

Workshop on Insurance Mathematics and Longevity Risk

Centre of Mathematics for Applications (CMA), University of Oslo

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Abstract

This one-day workshop will focus on recent progress in life insurance, with special emphasis on longevity risk modelling and investment problems. The talks will cover important areas of current research in life insurance, given by world-leading experts, and are open for participants from both industry and academia.

Program

08⁵⁰ – 09⁰⁰ *Welcome to the workshop*

09⁰⁰ – 09⁴⁵ Ragnar Norberg *Management of financial and demographic risk in life insurance and pensions: with profit, unit-linked and securitization*

09⁴⁵ – 10¹⁵ *Coffee break*

10¹⁵ – 11⁰⁰ Daniel Bauer *Solvency II and nested simulations – a least-squares Monte Carlo approach*

11¹⁵ – 12⁰⁰ Mogens Steffensen *Pension fund management based on solutions to constrained consumption-investment problems*

12⁰⁰ – 13⁰⁰ *Lunch break*

13⁰⁰ – 13⁴⁵ Andrew Cairns *Modelling multi-population mortality*

14⁰⁰ – 14⁴⁵ Rüdiger Kiesel: *Modeling the forward surface of mortality*

14⁴⁵ – 15¹⁵ *Coffee break*

15¹⁵ – 16⁰⁰ Gerhard Stahl *Aspects of model risk*

16¹⁵ – 17⁰⁰ Knut Aase *The investment horizon problem: a resolution*

17⁰⁰ – 17¹⁰ *End of workshop*

List of abstracts

Ragnar Norberg (London School of Economics)

Title: Management of financial and demographic risk in life insurance and pensions: with profit, unit-linked and securitization

On diversifiable and non-diversifiable risk: non-systematic mortality risk, systematic mortality risk, financial risk. Management of non-diversifiable risk: the with profit scheme, unit-linked insurance, and alternative risk transfer (ATR). A closer look at ATR through mortality derivatives: optimal mean-variance hedging with a given set of derivatives and optimal design of the very derivatives. Some common sense: can the market really come to our rescue?

Daniel Bauer (Georgia State University)

Title: Solvency II and nested simulations – a least-squares Monte Carlo approach

Within the European Union, risk-based funding requirements for life insurance companies are currently being revised as part of the Solvency II project. However, many insurers are struggling with the implementation, which is in part due to the inefficient methods underlying their numerical computations. We review these methods and propose a significantly faster approach for the calculation of the required risk capital based on least-squares regression and Monte Carlo simulations akin to the well-known Least-Squares Monte Carlo method for pricing non-European derivatives introduced by Longstaff and Schwartz (2001). Joint work with Daniela Bergman and Andreas Reuss.

Mogens Steffensen (Copenhagen University)

Title: Pension fund management based on solutions to constrained consumption-investment problems

We give an overview over a series of problems of expected utility optimization with constraints on consumption and/or wealth. Interpreting the constraints as contractually binding terms and solvency rules, problems and results are closely linked to the management of pension funds. The innovation is contextual (pension fund management) and methodological (dynamic programming).

Andrew Cairns (Heriot-Watt University)

Title: Modelling multi-population mortality

As a starting point we assume that mortality changes in different populations do not move exactly in parallel, rather there is some form of stochastic linkage. The first part of the talk will discuss potential criteria that are required for stochastic mortality models that models jointly two or more populations. The talk will then focus on a two-population extension of a simple age-period-cohort

model. We apply this model in a Bayesian framework in a setting with one large population and a second and relatively-small sub-population.

Rüdiger Kiesel (Ulm University and CMA)

Title: Modeling the forward surface of mortality

In recent literature, different methods have been proposed on how to define and model stochastic mortality. In most of these approaches, the so-called spot force of mortality is modeled as a stochastic process. In contrast to such spot force models, forward force mortality models infer dynamics on the entire age/term-structure of mortality.

This paper considers forward models defined on best-estimate forecasts on survival probabilities as can be found in so-called best-estimate generation life tables. We show that the forward approach bears profound advantages in view of actuarial applications and provide a detailed analysis of forward mortality models driven by finite-dimensional Brownian motion. In particular, we address the relationship to other modeling approaches, the consistency problem of parametric forward models, and the existence of finite dimensional realizations for Gaussian forward models.

All results are illustrated based on a simple example with an affine specification.

The talk is based on joint work with Daniel Bauer (Georgia State University) and Fred Espen Benth (CMA).

Gerhard Stahl (Talanx)

Title: Aspects of model risk

The talk gives an overview of definitions of model risk. Real life examples to be presented cover topics from banks and insurances as well. The examples show that model risk can hardly be overestimated. Regulatory implications of model risk will also be discussed. One way to tackle model risk is to apply robust statistical methods.

Knut Aase (NHH and CMA)

Title: The investment horizon problem: a resolution

In the canonical model of investments, the optimal fractions in the risky assets do not depend on the time horizon. This is against empirical evidence, and against the typical recommendations of portfolio managers. We demonstrate that if the intertemporal coefficient of relative risk aversion is allowed to depend on time, or the age of the investor, the puzzle can be resolved. Accordingly, the only standard assumption in applied economics/finance that we relax in order to obtain our conclusion, is the state and time separability of the

intertemporal utility index in the integral of the investor's utility function. Keywords: The investment horizon problem, complete markets, pension insurance, dynamic programming, Kuhn-Tucker, directional derivatives in function space.