2nd Cologne Workshop on Actuarial Mathematics

Programme

	Thursday	Friday
10:00–11:00	**Deelstra**	**Drees**
11:00–11:30	**Eisenberg**	**Schmidli**
11:30–14:00	Lunch	
14:00–15:00	**Müller**	
15:00–15:30	Coffee	
15:30–16:00	**Haas**	
16:00–16.30	**Manca**	
16:30–17:00	**Valkeila**	
17:30–	Beer and Sandwiches	

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Abstracts

Invited Talks

Griselda Deelstra (Université Libre de Bruxelles)

Local Volatility Pricing Models for Long-Dated Derivatives in Finance and Insurance

We study the local volatility function in the Foreign Exchange market where both domestic and foreign interest rates are stochastic. This model is suitable to price long-dated FX derivatives. We derive the local volatility function and obtain several results that can be used for the calibration of this local volatility on the FX option's market. We further concentrate upon Guaranteed Annuity Options (GAO), which give the right at the policyholder to convert his accumulated funds to a life annuity either at a rate based on the current market rates or at a fixed rate called the Guaranteed Annuity rate. We derive prices of GAO's in the settings of a two-factor pricing model where the equity is locally governed by a geometric Brownian motion with a local volatility, while the interest rate follows a Hull-White one-factor Gaussian model.

Holger Drees (University of Hamburg)

Extremal Dependence of Time Series

By now the statistical analysis of independent extreme risks is well developed. In contrast, the understanding of the statistical inference on the dependence between extreme events over time is rather patchy, despite the fact that the total risk is often strongly influenced by the clustering behaviour of extremal events. For example, the risk of huge accumulated losses in a financial investment is larger if days with large losses tend to occur in clusters.

We present a systematic approach to the analysis of the extremal serial dependence of such time series using empirical process theory. Particular attention is turned to the bias which is known to often cause serious misjudgment of the clustering behaviour and hence of the total risk.

Alfred Müller (University of Siegen)

Duality Theory for the Ordering of Risks

In this talk we will demonstrate how functional analytic results from duality theory can be used in the theory of stochastic order relations, useful for the ordering of risks. It will be shown how this can be used to give elegant and intuitive proofs of some known results, and how they can be generalized to new results. Special emphasis will be given to the case of characterizing convex ordering of univariate distributions by mean preserving spreads and how these results can be generalized to the multivariate case.

Contributed Talks

Julia Eisenberg (Technical University of Vienna)

Minimising Capital Injections by Reinsurance and Surplus Investment Under Short-selling and Borrowing Constraints

We consider an insurer whose surplus process is modelled as a diffusion. The insurer can buy proportional reinsurance and invest his surplus into risky and risk-free assets under short-selling and/or borrowing constraints, changing the reinsurance and investment amount continuously. To prevent that the surplus process becomes negative, the cedent has to inject capital. We choose as a risk measure connected to some reinsurance strategy pair the value of expected discounted capital injections. The objective is to find the value function defined as the infimum of expected discounted capital injections over all reinsurance strategies and to derive the optimal strategy leading to the value function.

In contrast to the case without constraints we are not able to give a closed expression for the value function. But we derive a method for numerical calculation of the optimal strategy.

Sandra Haas (Université de Lausanne)

The Joint Perspective of Cedent and Reinsurer on the Optimality of Reinsurance Contracts

Optimality results in the reinsurance literature focus mainly on the cedent's perspective. When the reinsurer's perspective is not part of the considerations often Stop-Loss contracts are identified as optimal. In practice, however, reinsurance companies will often avoid such contracts or set upper limits, partly to reduce the problem of careless claim settlements and potential moral hazard of the first-line insurer. In this paper we consider reinsurance contracts that take this problem into account more explicitly and optimize the situation for both parties, the cedent and the reinsurer, where the objective function is a linear combination of expected utility

of the cedent and the reinsurer, respectively. Some analytical and numerical results are provided.

Raimondo Manca (University La Sapienza, Rome)

Stochastic Cash Flows and Backward Semi-Markov Reward Processes

A full treatment of continuous time homogeneous and non-homogeneous backward semi-Markov reward processes will be presented, as far as the authors know, for the first time in the continuous time continuous state non-homogeneous case. In the continuous time semi-Markov process environment, the distribution function that rules the transitions between the states of the studied system can be of any type and not only exponential. This fact is an important generalization as regards the Markov environment. The introduction of backward time makes it possible to consider the instant in which the system entered a state, even if it entered before the time under consideration.

Rewards permit the introduction of a financial environment into the model. Considering all these properties any stochastic cash flow can, in the authors' opinion, be naturally modeled by means of semi-Markov reward processes. Furthermore, the backward case offers the possibility of considering the duration of an event that began before the time in which the system is observed, and this fact can be very useful in the evaluation of some insurance contracts.

Hanspeter Schmidli (University of Cologne)

Ruin Probabilities in a Diffusion Environment

We consider an insurance model, where the underlying point process is a Cox process. Using a martingale approach applied to diffusion processes, finite-time Lundberg inequalities are obtained. By change of measure techniques Cramér–Lundberg approximations are derived. Finally, subexponential claim sizes are considered.

Esko Valkeila (Aalto University, Helsinki)

On Bayesian Modeling of Insider Information

We will give a Bayesian formulation of the insider information in some market models. We consider both the strong information, where the insider knows the final value, and the weak information, where the insider has only some prior knowledge of the final value.