UNIVERSITY OF AMSTERDAM

R in Insurance

Amsterdam, 29 June 2015

Statistical computing for the insurance community

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Contents

Welcome to the 3rd R in Insurance conference

We are delighted to welcome you to the 3rd R in Insurance conference, at the Amsterdam School of Economics, University of Amsterdam. After the overwhelmingly positive response to the two previous editions of the R in Insurance conference, we could not help repeating and developing the event further! Following two successful editions at Cass Business School the conference now crosses the Channel and visits the beautiful city of Amsterdam.

This one-day conference will focus once more on applications in insurance and actuarial science that use R, the lingua franca for statistical computation. Topics covered include reserving, pricing, mortality modelling, the use of R in a production environment, and more. All topics are to be discussed within the context of using R as a primary tool for insurance risk management, analysis and modelling.
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.

The organizing committee

Katrien Antonio

Roger Laeven

Angela Van Heerwaarden

Michel Vellekoop

Thanks

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

- Markus Gesmann and Andreas Tsanakas, founding fathers of the conference, who generously shared their experience in organizing the first two editions of the conference;
- Christophe Dutang and Jens Perch Nielsen, who joined us on the scientific committee;
- The administrative support staff of the Amsterdam School of Economics, in particular Mrs. Evelien Brink, who have worked tirelessly to make the conference a success.

Finally, we are grateful to our sponsors Milliman, CYBAEA, RStudio, Deloitte, ASR, Triple A Risk Finance, AEGON, Delta Lloyd, QBE Re and Applied AI. Without their generous support, this conference would not have been possible.

Programme

8.30 – 9.30 Registration, M-building, Amsterdam Business School, Plantage Muidergracht 12, Amsterdam

9.30 – 10:30 Keynote 1 (Chair: Katrien Antonio)
Richard Gill (Leiden University) on
Experiences with R in integRity

10:30 – 11:30 Session 1 (Chair: Roger Laeven) – New developments in risk modelling for large portfolios

- Markus Gesmann (Lloyd's, London) on Communicating risk: a perspective from an insurer
- Kristof Verbeken (VUB, Belgium) on BRAVE model risk assessment for large portfolios
- Sébastien de Valeriola (UCL and Reacfin, Belgium) on Using least square Monte Carlo techniques in insurance with R

11:30 – 12:00 Tea/Coffee break

12:00 – 13:00 Session 2 (Chair: Tim Boonen) – Lightning talks on R packages and case studies

- Andres Villegas (City University, London) on StMoMo: an R package for stochastic mortality modelling
- Giorgio Spedicato (Unipol, Italy) on Actuarial evaluation of annuities using R (package 'lifecontingencies')
- Andrew Webster (Forecast health) on Health care risk adjustment in R
- Mark Chisholm (XL Catlin, UK and US) on Case study of how actuaries use R
- Kevin Kuo on End-to-end reproducible analytics with R
- Orsolya Retaller (RU Groningen) on Broken heart in R

13:00 – 14:00 Lunch break

14:00 – 15:00 Session 3 (Chair: Michel Vellekoop) – Life insurance and mortality modeling

- Han Li (Monash University, Australia) on Mortality forecast: global or local?
- Anastasios Bardoutsos (KU Leuven, Belgium) on Bayesian Poisson log-bilinear models for mortality projections with multiple populations
- Michael Cooney (Applied AI, UK) on Pricing mortality swaps using R

15:00 – 15:30 Panel discussion, moderated by Angela Van Heerwaarden

15:30 – 15:50 Tea/Coffee break

15:50 – 16:50 Session 4 (Chair: Umut Can) – Non life and health insurance

- Jake Morris (Liberty Specialty Markets) on Compartmental reserving in R
- Seth J. Chandler (University of Houston) on Using R to examine data from the affordable care act on the American health insurance market
- Indra Loljeeh (QBE Re, Belgium) on Pricing of MAXL treaties
- Carryl Oberson (University of Basel) on Boosting actuarial regression models in R

16:50 – 17:50 Keynote 2 (Chair: Markus Gesmann)
Jim Guszcza (Chief data scientist, Deloitte Consulting US) on
The future of loss reserving: a Bayesian 21st century

17:50 – 18:00 Closing by Markus Gesmann

Canalboat leaves at 18:30, from Amsterdam Business School and brings us to the restaurant, D'Vijff Vlieghen (Spuistraat 294-302, 1012 VX Amsterdam).

Abstracts

Keynote 1
Experiences with R in integRity

Richard Gill, Leiden University

I will discuss recent experiences involving (a) R and (b) scientific integrity. Some more R's will be: Reproducible Research, the Replication crisis, questionable Research practices. My examples come from (social) psychology and economics. I think there are broader lessons for science and for professionals. Is scientific integrity any different from professional integrity? I hope that the audience will see lessons for insurance.

Session 1
New developments in risk modelling for large portfolios

Communicating risk: a perspective from an insurer

Markus Gesmann, Lloyd's London

Communicating risk makes risk transfer possible. Over the last ten years we have observed a convergence of the insurance and capital markets. Insurance linked securities (ILS), such as catastrophe bonds, have become more popular by investors looking for 'non-correlated' risks. The author has worked within a major insurance and reinsurance market and a major investment bank over the last 10 years and gained much experience in measuring, monitoring and communicating the performance of underwriters, who are portfolio risk selectors on behalf of insurance companies and their capital providers. Understanding the risks (and opportunities) of such risk portfolio is at the heart of the new Solvency II regulation in Europe, which will be introduced in 2016. The talk will give an overview of ideas that have been introduced and used over the years to communicate risk and performance and the more recent developments on setting and monitoring risk appetite, which will further foster the communication of risk between industries. Examples will be given in R.

BRAVE model risk assessment for large portfolios

Kristof Verbeken, VUB, Belgium

The Rearrangement Algorithm by Puccetti and Rüschendorf (2012) makes it possible to minimize the variance of the portfolio sum when no assumptions regarding the dependence structure are made and only the marginal distributions of the risks are known. It can be used as a practical method for approximating sharp Value-at-Risk (VaR) bounds of portfolios (Embrechts, Puccetti and Rüschendorf (2013)). It has been shown that this algorithm performs very well in practical situations. However, it faces a curse of dimensionality.

The Block ReArrangement Variance Equalizer (BRAVE) is developed as an effective new algorithm that scales for large portfolios. The algorithm minimizes the portfolio's variance across states by decomposing the matrix in two sub-portfolios that have the same variance. By imposing antimonotonicity between the sub-portfolio losses, a minimum variance is achieved. Rewriting one critical part of the algorithm in C and calling it from R reduces computation time by an order of magnitude. R enables a swift translation from an idea to a working program. Matrix subsetting in R is particularly helpful in the selection of sub-portfolios. On average, the BRAVE algorithm finds the target dependence structure in 30% less iterations than the existing solutions, worst-case performance is on par. Overall, the number of iterations is less sensitive to randomness. The proposed BRAVE algorithm combines accuracy and speed in terms of numerically deriving the VaR bounds of high-dimensional portfolios. This is empirically relevant, given the almost continuous changes in the portfolio composition of insurers, requiring the risk manager to update frequently his assessment of the worst-case portfolio VaR. The proposed algorithm thus allows risk managers and regulators to monitor worst-case losses more effectively, with high-dimensional portfolios.

Using least square Monte Carlo techniques in insurance with R

Sébastien de Valeriola (UCL and Reacfin, Belgium)

In this talk we propose to present how Least Square Monte Carlo techniques can be applied in the Insurance industry using R. Primarily developped for the pricing of an American option, this approach can be used to compute the Solvency Capital Ratio of an insurance company, as defined in the Solvency II directive. We will show on a simple model how the LSMC techniques reduce the computation time by a factor 100.

Session 2
Lightning talks on R packages and case studies

StMoMo: an R package for stochastic mortality modeling

Andres Villegas (Cass Business School)

In this talk we use the framework of generalised (non-)linear models to define the family of generalised Age-Period-Cohort stochastic mortality models which encompasses the vast majority of stochastic mortality projection models proposed to date, including the well-known Lee-Carter and Cairns-Blake-Dowd models. We also introduce the R package StMoMo which exploits the unifying framework of the generalised Age-Period-Cohort family to provide tools for fitting stochastic mortality models, assessing their goodness of fit and performing mortality projections. We illustrate some of the capabilities of the package by performing a comparison of several stochastic mortality models applied to the England and Wales population. The latest development version of StMoMo is available at https://github.com/amvillegas/StMoMo and we expect to have submitted the package to CRAN by June 2015.

Actuarial evaluation of annuities using R

Giorgio Spedicato (Unipol)

The R statistical framework (R Core Team 2014) could be used for life insurance actuarial analyses also thanks to the the lifecontingencies R package, (Spedicato 2013). This package provides useful functions to that allow the life actuary to perform standard pricing and reserving tasks as well as financial mathematics and demographic analyses. Moreover, some stochastic evaluations can be performed in addition to standard deterministic calculations. After a quick presentation of package key functions, an exercise of actuarial assessment of an annuities portfolio will be performed. In particular, the portfolio Actuarial Present Values (APV) will be modeled when both probabilities of death and interest rates are uncertain. Mortality dynamics will be modeled using the Lee Carter method (Lee 2000) as implemented in demography (Heather Booth,Tickle, and Maindonald. 2014) R package, whilst interest rates will be modeled within the R system following the suggestions shown in (Charpentier 2014, ch. 12).

Health care risk adjustment in R

Andrew Webster (Forecast Health)

The United States Heath Care system heavily restricts individual medical underwriting factors through Federal regulation. In its place, risk adjustment rebalances premium dollars across insurance entities according to chronic illness burden in hopes of premium stabilization. Up until now, SAS® has been the only option for calculating risk adjustment scores out of the box. In this lightning talk the riskAdjuster package is introduced, which provides a unified framework for commercial, Medicare, and Medicaid risk adjusters in R. Andrew demonstrates how to calculate risk adjustment scores for a million health care claims in less than one minute with the riskAdjuster package: http://youtu.be/GUlo2-vZWV0 . The riskAdjuster package is in public beta and source code can be found at: https://github.com/amwebste/riskAdjuster . Anticipated CRAN release date is 4/15/2015.

Case study of how actuaries use R

Mark Chisholm (XL Catlin)

R is a versatile statistical language that enables practitioners to manipulate and analyse complex data sets. This presentation describes how R has been used in XL Catlin to create predictive models, build a visualisation tool, and enrich existing data sets kept in non-standard formats. The cost of acquiring R, its flexible graphics capabilities and the abundance of open source package add-ons make it attractive when compared with other tools. One of the purposes of R is to perform predictive modelling, which makes it a suitable tool for Actuarial teams. Generalised linear models are commonly employed by actuaries to understand how a policyholder's characteristics relate to claims, and it is easy to create an initial fit in R. Other classification techniques available in R, such as random forests and discriminant analysis, also hold promise for understanding low-frequency/high-severity classes of business, which have traditionally been difficult to model. For insurers that use one-way tables in spreadsheets to analyse multiple variables in their data, R offers an inexpensive way of utilizing multivariate techniques. In addition to R's statistical analysis capabilities, it also produces high quality charts. The 'Shiny' package extends this functionality by allowing the end user to interactively explore and visualise data through a web browser. This holds tremendous benefits for insurers as it allows underwriters to better understand their book of business, without requiring any knowledge of programming or spreadsheet software.
Attendees will learn:

- How R and associated packages relate to other commonly used actuarial tools;
- Examples of actuarial use cases for which R is a good fit;
- A description of how R has been used for various kinds of models at XL Catlin;
- How R works with data visualisation.

End-to-end reproducible analytics with R

Kevin Kuo

As the emphasis on reproducible research becomes more prevalent, actuarial and data science teams are thinking about how to work more reproducibly and collaboratively. To aid in this endeavor, the R ecosystem has grown to be rich enough that one can stay in the same environment during the analytics process from beginning to end. This talk presents a production-ready workflow, from working with backend datastores to data checking, data manipulation, machine learning, model validation, and the creation of slide decks and documentation – and how all of this can be put under source control. We demonstrate a variety of packages under active development and how they work together. A few examples include using dplyr and data.table for data manipulation, caret and h2o for model fitting, and the htmlwidgets suite of packages for visualization.

Broken heart in R

Orsolya Retaller (RUG, Groningen)

In the insurance business independent lives are usually assumed for computational convenience. However, studies have already revealed that this assumption is quite unrealistic. Couples who spend a long time together share certain factors which influence both their life expectancy. In addition, there exists a phenomenon, called the broken heart syndrome, which implies that one's death makes a significant impact on the partner's mortality. This particular study observes married couples of a large Canadian insurer's database and compares life expectancy of those who have and who haven't lost their spouses. The comparison is also made separately for males and females and it is also observed which gender seems to suffer more because of the broken heart effect and whether the difference is significant. It should also be noted, that life expectancy varies over age and it is more likely that someone loses their spouse in an older age than younger. This is also taken into consideration when making the previously described comparisons. Since the study mainly focuses on differences in mortality for those who have and who haven't suffered the loss of their spouses, only univariate survival models are being used. If, however, the broken heart syndrome gets verified, there is still room for further research on models which can incorporate and utilize this phenomenon for life-insurance products.

Session 3
Life insurance and mortality modeling

Mortality forecast: global or local?

Han Li (Monash University)

Accurate future mortality forecasts are of fundamental importance as they ensure adequate pricing of mortality-linked insurance and financial products. Extrapolative methods are the most commonly adopted forecasting approach in the literature to projecting future mortality rates (see for example Clayton and Schifflers, 1987; Lee and Carter, 1992). These methods tend to identify the trends in past mortality experience and then uses these trends to forecast future mortality rates. There are generally two types of mortality models using the extrapolative approach. The first imposes assumptions on the age, time or cohort structure of the mortality data (see for example Lee and Carter, 1992; Plat, 2009). The second uses non-parametric smoothing method to model mortality and thus has no explicit constraints placed on the model (see for example Currie, et al., 2004; Hyndman and Ullah, 2007). We argue that the main difference between the two types of models in terms of forecasting is the fact that, the former uses global information and the latter mainly uses local information. In this paper we conduct an investigation on the comparison of the forecasting performance of the two types of models using several R functions developed in mortality related packages such as the "demography" package. The paper will assess the accuracy of forecasts not only based on statistical measures but also take the randomness of residuals into account. We also explore the possibility of combining the two types of forecasts together to see if this could improve the overall predictive accuracy and reduce the uncertainty of forecasts.

Bayesian Poisson log-bilinear models for mortality projections with multiple populations

Anastasios Bardoutsos (KU Leuven)

Life insurers, pension funds, health care providers and social security institutions face increasing expenses due to continuing improvements of mortality rates. The actuarial and demographic literature has introduced a myriad of (deterministic and stochastic) models to forecast mortality rates of single populations. This paper presents a Bayesian analysis of two related multi-population mortality models of log-bilinear type, designed for two or more populations. Using a larger set of data, multi-population mortality models allow joint modelling and projection of mortality rates by identifying characteristics shared by all sub-populations as well as sub-population specific effects on mortality. This is important when modeling and forecasting mortality of males and females, regions within a country and when dealing with index-based longevity hedges. Our first model is inspired by the two factor Lee & Carter model of Renshaw and Haberman (2003) and the common factor model of Carter and Lee (1992). The second model is the augmented common factor model of Li and Lee (2005). This paper approaches both models in a statistical way, using a Poisson distribution for the number of deaths at a certain age and in a certain time period. Moreover, we use Bayesian statistics to calibrate the models and to produce mortality forecasts. We develop the technicalities necessary for Markov Chain Monte Carlo ([MCMC]) simulations and provide software implementation (in R) for the models discussed in the paper. Key benefits of this approach are multiple. We jointly calibrate the Poisson likelihood for the number of deaths and the times series models imposed on the time dependent parameters, we enable full allowance for parameter uncertainty and we are able to handle missing data as well as small sample populations. We compare and contrast results from both models to the results obtained with a frequentist single population approach and a least squares estimation of the augmented common factor model.

Pricing mortality swaps using R

Michael Cooney (Applied AI)

Mortality swaps are a relatively new financial contract involving the guaranteeing of annuity payments that are contingent on the life of a policy holder. Also known as longevity swaps, the contracts are designed to insure against the risk of unexpected termination of the annuity payments. This risk can be on either side, depending on whether or not the annuities in the portfolio are an asset or a liability. We take a Monte Carlo simulation approach, using adjusted life table data to sample the years of death and calculate the discounted cash flows. Iterating over each annuity in the portfolio we calculate an expected value for the portfolio for the time horizon of the swap. The difference between this value and the present value of a guaranteed annuity is the fair value for the swap. The simulation approach naturally includes correlations within cohorts with similar health profiles and provides the flexibility to add additional wrinkles to the model as appropriate. Sensitivity of the price to changes in interest rates are tested and consideration is made to modifying the life tables due to the health status of the annuitants, using a underwriting rating.

Session 4
Non-life and health insurance

Compartmental reserving in R

Jake Morris (Liberty Specialty Markets)

Compartmental reserving is a new non-life insurance triangle-based reserving method that I developed whilst in employment at Lane Clark & Peacock. It is independent of chain-ladder and BF-type methods, and provides a way of modelling uncertainty that is independent of ODP bootstrap and Mack.
Key features of the method include:

- Models the claims process directly, making the most of both paid and outstanding data;
- A reserving framework that can be as simple or sophisticated as the situation demands;
- Model parameters that have real-world meanings and are easy to communicate;
- Enables key business features to be modelled explicitly;
- Provides a new way of analysing case reserve robustness;
- Based on mainstream mathematical techniques used routinely outside the insurance industry.

The method builds on J.Guszcza's hierarchical growth curve research1 and requires a nonlinear mixed effects model solver algorithm, which the R package "nlme" provides. I will talk through the methodology and an application to real data using R. Additionally, I will explore how compartmental reserving models can be extended to capture specific data features.

Using R to examine data from the affordable care act on the American health insurance market

Seth J. Chandler (University of Houston)

The Affordable Care Act enacted in 2010 ("Obamacare") has not only transformed American health insurance but has also generated several large and unprecedented databases on the state of that market. This presentation shows how R can be used in diverse ways to find latent patterns in those datasets and thereby improve understanding of health insurance markets for individuals and small businesses as well as the effects of the ACA. Among the topics explored will be the effects of government-provided stop loss reinsurance on health insurance pricing, the effect of a government-created program known as "Risk Corridors" that acts as a kind of derivative security for the benefit of health insurers, and the dynamics of insurance pricing distributions in various health insurance markets created by the ACA. Packages of which heavy use will be made include dplyr, ggplot2, fitdistr, and fitdistrplus. The talk will be accompanied not just by the code used to perform the analysis but also by release of several datasets in "RData" format that provide variants and ensembles of data from healthcare.gov and from the "Actuarial Value Calculator" created as part of the ACA.

Pricing of MAXL treaties

Indra Loljeeh (QBE Re Europe, Secura branch, Belgium)

The pricing of MAXL (Multiline Aggregate eXcess of Loss) treaties is a major problematic when considering reinsurance on mature markets. This kind of treaty corresponds to a non-proportional structure with deductible and limit on the aggregate retention of several underlying structures (proportional or non-proportional, each of them corresponding to a specific line of business), and is a generalization of Stop Loss treaties. Such treaties are more and more asked by our clients, and leave us facing a major challenge in terms of pricing techniques. For such a treaty, classical pricing methods are not adequate. Obtaining the loss distribution corresponding to each of the underlying structures seems quite easy (one could consider some scenario if needed as well), but the combination of all layers is a challenge. Indeed, due to the numerous lines of business that could be concerned, lots of issues remain unsolved from a theoretical point of view. For example, a MAXL treaty could actually combine short tail (e.g. property) and long tail (e.g. liability) businesses or more exotic structures (e.g. crops, Nat cat). Some hypotheses are then needed when mixing such different businesses.
Given some hypotheses about the dependency structure on the underlying lines of business, the use of simulations is fit for purpose. After several trials in different languages, R finally proved to be the most adequate. Thanks to its ease of use and efficiency (programming and computation time), we have developed an efficient tool that meets our expectations towards a pricing tool. Its flexibility allows us to take account of scenarios, distributions or ELTs (event loss tables) and therefore gives us the flexibility needed to treat such particular reinsurance treaties.

Boosting actuarial regression models in R

Carryl Oberson (University of Basel)

We build regression models for claim incidence, claim frequency and claim amount in car insurance using two data sets from the literature. We consider Generalized Linear Models (GLMs) and Generalized Additive Models (GAMs) and fit each model twice: once using the usual machinery and once with the componentwise gradient boosting algorithm, as implemented in the R package mboost. We assess the out-of-sample predictive power of our models using k-fold cross-validation. Although we also consider in-sample goodness of fit measures, the main focus in this work is on out-of-sample predictive power as the latter is of primary interest in actuarial pricing. The componentwise boosting algorithm provides some appealing features: Firstly, it performs variable selection as only the most important covariates are included after an iterative search. Moreover, it is able to determine the appropriate functional form for each covariate and can be applied to situations with high dimensional covariate vectors. Finally, early stopping of the boosting algorithm yields shrunken parameter estimates which seem to provide good predictions in practice, similar to LASSO or ridge regression. For our data, the models estimated with the boosting algorithm compare well with their conventional counterparts in terms of fit, as measured by Akaike's information criterion (AIC). Secondly and more importantly, we find that the boosted models provide more accurate out-of-sample forecasts than the traditional GLMs and GAMs; i.e., the boosted models are better at predicting new claims. Consequently, boosting appears to be a promising tool in an a-priori pricing setting.

Keynote 2

The future of loss reserving – a Bayesian 21st century

Jim Guszcza (Deloitte Consulting, US)

The past quarter century has witnessed a dramatic renaissance of Bayesian theory and practice thanks to the introduction of Markov Chain Monte Carlo [MCMC] simulation for estimating posterior distributions. Yet despite its rich Bayesian heritage, the actuarial profession has yet to adopt these modern developments into its mainstream practice. This talk will review central concepts of the Bayesian paradigm, sketch the outlines of MCMC-based applied Bayesian Data Analysis, and discuss why the Bayesian paradigm is ideal for the problem of estimating outstanding insurance liabilities. The conceptual discussion will be complemented with a case study.

Biographies of presenters (in order of presenting)

Richard Gill

Leiden University, professor
gill1109@gmail.com

Richard David Gill (born 11 September 1951) is a mathematician born in the United Kingdom who has lived in the Netherlands since 1974. He studied mathematics at the University of Cambridge (1970–1973), and subsequently followed the Diploma of Statistics course there (1973–1974). As a probability theorist and statistician, Gill is known for his research on counting processes and survival analysis, some of which has appeared in an advanced textbook. He is the chair of mathematical statistics at Leiden University. Gill is also known for his pro bono consulting and advocacy on behalf of victims of incompetent statistical testimony, including a Dutch nurse who was wrongfully convicted and jailed for six years.

Markus Gesmann

Manager, Analysis, Lloyd's of London
markus.gesmann@lloyds.com

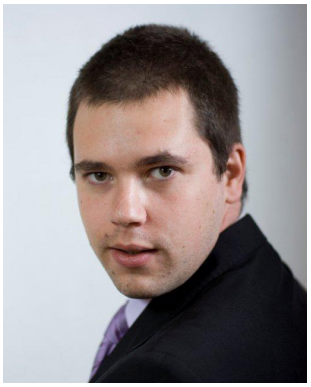
Markus heads up the Analysis function at Lloyd's of London. He is responsible for analytical research and development in Underwriting Performance. His team developed many of the performance oversight tools at Lloyd's, such as the Performance Information, Statistics Relating to Lloyd's and the Price Monitoring Framework (PMDR). Markus is the maintainer and co-author of the ChainLadder reserving package in R and the founder and co-organiser of the R in Insurance conferences. His blog is www.magesblog.com.
Kristof Verbeken

Kristof Verbeken

Vrije Universiteit Brussel (VUB),
PhD student
kristof.verbeken@vub.ac.be

Kristof Verbeken is a first-year PhD student at the Free University of Brussels (VUB). His research focuses on model risk assessment. He is currently working on the Rearrangement Algorithm, combining both his background in computer science and economics, where he is the coauthor of the blockra package.

Sébastien de Valeriola



Sébastien de Valeriola is postdoctoral research fellow at Université catholique de Louvain (UCL) and Senior consultant at Reacfin (Belgium). He holds a Master of Mathematics from the Université Libre de Bruxelles, and a PhD in science and a master in actuarial sciences from UCL. He is member of the IA|BE (Institute of actuaries in Belgium).

Université Catholique de Louvain-la-Neuve, postdoc and Reacfin
sebastien.devaleriola@reacfin.com

Andres Villegas

Since 2010 Andres Villegas is a PhD student in Actuarial Science at Cass Business School focusing on the modelling and projection of mortality. 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 one of the biggest Colombian life insurance companies. Andres research interests include mortality modelling, longevity risk management and the application of optimisation techniques in actuarial science and finance.

Cass Business School, PhD student
Andres.Villegas.1@cass.city.ac.uk

Giorgio Alfredo Spedicato

Giorgio works as Data Scientist at UnipolSai R&D where he is involved in various Risk Management and Business Intelligence projects. Before UnipolSai, he worked as Reserving and Pricing P&C actuary for the Italian branches of Axa and Aviva Groups. He is the author of three R packages used in actuarial science: lifecontingencies, markovchain and mbbefd. He holds a Ph.D in Actuarial Science, is Associate of the Casualty Actuarial Society and is Chartered Statistician.

ACAS Data Scientist at UnipolSai
spedicato_giorgio@yahoo.it

Andrew Webster

Andrew is a health care actuary and developer active in the Chicago health care technology scene. He is founder of Forecast Health (www.forecast-health.com), a company that provides modeling as a service for providers managing risk. His interests include risk adjustment, automation, and analytics-driven application design.

Forecast health, founder
andrew.webster@forecast-health.com

Mark Chisholm

Mark Chisholm has nearly 10 years of experience in different actuarial roles in the US and UK. His background is in helping underwriters at general insurers use data to determine prices for their policies and better understand the risk characteristics of their insureds.

XL Catlin, actuarial analyst
mark.chisholm@xlcatlin.com

Kevin Kuo

Kevin is currently VP, Data Scientist at a global financial services company developing analytical strategies for a private-label credit card portfolio. Prior to his current role, Kevin was a consultant with the Actuarial and Insurance Risk practice at KPMG, where he worked on a variety of engagements including predictive modeling and variable annuity model validation.
Kevin holds a BA in Applied Mathematics from the University of California, Berkeley, a Master's in Applied Mathematics from the University of Georgia, and the Certificate in Quantitative Finance (CQF) designation

kevinykuo@gmail.com

Orsolya Retaller

Orsolya is a PhD student currently holding a teaching position at the University of Groningen. She obtained her master's degree in Finance in her home country, Hungary at the Corvinus University of Budapest, where she majored in Actuarial Science and minored in Applied Statistics. She also has a master's degree in International Management from the CEMS MIM program, which also gave her the opportunity to spend a semester at the University Colleges Dublin. She has been living and working in the Netherlands for the last one and a half years.

RUG, Groningen, PhD student
o.retaller@rug.nl

Han Li

I received my Bachelor of Commerce degree in Actuarial Science with Honours from the University of Melbourne in 2012. To pursue a PhD degree I joined Monash University to work with Professor Colin O'Hare. My research interest is in the field of mortality modelling and forecasting (Life Insurance related topic) and I am now towards the end of the writing up stage of my thesis (*Applications of Various Nonparametric Techniques to Analyze and Forecast Mortality Rates*). In my analysis, I have applied several statistical techniques, such as nonparametric and semi-parametric techniques to mortality modeling. As part of my PhD I have actively engaged with the publication process. I have successfully obtained a publication in Insurance: Mathematics and Economics. I also have another three papers currently in the review process which were submitted to various widely recognized actuarial and statistical journals including Insurance: Mathematics and Economics, Journal of Forecasting and Annals of Actuarial Science.

Han Li
Monash Universityhan.li@monash.edu

Anastasios Bardoutsos

Anastasios Bardoutsos is a PhD candidate, working as research and teaching assistant in the insurance research group at KU Leuven, under the supervision of Associate Prof. Dr. Katrien Antonio and Prof. Dr. Jan Beirlant. Prior to beginning the PhD program, Anastasios obtained a BSc and a MSc in Actuarial and Financial mathematics from University of Aegean, Greece. His research focus is on mortality modelling using Bayesian statistics and on extreme value theory with applications in non-life insurance.

KU Leuven, PhD student
anastasios.bardoutsos@kuleuven.be

Michael Cooney

Michael Cooney has a degree in Theoretical Physics, MSc in High Performance Computing and a PhD in Computational Stochastic Mathematics all from Trinity College Dublin. Michael is highly experienced in probabilistic programming and has worked extensively as a quantitative analyst primarily in the derivatives field. Michael is a founder of the very active Dublin R meetup group.

Applied AI
michael.cooney@applied.ai

Jake Morris

Jake is interested in the application of nonlinear mixed-effects models to general insurance; a branch of statistics that he first became familiar with while working in drug development. He began his actuarial training at consultancy firm Lane Clark & Peacock in 2011 and currently works in a mixed role at Liberty Specialty Markets in London.

Liberty Specialty Markets
Jake.Morris@LibertyGlobalGroup.com

Seth J. Chandler

Seth Chandler holds an A.B. from Princeton University and J.D. from Harvard University Law School. Seth J. Chandler is a Professor of Law at the UH Law Center. He practiced with Munger, Tolles & Olson in Los Angeles and Williams & Connolly in Washington, D.C., working in part on insurance and mal-practice issues, before beginning his academic career at the UH Law Center. Professor Chandler's research interests include the use of computerized mathematical modeling techniques to explore the application of law and economics principles to insurance. He won a prestigious university-wide teaching excellence award in 1995. His topics include: contracts, health law I and II, insurance law, law & economics, life & health insurance seminar.

UH Law Center, professor of Law
chandler.seth@gmail.com

Indra Loljeeh

At the beginning of my studies, I followed intensive Mathematics and Physics courses in a preparatory school in Reunion Island. I was then able to enter an engineering school (Ecole Nationale Supérieure des Mines de St-Etienne) in France, and then to finish my studies in an actuarial school in France as well (ISFA, at Lyon). My main domain of research is the pricing of property reinsurance (both per risk treaties and catastrophic treaties). With a strong focus on both theoretical and practical problems, the Analytics department of QBE Re, which I'm part of for years, focuses on the pricing methods and tools in reinsurance, and the modelling of economical capital.

QBE Re, Europe, Secura branche
indra.loljeeh@qbere.com

Carryl Oberson

Carryl Oberson holds a master degree in actuarial sciences from the University of Lausanne. He is currently PhD student in statistics at the University of Basel where his research focus mainly on predictive modelling with applications in actuarial sciences. Parallel to his research, he also works part-time for the Swiss Federal Treasury in the risk department where his main activity consists in implementing yield curves models for interest rate risk quantification.

University of Basel, PhD student
carryl.oberson@unibas.ch

James (Jim) Guszcza

Chief Data Scientist of Deloitte Consulting in the United States, as well as a member of Deloitte's Advanced Analytics and Modeling practice. Jim has applied statistical and machine learning methods to such diverse business problems as healthcare utilization, customer and employee retention, talent management, insurance agent recruiting, customer segmentation, insurance pricing and underwriting, credit scoring, child support enforcement, medical malpractice and patient safety, claims management, and fraud detection. He has also explored the use of behavioral nudge tactics to more effectively act on model indications. A frequent author and conference speaker, Jim designed and teaches hands-on business analytics training seminars for both the Casualty Actuarial Society and the Society of Actuaries. Jim is a former professor at the University of Wisconsin-Madison business school, and he holds a PhD in the Philosophy of Science from The University of Chicago. Jim is a Fellow of both the Casualty Actuarial Society and Society of Actuaries.

Deloitte consulting US, chief data scientist
jguszca@deloitte.com