

PROGRAM DETAILS - DAY I

Economic Scenario Generators

Abstract: In this presentation, we will first talk about what is an economic scenario generator (ESG). In particular, we shall introduce the risk-neutral ESG and the real-world ESG, and then discuss their uses and their differences. After that, a number of mathematical models used in ESGs will be presented together with their implementation, calibration and validation. The presentation will end with concrete examples of the application of both types of ESG.

Authors:



Jonathan Mossman - Director, Investments at Willis Towers Watson with over 15 years of experience in economic and asset modelling. He is the global product lead for the Willis Towers Watson Real World Economic Scenario Generator, STAR ESG RW. He has nearly three decades of experience in actuarial consulting. Jon specializes in economic scenario generators, with experience in development and calibration of stochastic models used to project economic risk factors such as interest rates, credit spreads, credit transitions and default probabilities, asset-liability modelling for insurance companies and pension plans, strategic asset allocation, asset modelling, validation of internal models for appropriate methodology, assumptions, judgements, documentation and tests, risk neutral valuation. Jon is a CFA charterholder, a Fellow of the Society of Actuaries and a certified Financial Risk Manager from the Global Association of Risk Professionals. He also holds a BSc in Actuarial Science from the University of Calgary, Alberta, Canada.



Zhikang Xu - joined Willis Towers Watson as a quantitative analyst in 2018, after obtaining his PhD in Mathematics at the University of York. He works on the risk-neutral ESG - a software that generates economic scenarios used for valuing financial options and guarantees embedded in insurance liabilities. He mainly works on model research and development, but also helps with model calibration and simulation.

On the Validation of Internal Models

Abstract: The development of risk models for managing portfolios of financial institutions and insurance companies requires, both from the regulatory and management points of view, a strong validation of the quality of the results provided by internal risk models. In Solvency II for instance, regulators ask for independent validation reports from companies who apply for the approval of their internal models. Unfortunately, the usual statistical techniques do not work for the validation of risk models as we lack sufficient data to significantly test the results of the models. Indeed, we will never have enough data to statistically estimate the significance of the VaR at a probability of 1 over 200 years, which is the risk measure required by Solvency II. Instead, we need to develop various indirect strategies to test the relevance of the model. These indirect methods comprise various steps that we list and discuss. In this presentation, we analyze various ways to enable management and regulators to gain confidence in the quality of models. It all starts by ensuring a good calibration of the risk models and the dependencies between the various risk drivers. Then by applying stress tests to the model and various empirical analysis, in particular the probability integral transform, we can build a full and credible framework to validate risk models.

A Change in Paradigm for the Insurance Industry

Abstract: In this presentation we review changes in the insurance industry due to new risk-based regulations such as Solvency 2 and SST and pressure of the shareholders. The move from corporate management based on cash-flow to risk-based management is described and discussed through its consequences on capital management,

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economic valuation and the internal model. We discuss the limits and difficulties

of Enterprise Risk Management and its effect on the organisation of companies as well as we emphasize the changing role of actuaries in insurance. The risk/return relationship and the solvency ratio are becoming a central element of the company's management, slowly supplanting the traditional accounting view.

Author:



Michel Dacorogna - partner at Prime Re Solutions, a company advising financial institutions on actuarial and economic matters. He is also Director of Risk Management at the Geneva Association and head of DEAR-Consulting. He is the former scientific advisor to the chairman of SCOR. He conducts research in the field of insurance mathematics, capital management and risks. He presents models and capital management techniques to management and customers. He is Member of the board of the Research Center on Insurance Risk at the Nanyang Technical University of Singapore, he collaborates with the center on their various initiatives. Until July 2013, Michel was deputy group CRO of SCOR in charge of Solvency II and the internal model. He was at the origin of SCOR's internal model, which he developed with his team for more than 10 years. Author and co-author of more than 85 publications in refereed scientific journals; he is often invited to present his results in international conferences and specialized seminars. His work is referenced in many publications. One of the papers he co-authored was the most quoted paper over 5 years in the Journal of Banking and Finance. His book: "An Introduction to High Frequency Finance" remains a reference in the field. He also lectures at the ETH and University of Zurich, at the University Ca'Foscari in Venice (Italy) and at the University of Turin (Italy) in their master of finance and insurance programs. He has been awarded the International Research Chair LabEx MME-DII & ES-SEC CREAR in 2018 at ESSEC Business School in Paris. He received his Habilitation, Ph.D. and M.Sc.

Valuation of Insurance Liabilities: Merging Market - and Model-Consistency

Abstract: We investigate the valuation of liabilities related to an insurance policy or portfolio in a single period framework. We define a fair valuation as a valuation which is both market-consistent (mark-to-market for any hedgeable part of a claim) and model-consistent (mark-to-model for any claim that is independent of financial market evolutions). We introduce the class of hedge-based valuations, where in a first step of the valuation process, a 'best hedge' for the liability is set up, based on the traded assets in the market, while in a second step, the remaining part of the claim is valued via an actuarial model. We also introduce the class of two-step valuations, the elements of which are very closely related to the two-step valuations which were introduced in Pelsser and Stadje (2014). We show that the classes of fair, hedge-based and two-step valuations are identical.

Author:



Jan Dhaene - holds a Master degree in Mathematics (Universiteit Gent) and in Actuarial Science (KU Leuven). He holds a Ph.D. in Actuarial Science from KU Leuven, where he worked under the guidance of Prof. Dr. N. De Pril and Prof. Dr. M.J. Goovaerts. Currently, he is full professor with the Actuarial Research Group of the Department Accountancy, Finance and Insurance at the Faculty of Business and Economics of KU Leuven. He is head of the Research Centre Insurance (Actuarial Research Group) at KU Leuven. His main current research interests are in modeling dependencies in insurance portfolios, incorporating stochastic financial aspects in actuarial models and risk management for financial institutions. He has published over 130 scientific papers in refereed journals. Together with R. Kaas, M. Goovaerts and M. Denuit, he is co-author of the following books:

- Modern Actuarial Risk Theory (Kluwer, 2001). This book has been translated in Chinese and in Russian.
- Modern Actuarial Risk Theory – Using R (Springer, 2008). This book has been translated in Chinese and in Persian.
- Actuarial Theory for Dependent Risks – Measures, Orders and Models (Wiley, 2005).

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Jan is Associate Editor of Insurance: Mathematics & Economics (since 2000), member of the Editorial Board of ASTIN Bulletin (since 2007), Advisory Editor of Journal of Computational and Applied Mathematics (since 2008), Associate Editor of Istatistik, Journal of the Turkish Statistical Association (since 2012), Associate Editor of Journal of the Iranian Statistical Society (JIRSS, since 2018) and Editor-in-Chief of the Iranian Journal of Risk and Insurance (since 2018). He is member of IAIBE (Institute of Actuaries of Belgium) and IAA. (International Actuarial Association). He is vice-chair of AEN (the Actuarial Education Network of IAA).

Recognition of Life Insurance Contracts' Results Under Different Reporting Regimes

Abstract: Nowadays actuaries face the need of parallel recognition of revenues and expenses under different reporting regimes, even within one company. Understanding of overarching principles particular valuations are based on would allow for a better understanding and reconciliation of the adequacy of metrics' equivalence and transition between them. The presentation aims to compare recognition of results under different reporting regimes based on numerical examples illustrated for unit-linked and term life products. Even though the overall sum of a non-discounted profit emerging from an insurance contract remains the same under different regimes, its recognition is approached differently depending on principles/rules underlying the valuation. The latter can be classified under either prospective or retrospective philosophy depending on the reporting purpose with impact on reconciliation ability.

Authors:



Witold Czechowski - Member of the Management Board of Vienna Life Poland, Vienna Insurance Group. Actuary, Chief Financial Officer and Risk Manager with 28 years' experience in both non-life and life insurance. A graduate of the Warsaw University, Faculty of Physics (Master of Astronomy), Actuarial Summer School and postgraduate studies in Accounting at the University of Finance and Management in Warsaw (Faculty of Finance and Banking). Polish licensed actuary under number 0001, Fellow and Member of the Management Board of the Polish Society of Actuaries. Life Insurance Committee member in the Polish Chamber of Insurance. Responsible for actuarial part of Solvency II implementation in Polish, Austrian, German and Swiss companies of Old Mutual.

Co-author of "Best Estimate Liability: Unit-Linked Business Valuation Methodology" Old Mutual Group internal methodology paper. Co-author of a 3-part cycle about risk metrics as a tool for Risk Management (Miesięcznik Ubezpieczeniowy no. 4,5,6/2015). Coordinator of IFRS 17 implementation in Polish Insurance Companies of Vienna Insurance Group.



Monika Lis - consultant with the Warsaw, Poland office of Milliman with a demonstrated 12-year history of working in the actuarial consulting industry. Polish licensed actuary 0209, Fellow of the Polish Society of Actuaries, Member of the Institute and Faculty of Actuaries in the United Kingdom. A graduate with honors of Lodz Technical University with specialization in financial and insurance mathematics. In Milliman responsible for project management related to wide spectrum of life, non-life and health insurance including profitability measurement, financial reporting under IFRS and local GAAPs, Solvency II, IT implementations and research projects. Before joining Milliman in 2010, Monika worked in the actuarial department of Ernst & Young in Warsaw where she participated in a number of actuarial reviews and audits of life and non-life insurance companies in Poland and CEE region.

Co-author of a 3-part cycle about risk metrics as a tool for Risk Management (Miesięcznik Ubezpieczeniowy no. 4,5,6/2015). Co-author of articles on particular Solvency II aspects (overview of EIOPA guidelines (Miesięcznik Ubezpieczeniowy no.4/2014), impact on insurance products' pricing (Miesięcznik Ubezpieczeniowy no.3/2011).

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The Mathematics and the Practice of Reinsurance

Abstract:

Reinsurance is one of the most powerful drivers for solvency optimization. In this workshop we shall quickly review the theoretical foundations of reinsurance and apply them to price and structure traditional and alternative reinsurance covers. In particular, we will consider:

- The purpose and fundamentals of reinsurance
- Proportional and non-proportional covers
- Experience and exposure rating
- Expenses and risk loadings
- Alternative risk transfer
- Reinsurance optimization

Author:



Frank Cuypers - is a nuclear engineer, with a M.Sc. in nuclear physics and a Ph.D. in theoretical physics. He comes with a prominent scientific track record in modelling complex systems and a vast lecturing experience. As a former Swiss Re Executive and Chief Actuary of Zurich Re in Cologne, he has accumulated a wide experience in most actuarial disciplines, which he now deploys to advise leading insurers & reinsurers with bespoke technical solutions. Moreover, numerous regulators and companies regularly appoint him to validate risk and solvency models. Frank is a fully qualified Actuary. He is currently the Chairman of ASTIN and he created the CPD Committee of the Swiss Actuarial Association, which he presided for 10 years. He is also a shareholder and actuarial director of Prime Re Solutions, a general advisor and service provider for insurers & reinsurers.

IFRS 17 - Disclosure of Confidence Level of Reserve Risk Margins: Practical Approximations

Abstract:

The new Solvency II Directive and the upcoming IFRS 17 regime bring significant changes to current reporting of insurance entities, and particularly in relation to valuation of insurance liabilities. Insurers will be required to value their insurance liabilities on a risk-adjusted basis to allow for uncertainty inherent in cash flows that arise from the liability of insurance contracts. Whilst most European-based insurers are expected to adopt the Cost of Capital approach to calculate reserve risk margin – the risk adjustment method commonly agreed under Solvency II and IFRS 17, there is one additional requirement of IFRS 17 to also disclose confidence level of the risk margin.

Given there is no specific guidance on the calculation of confidence level, the purpose of this paper is to explore and examine practical ways of estimating the risk margin confidence level measured by Probability of Sufficiency (PoS).

The paper provides some practical approximation formulae that would allow one to quickly estimate the implied PoS of Solvency II risk margin for a given non-life insurance liability, the risk profile of which is specified by the type and characteristics of the liability (e.g. type / nature of business, liability duration and convexity, etc.), which, in turn, are associated with

- the level of variability measured by Coefficient of Variation (CoV);
- the degree of Skewness per unit of CoV; and
- the degree of Kurtosis per unit of CoV^2 .

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The approximation formulae of PoS are derived for both the standalone class risk margin and the diversified risk margin at the portfolio level. This presentation is based on the award-winning paper (2017 Bob Alting von Geusau Prize, AFIR-ERM) by Eric Dal Moro and Yuriy Krvavych titled 'Probability of Sufficiency of Solvency II Reserve Risk Margins: Practical Approximations', published in ASTIN Bulletin 47(3), 2017.

Author:



Yuriy Krvavych - is a Managing Director within the EMEA Strategic Advisory of Guy Carpenter, with specific responsibility for the Risk and Capital Advisory offering. His main areas of focus cover a wide range of ERM advisory services including internal capital model development and model use in supporting strategic capital optimisation. Yuriy has over eighteen years of experience working in general insurance and has delivered a number of strategic risk and capital projects. Prior to joining Guy Carpenter, Yuriy was a Senior Manager at PwC's Actuarial Services in London, UK providing consulting services to the Lloyd's market and London company market in Enterprise Risk Management including Risk and Capital Modelling, Model Validation, Advanced Risk Analytics and Reporting, Capital Model Use and Solvency II. Prior to PwC, Yuriy worked at Insurance Australia Group (IAG) in Sydney, Australia as a DFA and Capital Modelling Manager responsible for providing actuarial consulting services to the Group and its subsidiaries. Prior to IAG, he worked at Hollard Insurance Australia where he led the actuarial function. He holds PhD in Mathematics from Kiev University and PhD in Actuarial Science from the University of New South Wales (Sydney). Author of several scientific publications, Yuriy is a frequent speaker at actuarial and mathematical conferences. He is also globally active in actuarial research and is currently serving on the ASTIN Board of the IAA.

Predicting Cyber-Attacks using Hawkes Processes

Abstract: Among the several features of cyber-attacks one wants to reproduce, those related to the memory of events and self-exciting behavior is of major importance, as it underlies the clustering and auto-correlation properties of inter-arrival times. In this talk, we will describe the step-by-step specification, calibration and simulation of a multivariate Hawkes model for modelling and predicting cyber-attacks frequency, based on a public US dataset. After a short description of the challenges related to the pricing and risk capital calculation for cyber-insurance products, we will first detail some statistical tests invalidating the classical Poisson modelling. Then, we will discuss the multivariate Hawkes model specification based on data segmentation and the interpretations associated with the inferred parameters. Numerical results will be given which provide the full distribution of future cyber-attacks times of occurrence. Finally, the mathematical challenges related to calibration of such Hawkes model in the case of partial observation due to reporting delays will be discussed. Joint work with Caroline Hillairet (ENSAE-ParisTech, CREST) and Yannick Bessy-Roland (Milliman R&D).

Author:



Alexandre Boumezoued - Alexandre Boumezoued is leading the Research & Development team in Milliman Paris office, covering modelling topics in life and non-life insurance as well as financial risks.

Alexandre's current research interests deal with stochastic population dynamics and its use for longevity and mortality risks purposes, stochastic micro/macro non-life reserving models, as well as calibration methods for interest rate and credit risk models.

During the last years, Alexandre has given talks in international conferences and working groups worldwide, and courses in actuarial centers in France.

Alexandre received his PhD in Applied Mathematics from Paris 6 University (Probability and Random Models Laboratory), for which he has been awarded by the 2016 PhD SCOR Actuarial Prize.

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Data Analytics on Cyber Crimes Complaints Registered at C3N of Gendarmerie Nationale

Abstract: Cyber risk cannot be avoided, whatever the implemented IT security. It means to improve the resilience of society, hence the need of a deep understanding of the risks. A way towards this understanding is the search for reliable data and their statistical analysis. It is what is proposed here. We proceed to the statistical data exploration and analysis of the cyber-crimes complaints by victims (individual and companies) registered at the Gendarmerie Nationale's Cyber Crime Unit. Using a recent algorithmic method developed by Debbabi et al. for heavy-tailed data modeling, we show the existence of heavy-tailed distributions, one of the main characteristics of cyber risk.

Author:



Marie Kratz - is a Professor at ESSEC Business School and Director of its risk research center, CREAR. Since July 2017, she also holds a part time position of visiting professor at Lund University (Department of Statistics), Sweden. Marie is a Fellow (Actuaire Agrégée) of 'Institut des Actuaire' (French Institute of Actuaries). She holds a Doctorate in Applied Mathematics (UPMC-Paris 6; carried out to a great extent at the Center for Stochastic Processes at Chapel Hill, North Carolina, USA) & Habilitation (HDR), did a post-doc at Cornell University, USA. Her research addresses a broad range of topics in probability, statistics and actuarial mathematics, with a focus on extreme value theory, risk analysis & management, and the study of random excursion sets. These fields find natural applications in Finance and Actuarial Science that she is developing at ESSEC, with academic and professional partners (e.g. Swiss Life, FP7-European 'RARE' (Risk Analysis, Ruin theory, Extremes) project). Marie coordinates the ESSEC-ISUP Actuarial Track and is member of the Group 'Banque Finance Assurance' of SFdS (French Society of Statistics). Since 2009, she has been organizing a fortnightly Working Group on Risk Analysis at ESSEC – Paris La Défense (and ESSEC Asia Pacific in Singapore, since January 2019), with Academics and Professionals, as well as international conferences on this topic. Marie is invited to present her research in numerous international conferences, seminars and expert forums.



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