events. For example, in a study in the Bulletin of the American Meteorological Society (BAMS)[2], scientists at the National Oceanic and Atmospheric Administration (NOAA), the UK's Met Office, and other institutions examined the extent to which manmade climate change influenced 12 extreme weather events that occurred in 2012. By using sophisticated weather models, they estimate the probability of an actual weather event (e.g. drought, flood or storm), both with and without the effect of climate change. By doing this, they can answer the question how much more likely any specific event was due to climate change. They found that half of the weather events studied showed the influence of climate change. The scientists pointed out that just as speeding in a car makes an accident more likely, climate change makes severe weather events more likely. But not every extreme weather event will be caused by climate change, just as not every car accident is caused by speeding.

For setting premium rates, the most important question is, how much more likely are extreme weather events in the future, given climate change, and therefore how much do rates need to be adjusted compared with the past experience? In 2012 the reinsurer Munich Re produced a report on North American weather[3]. The report details how North American weather has already changed, and it is likely that extreme weather events which cause insurance losses, such as floods, storms and tornadoes, are more common in this region due to climate change.

Also, the Australian Government recently commissioned a report on extreme weather[4]. Chapter 2 of this report shows how temperature has already risen in Australia due to climate change. Simply a small increase in the mean temperature can give rise to a proportionately larger increase in the number of extremely hot days in the year (a natural consequence of the probability distribution, and the same principle applies to other extremes over a fixed threshold e.g. of rainfall). One example of the effect is on the risk of severe bushfire, which is of interest to reinsurers. These events only tend to occur during extreme heat.  So it is very likely that the risk from severe bushfire has increased substantially relative to the long term history.


global warming

The bottom line for general insurers and reinsurers is that climate change is not a distant prospect, it is affecting their risks now. As the Earth continues to warm through the 21st century, it is expected that the impact on extreme weather will increase, and the insurance industry will need to adapt.

**Oliver Bettis** has worked in the non-life insurance industry since graduating with a degree in Chemistry in 1989. He is a fellow of the Chartered Insurance Institute and the Institute & Faculty of Actuaries. He is chairman of the UK Actuarial Profession's Resource & Environment Group. He has had a variety of roles, including claims handling, underwriting and reinsurance consulting. Since 2001 he has worked as an insurance actuary, and since 2006 he has worked as a pricing actuary, pricing large single risks.

1 – http://www.nytimes.com/2013/09/01/magazine/mutually-insured-destruction.html?ref=insurance&_r=0

2 – http://insights.wri.org/news/2013/09/new-report-connects-2012-extreme-weather-events-human-caused-climate-change

3 – http://www.munichre.com/en/media_relations/press_releases/2012/2012_10_17_press_release.aspx

4 – http://www.aph.gov.au/parliamentary_business/committees/senate_committees?url=ec_ctte/completed_inquiries/2010-13/extreme_weather/report/index.htm

# European agenda

## 2013

| | |
|---|---|
| Early October | Groupe Consultatif publication of Tracking Services Report (pensions) |
| 15 October | Pensions Forum meeting, Brussels |
| 22 October | EIOPA Insurance & Reinsurance Stakeholder Group meeting |
| 24 October | EIOPA Occupational Pensions Stakeholder Group meeting |
| 31 October | Gabriel Bernardino participates in a Joint Committee meeting of the European Supervisory Authorities in Frankfurt |
| 20 November | EIOPA Conference (EURO Finance Week) |
| 26 November | Joint meeting of EIOPA Insurance & Reinsurance Stakeholder Group meeting and EIOPA Occupational Pensions Stakeholder Group meeting |
| November | Commission to put forward revised IORP draft Directive, excluding pillar 1 |
| November | European Parliament and member states to consider Commission Communication on Shadow Banking (published 4 September, 2013) |
| 9 December | Gabriel Bernardino participates in a Joint Committee meeting of the European Supervisory Authorities in Frankfurt |

## 2014

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| 1 February | European Parliament vote on Omnibus II/Solvency |
| 30 March – 4 April | IAA International Congress of Actuaries, Washington D.C. |
| April 2014 | EU expected to adopt Portability of pensions Directive |
| May 2014 | European Parliament elections |

## colophon

**The European Actuary (TEA) is a bi-annual magazine about international actuarial developments. TEA is written for European actuaries, financial specialists and board members. The magazine is published in cooperation between the four actuarial associations: Deutsche Aktuarvereinigung, The Institute and Faculty of Actuaries, Het Koninklijk Actuarieel Genootschap and the Institut des Actuaires.**
**It will be released as e-mail newsletter, as well as in print. The Editorial Board welcomes comments and reactions on this edition under contact@the-european-actuary.org. Please also feel free to direct them to one of the members of the Editorial Board.**



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Institute and Faculty of Actuaries

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