# Cass Business School
## CITY UNIVERSITY LONDON

# R in Insurance

## Statistical computing for the insurance community

15th July 2013

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# Welcome to the first R in Insurance conference

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# Welcome to the first R in Insurance conference

Over the last 20 years R has evolved from a project by two statisticians in New Zealand, Ross Ihaka and Robert Gentleman, to a software suite that has been embraced by many academics and industries around the world, including insurance.

The insurance industry has a long tradition in using data and statistics for decision-making, in areas such as pricing, reserving and capital modelling.

In this space R has grown rapidly over the recent years as it provides a rich environment for data analysis, statistical computing and visualisation. Additionally, thanks to its open source background, it encourages collaborative working and comes with tools and frameworks that support a workflow of development, testing and documentation for end user computing.

Further, as R is widely used in academia, new research is often published along with R packages, accelerating the transition of theory into applications and fostering the dialogue between universities and industry.

The conference programme consists of invited talks and contributed presentations discussing the wide range of fields in which R is used in insurance.

We hope that you find the conference enjoyable and stimulating.

Andreas Tsanakas        Markus Gesmann

## Thanks

An event like this is not possible without the help of many. Our special thanks go to:

- Peter Carl of the *R in Finance* committee in Chicago, who encouraged Markus to organise an *R in Insurance* conference in London and shared his experience with us

- Christophe Dutang and Jens Perch Nielsen, who joined us on the scientific committee

- The Cass Events, Faculty Administration and Marketing teams, who have worked tirelessly to make the conference a success.

Finally, we are grateful to our sponsors Mango Solutions and CYBAEA. Without their generous support, this conference would not have been possible.

## Programme

**8:30 - 9:00**    **Registration**

**9:00 - 10:00**    **Opening keynote – Professor Alexander McNeil**

Implementing CreditRisk+ in R with the Faster Fourier Transform

**10:00 - 11:00**    **Contributed talks**

A practical approach to claims reserving using state space models with growth curves

A new R-package for statistical modelling and forecasting in non-life insurance

A re-reserving algorithm to derive the one-year reserve risk view

**11:00 - 11:30**    **Tea/coffee**

**11:30 - 12:30**    **Contributed talks**

Pricing insurance contracts with R

Mortality modelling in R: an analysis of mortality trends by cause of death and socio-economic circumstances in England

Non-life insurance pricing using R

**12:30 - 13:30**    **Lunch**

**13:30 - 14:30**    **Contributed talks**

End user computing: Excel / VBA vs. R

Claim fraud analytics with R

Integrating R with Azure for High-throughput analysis

**14:30 - 15:00**    **Panel discussion: "The Future of R in Insurance"**

**15:00 - 15:30**    **Tea/coffee**

**15:30 - 16:30**    **Contributed talks**

Automate presentations of management information with R

Practical implementation of R in the London Market

Catastrophe modelling in R

**16:30 - 17:30**    **Closing keynote – Trevor Maynard**

There is an R in Lloyd's

**17:30 - 18:30**    **Drinks reception**

**18:45 - 19:00**    **Bus transfer to conference dinner at Cantina del Ponte**

# Abstracts

## Implementing CreditRisk+ in R with the Faster Fourier Transform

**Professor Alexander McNeil,** Department of Actuarial Science & Statistics, Heriot-Watt University

The well-known CreditRisk+ model of portfolio credit risk is often described as "an actuarial model". Conditional on independent gamma-distributed economic factors, credit losses in fixed time periods are conditionally independent Poisson events. Exposures are usually discretised into a finite number of exposure bands. This leads to a reasonably tractable model that can be represented in terms of compound sums.

We will review the structure of the model and then show how it can be easily implemented in R. We focus on computing the portfolio loss distribution using Fourier inversion techniques and deriving measures of tail risk. We will also discuss the calibration of the model.

## A practical approach to claims reserving using state space models with growth curves

**Chibisi Chima-Okereke,** Active Analytics Ltd

State space models offer much flexibility in dealing with general time series and regression problems. Bayesian approach means that expert judgment can be used in their formulation and they offer the benefit of allowing the modeller to use information available at any time period to pre-empt the effects of expected changes or increased uncertainty in forecasts rather than being limited by more classical approaches. This makes them valuable for many applications and they are considered here for the calculation of actuarial reserves.

In this talk, a state space model using various growth curves for modelling claims developments is presented. These curves are used to model logarithm and inverse transformed cumulative claims as well as development patterns. An advantage of the state space modelling procedure is that a standard output of the model are parametric ultimate claims forecast distributions for state and observations. The parameters used in the state matrix are obtained from no-linear regression of curves from the claims triangle.

Intervention techniques allow the modeller to quickly assess the effects of new information before subsequent observations are obtained. The model can also be used as a tool for pre-empting the effects of potentially large claim events on the business class or increased uncertainty in the underwriting environment.

This technique is compared with outputs from the chain ladder method. The models are created using R, a rich statistical analysis environment which also provides a framework for creating space state models as well as allowing the user to create custom algorithms.

# A new R-package for statistical modelling and forecasting in non-life insurance

**Martínez-Miranda, M.D., Nielsen, J.P. and Verrall, R.,** Cass Business School

The recent Double Chain Ladder (DCL) by Martínez-Miranda, Nielsen and Verrall (2012) has demonstrated how the classical chain ladder technique can be broken down into its components. It was shown that DCL works under a wide array of stochastic assumptions on the nature and dependency structure of payments. Under certain model assumptions and via one particular estimation technique, it is possible to interpret the classical chain ladder method as a model of the observed number of counts with a build-in delay function from a claim is reported until it is paid. Under the DCL framework it is possible to gain a deeper understanding of the fundamental drivers of the claims development than is possible with the basic chain ladder technique. One example is the case when expert knowledge is available and one would like to incorporate it into the statistical analysis. This can be done in a surprisingly simple way to include into a double chain ladder framework.

In this talk we present a new package in R to analyse run-off triangles in the double chain ladder framework. The package, which is expected to be launched in July 2013, contains several functions to assist the user along the full reserving exercise. Using specific functions in the package the user will be able to load the data into R from Excel spreadsheets, make the necessary manipulations on the data, generate plots to visualize and gain intuition about the data, break down classical chain ladder under the DCL model, visualize the underlying delay function and the inflation, introduce expert knowledge about the severity inflation, the zero-claims etc. The package contains also data examples and has been documented to facilitate the analyses to a wide audience, which includes practitioners, academic researchers and also undergraduate, master and PhD students. Using the package the user will be able to reproduce the methodology of the recent papers by Martínez-Miranda, Nielsen, Nielsen and Verrall (2011), Martínez-Miranda, Nielsen and Verrall (2012, 2013), Martínez-Miranda, Nielsen and Wüthrich (2012) and Martínez-Miranda, Nielsen, Verrall and Wüthrich (2013).

## References

1. Martinez-Miranda M.D, Nielsen B, Nielsen J.P and Verrall, R. (2011) Cash flow simulation for a model of outstanding liabilities based on claim amounts and claim numbers. *ASTIN Bulletin*, 41/1, 107-129.

2. Martínez-Miranda, M.D., Nielsen, J.P. and Verrall, R. (2012) Double Chain Ladder. *Astin Bulletin*, 42/1, 59-76.

3. Martínez-Miranda, M.D., Nielsen, J.P. and Verrall, R. (2013) Double Chain Ladder and Bornhuetter-Ferguson. *North American Actuarial Journal*.

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## A re-reserving algorithm to derive the one-year reserve risk view

**Alessandro Carrato,** Allianz

**Keywords:** reserve risk, one-year view, re-reserving, ultimate view, model error, Solvency 2

I consider a practical approach, based on R code, to the methodology for the one-year view reserve risk described by [1]. The idea is to extend the re-reserving algorithm outside the chain ladder model (see [2]), introducing a proper algorithm that works directly on the underlying GLM model defined for the ultimate view, and updated with the simulated payments after 1 year. Besides, the R code gives also the option to change the regression structure, distribution in the exponential family and link function of the ultimate-view reserve risk (see [3] and [4]) in order to permit a better understanding and evaluation of the model error, as required by Solvency 2 (see [5]).

### References

1. Ohlsson et al. (2008). The one-year non life insurance risk. *2008 ASTIN Colloquium*.

2. Merz, Wüthrich (2008) Modelling CDR for Solvency purposes. *CAS E-Forum*, Fall 2008, 542-568.

3. Gigante, Sigalotti (2005) Model Risk In Claims Reserving with GLM *Giornale Istituto Italiano degli Attuari* LXVIII, n. 1-2, pp. 55-87, 0390-5780.

4. Wüthrich, Merz (2008) *Stochastic Claims Reserving Methods in Insurance*. Wiley.

5. EIOPA (2012) *Technical Specifications for the Solvency II valuation and Solvency Capital Requirements calculations,* SCR 1.23, p. 119.

## Pricing insurance contracts with R

**Giorgio Alfredo Spedicato,** PhD C. Stat ACAS

The R statistical system [3] could be a very powerful tool to price contracts in the business of insurance. As 2013, several packages already exist that can aid pricing actuaries in their activity. This presentation will show how standard R code enhanced by *ad hoc* packages could provide sound actuarial solutions for real business.

A first example could be pricing life contingent coverages for life insurance business. Few examples performed with the aid of lifecontingencies package [5] will show how R can be easily used to perform standard pricing and reserving for life insurances.

A second set of examples will show how GLM estimation capabilities of R statistical environment can be used to perform standard pricing of personal lines general insurance coverages. Examples will be taken from [4] working paper.

The last sets of example briefly show an application of actuar [2] and fitdistrplus [1] packages to price non-proportional reinsurance coverage for a Motor Third Party Liability portfolio.

### References

1. M. L. Delignette-Muller, R. Pouillot, J.-B. Denis, and C. Dutang (2012) *fitdistrplus: help to fit of a parametric distribution to non-censored or censored data*. R package version 1.0-0.

2. C. Dutang, V. Goulet, and M. Pigeon (2008) actuar: An R package for actuarial science. *Journal of Statistical Software*, 25(7):38.

3. R Development Core Team (2012) *R: A Language and Environment for Statistical Computing.* R Foundation for Statistical Computing, Vienna, Austria. ISBN 3-900051-07-0.

4. G. A. Spedicato (2012) Third party motor liability ratemaking with R. 6. *Casualty Actuarial Society Working Paper.*

5. G. A. Spedicato (2013) *Lifecontingencies: an R package to perform life contingencies actuarial mathematics.* R package version 0.9.7.

# Mortality modelling in R: an analysis of mortality trends by cause of death and socio-economic circumstances in England

**Andrés M. Villegas,** Cass Business School

**Keywords:** Mortality modelling; Lee-Carter model; socio-economic circumstances; cause of death; **ggplot2; gnm; forecast.**

It is well-known that mortality rates and life expectancy vary across socio-economic subpopulations of a country. Higher socio-economic groups – whether defined by educational attainment, occupation, income or area deprivation - have lower mortality rates and longer lives than lower socio-economic groups. In many cases, high socio-economic subpopulations also experience faster rates of improvement in mortality. These socio-economic differences pose important challenges when designing public policies for tackling social inequalities, as well as when managing the longevity risk in pension funds and annuity portfolios. The successful addressing of these social and financial challenges requires the best possible understanding of what has happened historically and what is likely to occur in the future. A key step in this direction is to investigate how individual causes of death differ between the different socio-economic subgroups of the population.

In this talk we illustrate how R can be used in the analysis of recent trends in mortality by cause of death and socio-economic stratification, using mortality data for England split by socio-economic circumstances. More specifically, we demonstrate how existing R packages can be used in the preliminary analysis and visualisation of mortality data (ggplot2) and in the modelling (gnm) and projection (forecast) of mortality trends employing multi-population extensions of the popular Lee-Carter mortality model.

## References

1. Hyndman, R. J. (2013) *forecast: Forecasting functions for time series*. R package version 4.03.

2. Turner, H., Firth, D. (2012) *Generalized nonlinear models in R: an overview of the gnm package*. R Package Version 1.0-6.

3. Wickham, H. (2009) *ggplot2: elegant graphics for data analysis*. Springer New York.

## Non-life insurance pricing using R

**Allan Engelhardt,** CYBAEA Limited

**Suresh Gangam,** 64 Squares

Insurance can greatly benefit from adopting the R platform and leading companies are already reaping the rewards. We will show one example from non-life insurance pricing which will cover both technical implementation and business change, and we will share information on the commercial benefits obtained. By using a specific example we can keep the presentation concrete and the benefits real; however, the applicability of the approach is general and we will touch on this in the discussion.

There are many advantages of R. We will focus on two. First, R is finely balanced to allow exploratory data analysis and interactive model development while also being a platform for statistical computing and data mining. As we will show, this is key for productivity and an element to set up (bit-perfect) reproducible models.

Second, it is comprehensive in the sense that most approaches to statistics and data mining are included in the tool or its contributed packages. Among other benefits, this allows you to easily run multiple model types on your data, ensuring compatibility with classic and often robust approaches while at the same time taking advantage of the latest developments and emerging industry standards.

Non-life insurance pricing is a well-known and well-established process and yet still a critical business issue. The standard for tariff analysis is generalised linear models. We first show how to develop such a model in R, including model selection and validation. We touch upon how to deploy the model (both scoring using the model and updating the model itself) while ensuring the results remain validated and reproducible.

Next we show how easy it is to extend the model to more complex techniques. In the interest of time we jump over intermediate approaches and go straight to ensemble models, which are possibly the state-of-the-art for high-performance models.

We are in no way advocating wholesale abandonment of classical approaches for modern techniques, "black-box" or otherwise. Rather, we propose that you make use of both: continuity and understanding tempered with the results from the latest up-to-date methods. In the final part we cover some of these business issues to show how other insurers resolved them and what commercial benefits resulted. Examples include using the advanced models to restrict the validity domain of the classical approach (*risk we do not understand and will not insure*) and using them to create derived variables, such as interaction variables, to extend the domain of the GLM *(understanding complex risk)*.

## End user computing: Excel / VBA vs. R

**Karen Seidel,** Lloyd's
**Tom Taverner,** Mango Solutions

Most actuarial departments in the non-life insurance industry use Excel /VBA as their computation engine. Industry leading bespoke modelling software, such as Igloo and ReMetrica relies on Excel/VBA for data inputs and reporting. This talk points out the typical problems that

arise from using Excel/VBA in capital modelling and how these issues can be overcome with a combination of R and a proper version control system. Issues covered include:

- Keeping track of links

- Keeping track of different versions of input data, model code and outputs

- Support for multiple users

- Trickiness of updates (e.g. range adjustments for a new underwriting year)

- Limitations of Excel analyses

- Limitations of reporting in Excel

- Constraints on data volumes

## Claim fraud analytics with R

**Enzo Martoglio,** Steria UK

**Adam Green,** Syntomy

According to different sources the insurance sector is plagued by fraudulent claims: in the UK alone total undetected general insurance claims fraud is estimated at £1.9 billion per annum. This adds around 6% (or £44 a year), on average, to the insurance premiums paid by all policyholders (Research Brief – 2009 Association of British Insurers).

R offers powerful analytical functions to detect fraudulent claims. They range from network analysis, typically used to monitor fraudulent motoring claims, to text analytics.

The presentation aims to:

- Offer a brief overview of the R packages that can be used for fraudulent claim analytics (e.g. how network analytics can be used to spot frauds etc.).

- Illustrate the analytical pipeline component required to detect potentially fraudulent claims using text analytics. One of the components illustrated will be the use of the LIWC (Linguistic Inquiry and Word Count) dictionary.

- Link claims with the general insurance process to show the benefits obtained through a wider usage of analytics.

Please note that currently we plan to illustrate the above using dummy data, as any insurance company is reluctant to "loan" their data for analysis.

## Integrating R with Azure for High-throughput analysis

**Hugh P. Shanahan,** Department of Computer Science, University of London
**Anne M. Owen,** Department of Mathematical Sciences, University of Essex
**Andrew P. Harrison,** Department of Biological Sciences, University of Essex

**Keywords:** Cloud Computing, Azure, PaaS, High-throughput

Cloud Computing is increasingly being used by the scientific community. For example, in Bioinformatics this has been largely driven by the rapid increase in the size of Omic (Genomic,

Transcriptomic,...) data sets Stein (2010). This rapid increase in data size is not unique to this field and is a surprisingly general feature in data analysis. This type of computing is particularly useful for a workflow where one needs to execute a complicated analysis (e.g. a large R script) in a trivially parallel fashion over a large data set. Within Insurance possible applications for such high-throughput calculations include

- time-series analysis which require extensive parameter sweeps or

- VaR calculations for a portfolio of a large number of various financial instruments Kim (2009).

Much of the emphasis in cloud computing has been on the use of Infrastructure as a Service platforms, such as Amazon's EC2 service where the user gets direct access to the console of the Virtual Machines (VM's) and *MapReduce* frameworks, in particular *Hadoop Yoo* (2011). An alternative to this is to use a Platform as a Service (PaaS) infrastructure, where access to the VM's is programmatic. Other PaaS clouds exist, notably the Google App Engine but are limited due to a conservative approach to allowing libraries on the App Engine.

A PaaS interface can offer certain advantages over the other approaches. In particular, it is more straight-forward to design interfaces to software packages such as R. In the case of Azure, another advantage is that Microsoft Research have provided a set of C# libraries called the Generic Worker which allow easy scaling of VM's.

We have developed software that makes use of these libraries to run R scripts to analyse a particular data set approximately 1 Tbyte in total size though decomposed into a number of a much smaller units. This analysis provides an exemplar to run multiple R jobs in parallel with each other on the Azure platform and to make use of its mass storage facilities. We believe that this workflow is a very common one and is applicable to any number of different areas where R is employed. We will discuss an early generalisation we have dubbed **GWydiR** to run any R script on Azure in this fashion, with a goal on providing as simple a method as possible for a user to scale up their R jobs.

## References

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3. Yoo, D. and Sim, K-M. (2011). A comparative review of job scheduling for MapReduce. *2011 IEEE International Conference on Cloud Computing and Intelligence Systems* (CCIS) 353-358. DOI:10.1109/CCIS.2011.6045089

## Automate presentations of management information with R

**Simon Brickman** and **Adam Rich,** Beazley

The talk will provide R code to show how to automate the presentation of key charts, tables and reports.

This will be in the context of providing information to general insurance professionals who are mainly non-actuarial. Typical audience is underwriters and claims managers. The goal here is to impart the maximum clarity to the information whilst also making the production task easy and flexible.

The code used will essentially comprise of existing package material: the intellectual added value provided here is really around the collation of this material into a useful bundle of value to analytical practitioners. The talk will also compare and contrast the process with current alternatives used in the industry and discusses ideas for future development to assist actuaries in their roles within general insurance.

## Practical implementation of R in the London Market

**Ed Tredger** and **Fiachra McLoughlin,** UMACS

Our talk will focus on the massive potential for R in the London Insurance Market, our practical experiences of using it with our insurance clients and the main obstacles R faces in gaining wider acceptance and usage in the London Market. All of this talk is based on practical experience of using R in real-world examples and draws from the presenter's personal experience.

There are three distinct sections to the talk:

1.   Why R is useful in the London market

2.   Personal experiences of using R in real-world problems

3.   Practical barriers to using R in Insurance

Since the first part of the talk will be well-understood by most attendees, this will be the briefest, but will offer our perspective based on the model development and modelling projects we deliver across a wide range of Lloyd's and London Market clients.

The second part will discuss different applications of R we have found useful, how they have been implemented and what value they have added to the client. This part of the talk will use examples of how R has been successfully used in pricing, reporting and in producing Lloyd's returns.

The third part of the talk is likely to prompt the most discussion; here we will discuss the barriers R encounters in Insurance and how these might be overcome. There is little doubt that while seasoned R users believe strongly in its abilities R has not, yet, reached a high level of market penetration. We hope that this talk will stimulate debate within the audience about overcoming these obstacles so that R can achieve wider recognition throughout the insurance industry.

## Catastrophe modelling in R

**S. Eppert, D. Lohmann** and **G. Morrow,** KatRisk LLC

Catastrophe (cat) models are used to estimate loss distributions from natural hazards like tropical cyclones, floods, or earthquakes. They integrate multiple disciplines such as meteorology, climatology, hydrology, structural engineering, statistics, software engineering and actuarial sciences.

The ever increasing complexity of these models, the need for model transparency, as well as the desire to integrate models with diverse APIs have led us to develop an open source web-based cat model engine based on R using Shiny.

By using R, users can easily create custom analytics and integrate auxiliary data from any data source, while being able to probe underlying model assumptions, perform sensitivity analysis and investigate all components of the cat model. We will demo our software and speak about the various technology components.

## There is an R in Lloyd's

**Trevor Maynard,** Lloyd's

In 2005, a group of nerds in Lloyd's (with one honorary member from outside) started a group called R Souls (say it fast and you'll get the joke).

They met every Friday to make the most of the fish and chips and swapped stories about R; learning from one another and becoming ever more proficient in the amazingly stable, flexible and exciting tool that is, R.

From these humble beginnings R is now embedded in many of Lloyd's core functions from benchmarking and reporting to catastrophe modelling.

My talk will give a short history of this turbulent and emotional journey including some tips on how to work with IT departments, and convince others to move from planet Excel to the 21$^{st}$ century.

# Biographies of presenters

## Alexander McNeil



**Alexander McNeil** is Maxwell Professor of Mathematics in the Department of Actuarial Mathematics and Statistics at Heriot-Watt University.

He is also Director of the Scottish Financial Risk Academy (SFRA), which organises knowledge exchange activities between the university and financial sectors in Scotland including Risk Colloquia, training events and postgraduate placements in industry. Formerly Assistant Professor in the Department of Mathematics at ETH Zurich he has a BSc in Mathematics from Imperial College, London and a PhD in Mathematical Statistics from Cambridge University.

His interests lie in the development of mathematical and statistical methodology for integrated financial risk management and include extreme value theory (EVT), risk theory, financial time series analysis and the modelling of correlated risks. He has published papers in leading statistics, econometrics, finance and insurance mathematics journals and is a regular speaker at international risk management conferences. He is joint author, together with Rüdiger Frey and Paul Embrechts, of the book "Quantitative Risk Management: Concepts, Techniques and Tools", published by Princeton University Press in 2005.

## Chibisi Chima-Okereke



**Dr Chibisi Chima-Okereke** is the Founder and CEO of Active Analytics Ltd, an R training, data mining, and software development company. He has worked in the insurance industry as a market analyst and also as a pricing statistician and has extensive experience in programming R in this field. He has also worked as a statistical consultant, R developer and R trainer.

As an R programmer, he has been the lead programmer on commercial R projects which included creating graphical user interfaces in R, unit testing frameworks, code conversion from S+ to R, and statistical analysis. He has used R extensively for creating generalized linear models (GLM) in actuarial risk models, cluster analysis, geo-mapping, geocoding, and developing actuarial analysis tools in R. He is also a Fellow of the Royal Statistical Society.

## Maria Dolores Martinez-Miranda



**Maria Dolores Martinez-Miranda** (Lola) is mathematician with a PhD in Statistics from the University of Granada (Spain). She is Associate Professor in Statistics at the University of Granada and has joined Cass Business School in September 2012 as Marie Curie Research Fellow (FP7-PEOPLE-2011-IEF). Her research interests include topics such as nonparametric estimation, bootstrap methods, computational statistics and claims reserving in non-life insurance. She has co-authored a number of papers in reserving such as "Double Chain Ladder", which is the framework of her presentation in the conference. Through these papers it is possible to phrasing in mathematical statistical terms how reserving is being done at the same time as being possible to present a full stochastic cash-flow model with or without prior knowledge.

## Alessandro Carrato



**Alessandro Carrato** is an Assistant Retail Actuary at Allianz in London. He worked for five years in the Risk Management Department in Allianz Italy, where he was involved in the research and development of risk capital models, in particular measuring actuarial and financial risks in a Solvency 2 framework. His experience includes stochastic modelling, reinsurance optimisation, capital allocation, NatCat modelling and risk based pricing.

Alessandro has both a BSc and MSc in Statistics and Actuarial Science from University of Trieste. He is a fully qualified Italian Actuary and member of Ordine Nazionale degli Attuari (Professional Association of Italian Actuaries), Istituto Italiano degli Attuari (IIA) and International Actuarial Association (IAA - ASTIN Section).

## Giorgio Alfredo Spedicato



**Giorgio Alfredo Spedicato** received an MSc in Actuarial Science from the Catholic University of Milan in 2006 and a PhD in Actuarial Science from the University of Rome, La Sapienza in 2011.

He is fully qualified member of the Italian Actuarial Professional Body, a Chartered Statistician of the Royal Society of Statistics and an Associate of the Casualty Actuarial Society since 2013. Prior to his actuarial career he worked as a freelance statistical consultant for two years before joining Axa Italy as motor third party liability pricing actuary in 2008. After three years he moved to Aviva Italy where he works as general insurance reserving actuary. Occasionally Giorgio still provides statistical consulting services to students and researchers.

## Andres Villegas



**Andres Villegas** is a PhD student at Cass Business School in London. Before starting his doctoral studies he obtained a MSc degree in Industrial Engineering from Universidad de Los Andes Colombia and worked as a risk analyst at the biggest Colombian life insurance company. Andrés research interests include mortality modelling, longevity risk management and the application of optimisation techniques in actuarial science and finance.

## Allan Engelhardt



**Allan Engelhardt** has over 20 years of 'big data' analytics experience across many industries. Since graduating in experimental particle physics and working at the CERN laboratory, he has worked with large corporations across Europe and North America to transform the way they derive value from data and the way they look at their customers.

Allan is one of the founders of CYBAEA, which provides analytics-as-a-service and consulting across the globe with a strong focus on commercial results. Prior he had helped start The PCA Group, which helps large corporations in Europe and South America transform their approach to marketing and customer management. Allan has held interim management roles at leading Dutch and Irish companies building their Insights and Customer Management teams.

## Karen Seidel



**Karen Seidel** joined Lloyd's in January 2011 and since then has been responsible for the development and running of the Lloyd's internal capital model (LIM), with major deliverables including the calculation of the Lloyd's capital requirement for regulatory and internal purposes, evaluation of risk appetite metrics and support for strategic business decisions involving capital. From a background in mathematics and computing, her actuarial career started with seven years in general insurance consulting at Bacon & Woodrow (later taken over by Deloitte), followed first by two years in reserving and capital modelling at Legal & General and another two years reviewing ICAS submissions at the FSA. After that she decided that doing was more fun than reviewing and moved to Allianz Global Corporate and Speciality, where she spent three and a half years as a senior reserving and capital modelling actuary.

## Enzo Martoglio



**Enzo Martoglio** is the Enterprise Information Management CTO at Steria UK heading innovation, new technologies & Big Data. For the last year his main responsibility has been to develop Steria's proposition and presence around Big Data encompassing big vendor offerings as well as open source (MarkLogic, Hadoop, HBase, Cassandra, Neo4J etc.), columnar databases (InfiniDB, GreenPlum etc.) and in memory & in DB analytics tools (R, Alpine Data Lab etc.). Enzo has been working on use cases in central Government, Financial Services, Telecom, Media and Retail.

## Hugh Shanahan



**Hugh Shanahan** is a lecturer at the department of Computer Science and the Centre for Systems and Synthetic Biology at Royal Holloway University of London. His research interest focuses on the analysis of transcriptomic data and the inference of regulatory gene networks using distributed and cloud computing and in particular using R in such environments; in the past he

has also worked in Structural Biology (in particular Protein-DNA interactions). In the nineties he completed his PhD and did three post-docs in Particle Physics before he switched over to Computational Biology. Hugh is a member of Collaboration Board of National Grid Service, a member of the Institute of Physics and referee of BBSRC research proposals.

### Simon Brickman

**Simon Brickman** joined Beazley Insurance, a leading quoted Lloyds Managing Agency, in July 2004. He is responsible for development and monitoring of pricing models, and encouraging exploitation of this information in Specialty Lines. Simon worked in Insurance since graduating in Mathematics from Cambridge University in 1980. He qualified as a fellow of the Institute of Actuaries in 1988. Previous experience includes responsibility for pricing and reserving for two London Market companies; managing a large team of actuaries and statisticians in a major BankInsurer; and pricing and reserving for a large specialist reinsurer.

### Adam Rich

**Adam Rich** is a fellow of the Casualty Actuarial Society and a member of the CAS's Open Source Software Committee.  As a pricing actuary at Beazley, he uses R on a daily basis.  Adam has over twenty years of programming experience.  He believes that good programming is an art form.

### Fiachra McLoughlin

**Fiachra McLoughlin** is a Fellow of the Institute of Actuaries, is a Director and co-founder of UMACS, and has led major modelling and strategic enhancement projects for some of the largest and most profitable organisations in Lloyd's and the global company market.

## Edward Tredger



**Ed Tredger** is a Fellow of the Institute of Actuaries, holds a PhD in Statistics, and has used R for many years in insurance, government and academia. His main areas of interest are pricing, capital modelling and developing R as a key tool for solving the unique problems presented by the London Market.

## Stefan Eppert



**Stefan Eppert** is Chief Technologist at KatRisk. He is responsible for the computational framework for hydraulic simulations and loss modelling based on R and CUDA. In his prior job, Stefan developed flood risk models for a large cat modelling company. He has a Masters in Hydrology from the University of Freiburg, Germany.

## Trevor Maynard



**Trevor Maynard** MSc, FIA, has degrees in Pure Mathematics and is a Fellow of the Institute of Actuaries. He is Head of Exposure Management and Reinsurance at Lloyd's and is responsible for monitoring the natural and manmade aggregations of risk across the Lloyd's market. He represents Lloyd's at ClimateWise, the Geneva Association Climate workgroup, and the London Climate Change Partnership. Trevor's team has produced all of the Climate Change research and publications from Lloyd's since 2006. He was seconded to HRH The Prince of Wales' Rainforest Project in 2009 and wrote the Insurance appendix to their "Emergency Package" which was discussed by high-level representatives from the G20 in London. He has spoken on climate risks at a number of forums in the last few years including for example, representing the insurance industry at a European Commission Green Week event on Climate risks and also in Portugal at a climate event hosted by the British Embassy.

# Notes

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