Extremes, Copulas and Actuarial Science
February 22 - 26, 2016

Hansjoerg Albrecher: Challenges in Reinsurance Modelling.

Some recent problems and challenges in reinsurance modelling will be discussed, both from an actuarial and statistical perspective. Topics include estimation of heavy tails, dependence, censoring, information asymmetry and reinsurance pricing.

Romain Biard: Fractional Poisson process: long-range dependence and applications in ruin theory.

We study a renewal risk model in which the surplus process of the insurance company is modeled by a compound fractional Poisson process. We establish the long-range dependence property of this non-stationary process. Some results for the ruin probabilities are presented in various assumptions on the distribution of the claim sizes.

Michel Broniatowski: Inference pour des modèles semi paramétriques définis par des conditions sur leurs L-moments.

Résumé: Cet exposé présente une généralisation des méthodes de minimum de divergences adaptées aux modèles semi paramétriques satisfaisant des contraintes linéaires par rapport à la mesure de la variable d'intérêt au cas où ces contraintes portent sur la mesure quantile; ces contraintes représentent donc des conditions de forme. Les méthodes d'inférence sont moins classiques que celles développées dans le cadre voisin de la vraisemblance empirique (minimum de divergence empirique).

Ces modèles, dont on montrera les propriétés, décrivent des lois proches de modèles classiques en valeurs extrêmes: ils partagent en effet leurs premiers L-moments avec ceux de lois de Pareto ou de Weibull, par exemple.

Divers exemples seront présentés, ainsi que des comparaisons de performances avec les estimateurs du maximum de vraisemblance sous les modèles de Pareto ou de Weibull complets. On s'interessera en particulier à des estimateurs de minimum du Chi-2, et on montrera quelques résultats sous mauvaise spécification.

Abstract: This talk presents the empirical minimum divergence approach for models which satisfy linear constraints with respect to the probability measure of the underlying variable (moment constraints) to the case where such constraints pertain to its quantile measure (called here semi parametric quantile models). The case when these constraints describe shape conditions as handled by the L-moments is considered and both the description of these models as well as the resulting non classical minimum divergence procedures are presented. These models describe neighborhoods of classical models used mainly for their tail behavior, for example neighborhoods of Pareto or Weibull distributions, with which they may share the same first L-moments. The properties of the resulting estimators are illustrated by simulated examples comparing Maximum Likelihood estimators on Pareto and Weibull models to the minimum Chi-square empirical divergence approach on semi parametric quantile models, and others.

Reference: arXiv:1409.5928 Alexis Decurninge, Michel Broniatowski Estimation for models defined by conditions on their L-moments, en révision, IEEE, Tr

Axel Bucher: Weak convergence of the empirical copula process with respect to weighted metrics.

The empirical copula process plays a central role in the asymptotic analysis of many statistical procedures which are based on copulas or ranks. Among other applications, results regarding its weak convergence can be used to develop asymptotic theory for estimators of dependence measures or copula densities, they allow to derive tests for stochastic independence or specific copula structures, or they may serve as a fundamental tool for the analysis of multivariate rank statistics. In this talk, we establish weak convergence of the empirical copula process (for observations that are allowed to be serially dependent) with respect to weighted supremum distances. The usefulness of our results is illustrated by applications to general bivariate rank statistics and to estimation procedures for the Pickands dependence function arising in multivariate extreme-value theory.

Paul Deheuvels: Extreme-Value Copulae and Applications.

We give an exposition of the theory of extreme-value copulae and their applications, with emphasis on statistical inference based upon random samples of multivariate observations.

Elena Di Bernardino: On tail dependence coefficients of transformed multivariate Archimedean copulas.

This work presents the impact of a class of transformations of copulas in their upper and lower multivariate tail dependence coefficients. In particular we focus on multivariate Archimedean copulas. In the first part, we calculate multivariate transformed tail dependence coefficients when the generator of the considered transformed copula exhibits some regular variation properties, and we investigate the behavior of these coefficients in cases that are close to tail independence. We obtain new results under specific conditions involving regularly varying hazard rates of components of the transformation. These results are also valid for non-transformed Archimedean copulas. In the second part we deal with a class of particular hyperbolic transformations. We show the utility of using transformed Archimedean copulas, as they permit to build Archimedean generators exhibiting any chosen couple of lower and upper tail dependence coefficients.

Clément Dombry: Full lilelihood inference for multivariate max-stable distributions.

Full likelihood inference methods for max-stable distributions suffer from the curse of dimension since the number of terms in the full likelihood in dimension d is equal to the Bell number B_d. For instance, $B_10 \approx 1,16\,10^5$ and $B_20 \approx 5,17\,10^{23}$. A direct maximisation of the likelihood is hence extremely challenging and one often uses pairwise or composite likelihood instead. The purpose of this talk is to present an on-going projects dealing with an EM approach for maximising the full likelihood. We introduce an additional random variable, called hitting scenario, defined as a random partition associated with the occurence times of the maxima. Treating the hitting scenario as a missing observation, the completed likelihood becomes simple and we can apply a EM strategy to maximise the full likelihood. For the E-step, we use a Monte-Carlo estimation based on a Gibbs sampler for the conditional hitting scenario, resulting in a stochastic EM algorithm. We present a preliminary numerical study based on the logistic model.

Christophe Dutang: Parameter Estimation for Mixed-type Distributions with Application to Destruction Rate Modeling in Insurance

Within the actuarial jargon, an exposure curve is a distribution of the ratio between the limited expected loss at various limits and the unlimited expected loss, i.e. $d \mapsto E(X \wedge d)/E(X)$. We present destruction rate models either defined by their distribution function or equivalently by their exposure curve. A particular attention is given to one-inflated distributions and the so-called MBBEFD distribution. Parameter estimation for these two models is carried out by maximum likelihood estimation. Properties of these estimators and regression models are studied. Finally, numerical illustrations are given in the actuarial context.

Nicole El Karoui: Fast Change of time Detection on Proportional Two Populations Hazard Rates.

Our first motivation in quickest detection problem of change in proportional hazard rates was the mortality evolution which may change in projection period. In experienced mortality, deaths can be observed sequentially, but detecting change as soon as possible allows to update mortality assumptions. Given the heterogeneity of the populations, only the ratio of the change may be assumed deterministic, when the reference hazard rate is assumed to be random. Given this double uncertainty, the criterium must be robust with respect of the uncertainty of the hazard rate (intensity) process. So, we adopt the robust Lorden criterion in place of the classical Bayesian point of view. The latter is formulated in terms of the number of events until detection, both for the worst-case delay and the false alarm constraint. In the Wiener case with proportional deterministic drift change, such a problem was solved using the so-called cumulative sums (cusum) strategy by many authors (Moustakides (2004), or Shyraiev (1963,..2009)). Our setting concerns doubly stochastic (deaths) point process, and the still so-called cumulative sums (cusum) strategy defined from the supremum in time of the log-likelihood process. Both criteria are invariant by time rescaling, which minimizes the impact of stochastic intensity. We derive the exact optimality of the cusum stopping rule by using finite variation calculus and elementary martingale properties to characterize the performance functions of the cusum stopping rule as solutions of some delayed differential equations that we solve elementary. The case of detecting a decrease in the intensity is easy to study because the performance functions are continuous (Moustakides (2008)). In case of detecting an increase, the optimality of the cusum rule was until now only a conjecture, even in the Poisson case. The difficulty is that the performance functions are not continuous and martingale properties require using a discontinuous local time. Nevertheless, from a thin identity on the performance functions, the conjecture is proved. Numerical applications are provided.
Joint work with S. Loisel and Y. Salhi.

Jonathan El Methni: Kernel estimation of extreme risk measures for all domains of attraction.

Value-at-risk, Conditional Tail Expectation, Conditional Value-at-risk and Conditional Tail Variance are classical risk measures. In statistical terms, the Value-at-risk is the upper α-quantile of the loss distribution where $\alpha \in (0, 1)$ is the confidence level. Here, we focus on the properties of these risk measures for extreme losses (where $\alpha \downarrow 0$ is no longer fixed). To assign probabilities to extreme losses we assume that the distribution satisfies a von-Mises condition which allows us to work in the general setting, whether the extremevalue index is positive, negative or zero i.e. for all domains of attraction. We also consider these risk measures in the presence of a covariate. The main goal of this communication is to propose estimators of the above risk measures for all domains of attraction, for extreme losses, and to include a covariate in the estimation. The estimation method thus combines nonparametric kernel methods with extreme-value statistics. The asymptotic distribution of our estimators is established and their finite sample behavior is illustrated on simulated data and on a real data set of daily rainfall.

Jean-David Fermanian: Single-index copulae.

We introduce so-called "single-index copulae". They are semi-parametric conditional copulae whose parameter is an unknown "link" function of a univariate index only. We provide estimates of this link function and of the finite dimensional unknown parameter. The asymptotic properties of the latter estimates are established. Thanks to some properties of conditional Kendall's tau, we illustrate our technical conditions with several usual copula families.

Stéphane Girard: Estimation of tail risk based on extreme expectiles.

The class of quantiles lies at the heart of extreme-value theory and is one of the basic tools in risk management. The alternative family of expectiles is based on squared rather than absolute error loss minimization. The exibility and virtues of these least squares analogues of quantiles are now well established in actuarial science, econometrics and statistical finance. Both quantiles and expectiles were embedded in the more general class of M-quantiles as the minimizers of a generic asymmetric convex loss function. It has been proved very recently that the only M-quantiles that are coherent risk measures are the expectiles. Least asymmetrically weighted squares estimation of expectiles did not, however, receive yet as much attention as quantile-based risk measures from the perspective of extreme values. In this talk, we develop new methods for estimating the Value at Risk and Expected Shortfall measures via high expectiles. We focus on the challenging domain of attraction of heavy-tailed distributions that better describe the tail structure and sparseness of most actuarial and financial data. We first estimate the intermediate large expectiles and then extrapolate these estimates to the very far tails. We establish the limit distributions of the proposed estimators when they are located in the range of the data or near and even beyond the maximum observed loss. Monte Carlo experiments and a concrete application are given to illustrate the utility of extremal expectiles as an efficient instrument of risk analysis.
Joint work with Abdelaati Daouia and Gilles Stupfler

Pierre-Olivier Goffard: Orthogonal polynomials expansions and lognormal sum densities.

Approximations for an unknown density g in terms of a reference density f and its associated orthonormal polynomials are discussed. The main application is the approximation of the density g of a sum S of lognormals which may have different variances or be dependent. In this setting, g may be f itself or a transformed density, in particular that of log(S) or an exponentially tilted density. Choices of reference densities f that are considered include normal, gamma and lognormal densities. For the lognormal case, the orthonormal polynomials are found in closed form and it is shown that they are not dense in the set of square integrable functions with respect to f, a result that is closely related to the lognormal distribution not being determined by its moments and provides a warning to the most obvious choice of taking f as lognormal. Numerical examples are presented and comparison are made to established approaches such as the Fenton–Wilkinson method and skew-normal approximations. Also extension to density estimation for statistical data sets and non-Gaussian copulas are outlined. Keywords: Lognormal distribution, sums of lognormally distributed random variable, orthogonal polynomial, density estimation, Stieltjes moment problem, numerical approximation of functions, exponential tilting, conditional Monte Carlo, Archimedean copula, Gram–Charlier expansion, Hermite polynomial, Laguerre polynomial.

Armelle Guillou: Estimation of the marginal expected shortfall.

Let Z be a random variable in the Frechet domain of attraction with an infinite mean. Set $X := \log(Z)$. As a result, X is in the Gumbel domain of attraction. Our main interest in this talk is to look at

$$E[X|Y > t]$$

, where Y is a related random variable. Apart from the continuity of the distribution function, we don't assume other condition on Y . In this talk we consider the case where t is a high threshold of the distribution of Y , i.e. $t := Q_Y(1-p)$, with p extremely small compared to the sample size n of the original dataset. This reduces to the marginal expected shortfall defined as $\theta_p := E(X|Y > Q_Y(1-p))$ for which we propose an estimator and we study its asymptotic properties under tail dependence of X and Y. A simulation study is provided to assess the performance of our estimator.
This work is in progress with Juan Juan Cai (Delft University of Technology, The Netherlands) and Valérie Chavez-Demoulin (University of Lausanne, Switzerland).

Anja Janßen: Applications of the multivariate tail process for extremal inference.

Multivariate regularly varying time series are a common tool for modelling the dynamics of heavy-tailed processes of dimension larger than one. Let $(X_t)_{t\in\mathbb{Z}}$ be a stationary d-dimensional regularly varying process. The extremal behavior of this process can be described by the index $\alpha > 0$ of regular variation and the law of the so-called spectral tail process $(\Theta_t)_{t\in\mathbb{Z}}$, for which

$$\mathcal{L}\left(\frac{X_{-n}}{x}, \ldots, \frac{X_m}{x} \,\middle|\, \|X_0\| > x\right) \stackrel{w}{\Rightarrow} \mathcal{L}(Y \cdot \Theta_{-n}, \ldots, Y \cdot \Theta_m), \quad x \to \infty,$$

with a Pareto(α)-distributed random variable Y which is independent of $(\Theta_t)_{t\in\mathbb{Z}}$, cf. Basrak & Segers (2009). The spectral tail process satisfies a certain property which is sometimes called the "time change formula" that describes its behavior when shifted in time, cf. Basrak & Segers (2009). We are interested in estimating the law of Θ_t for $t \in \mathbb{Z}$ with a focus on the cases $t = 0, 1$. These two quantities are of interest in particular for Markov processes $(X_t)_{t\in\mathbb{Z}}$ where their joint distribution (together with the value of α) already determines the whole distribution of $(\Theta_t)_{t\in\mathbb{Z}}$, cf. Janßen and Segers (2014). By extending an idea used in Drees, Segers & Warchoł (2015) from the univariate to the multivariate case we show that it may be helpful for the estimation of Θ_1 to make use of the time change formula that gives us

$$P(\Theta_1 \in A) = E\left(\mathbf{1}_A\left(\frac{\Theta_0}{\|\Theta_{-1}\|}\right)\|\Theta_{-1}\|^\alpha\right), \quad A \in \mathbb{B}^d \text{ with } \mathbf{0} \notin A,$$

and use an indirect estimator instead of a direct one.

Furthermore, we try to detect independence of $\|\Theta_1\|$ and $\Theta_1/\|\Theta_1\|$ and explore the implications of this fact for the structure of the spectral tail process.
Joint work with Holger Drees (University of Hamburg)

References

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Claudia Klueppelberg: Extremes on directed acyclic graphs.

A new max-linear structural equation model, where all random variables can be written as a max-linear function of their parents and noise terms. For the corresponding graph we assume that it is a DAG. We present basic probabilistic results of our model; in particular we characterise those max-linear random vectors, which originate in a max-linear structural equation model and are, hence, max-linear distributions on DAGs. We also determine the minimal DAG corresponding to the max-linear structural equation model. Moreover, we present results, which allow for prediction of unobserved nodes in the graph, when observing parts of the nodes. As an example we consider the structural equation model with max-stable noise variables, resulting in a max-stable max-linear DAG.
This is joint work with Nadine Gissibl.

Ivan Kojadinovic: Testing for changes in series of block maxima.

In connection with the celebrated method of block maxima, we present several nonparametric tests that can be used to assess whether the available series of maxima is identically distributed. It is assumed that block maxima are independent but not necessarily generalized extreme value distributed. The asymptotic null distributions of the test statistics are investigated and the practical computation of approximate p-values is addressed. Extensive Monte-Carlo simulations show the adequate finite-sample behavior of the studied tests for a large number of realistic data generating scenarios. Illustrations on several datasets conclude the work. This is joint work with Philippe Naveau.

Dominik Kortschak: Ruin problems for processes in a changing environment.

In this talk we consider risk processes in a time changing environment. We assume that there will be more claims in the future and the claims will be more severe. We study some specific models that have this behaviour (with heavy tailed as well as for light tailed claim sizes) and provide asymptotic results for the ruin probability.

Claude Lefèvre: Discrete Schur-constant models.

This paper introduces a class of Schur-constant survival models, of dimension n, for arithmetic non-negative random variables. Such a model is defined through a univariate survival function that is shown to be n-monotone. Two general representations are obtained, by conditioning on the sum of the n variables or through a doubly mixed multinomial distribution. Several other properties including correlation measures are derived. Three processes in insurance theory are discussed for which the claim interarrival periods form a Schur-constant model.
This is a joint work with A. Castaner, M.M. Claramunt and S. Loisel.

Olivier Lopez: Nonparametric copula estimation under censoring.

In this talk, we define a nonparametric copula estimator that can be used in presence of censoring and derive the asymptotic properties of this estimator. We illustrate this estimator throughout applications to life and non-life insurance.

Xavier Milhaud: Behavioural risk: correlation and contagion effects.

We present in this paper a new way to model lapses in life insurance. Our framework enables to cope with both stable economic regimes and crises. We suggest mathematical extensions in which the lapse decisions follow an extended Hawkes process, which integrates the dynamic aspect of human behaviours as well as correlation and contagion between policyholders that can potentially manifest. The associated intensity process is then studied: we give in closed form its moments and derive expressions showing how the lapse distribution is affected by such copycat behaviours. Contrary to previous works, our shot-noise intensity is not constant. Finally, we perform simulation studies and de- velop examples with this realistic model. These applications highlight the global underestimation of standard stress tests regarding this risk, and allow us to quantify the difference with current practices on some widespread key risk indicators.

John Nolan: A measure of dependence for stable distributions.

A distance based measure of dependence is proposed for stable distributions that completely characterizes independence for a bivariate stable distribution. Properties of this measure are analyzed, and contrasted with the covariation and co-difference. A sample analog of the measure is defined and demonstrated on simulated and real data, including time series and distributions in the domain of attraction of a stable law.
This is joint work with Tuncay Alparslan.

Bruno Remillard: Copulas for Discrete or Mixed Data and Applications.

In this talk I will introduce the multilinear empirical copula for discrete or mixed data and its asymptotic behavior will be studied. This result will then be used to construct inference procedures for multivariate data. Applications for testing independence will be presented.

Mathieu Ribatet: Probabilities of concurrent extremes.

The statistical modeling of spatial extremes has been an active area of recent research with a growing domain of applications. Much of the existing methodology, however, focuses on the magnitudes of extreme events rather than on their timing or spatial structure. To address this gap, this paper studies on the notion of extremal concurrence. Suppose that daily precipitation is measured at several synoptic stations. then we say that extremes are concurrent if the maximum precipitation over time at each station is simultaneously, i.e., on the same day. It is important to be able to understand, quantify and model extremal concurrence. Under general conditions, we show that the finite sample concurrence probability converges to an asymptotic quantity, deemed extremal concurrence probability. Using Palm calculus, we establish general expressions for the extremal concurrence probability through the max-stable process emerging in the limit of the component-wise maxima of the sample. Explicit forms of the extremal concurrence probabilities are obtained for various max-stable models and several estimators are introduced. In particular, we prove that the pairwise extremal concurrence probability for max-stable vectors is precisely equal to the Kendall's τ. The estimators are evaluated by using simulations and applied to study the concurrence patterns of temperature extremes in the United States. The results demonstrate that concurrence probability can provide a powerful new perspective and tools for the analysis of the spatial structure and impact of extremes.
Joint work with Clément Dombry and Stilian Stoev.

Christian Y. Robert: A characterization of the asymptotic cluster size distribution for a Poisson Voronoi tessellation.

We consider the Voronoi tessellation based on a stationary Poisson process χ in $\mathbb{R}^d$. We are interested in extremes of geometric characteristics of the tesselation and focus on the asymptotic distribution of the number of cells with extreme values. We provide a characterization of the asymptotic cluster size distribution which is based on the behavior of neighbouring cells of the typical cell when the geometric characteristic of the typical cell is extreme. Joint work with Nicolas Chenavier

Anne Sabourin: Marginal standardization of upper-semicontinuous processes, with applications to max-stable processes.

In the field of spatial extremes, stochastic processes with upper-semicontinuous (usc) trajectories have been proposed as random shape functions for max-stable models allowing for asymptotic independence between distant locations (Schlather 2002, Robert 2013, Huser and Davison 2014). Extremes of usc processes have been investigated, among others, by Norberg (1987), Giné et al. (1990), and Roy and Resnick (1991). Max-stability is then defined via a sequence of scaling *constants* only, which are supposed to be the same at every spatial location. It is however not clear from the literature whether and how EVT for continuous processes extends to usc processes. In particular, classical multivariate and continuous EVT relies on the probability integral transform and Sklar's theorem: this allows to work with standard marginal distributions, which simplifies the task of constructing and characterizing max-stable processes and their domain of attraction.

In the present work, we investigate the possibility to follow these steps in the space of usc processes. Unfortunately, the probability integral transform is not necessarily 'permitted': without additional assumptions, the obtained process may not even have upper semicontinuous trajectories. We give sufficient conditions for standardization to be possible, and we state a partial extension of Sklar's theorem for usc processes, with a particular focus on max-stable ones.
Joint work with J. Segers.

Matthias Scherer: Exogenous shock models in high dimensions.

We review recent results on exogenous shock models and show how interesting subfamilies can be constructed in high dimensions. This is promising for applications in portfolio-credit risk and insurance. From a mathematical perspective, this links concepts from stochastic processes, self-similar distributions and multivariate probability laws.

Johan Segers: Extremes in time serie.

Stormy weather in the skies or on the trading floors: in many dynamical systems, large values arrive in bursts. If it's been raining a lot today, then tomorrow has higher chances than usual to be wet as well. In time series models, extreme values often arrive in clusters. If that happens, the usual rare-event Poisson-type asymptotics, tailored to isolated spikes, need to be revised to compound Poisson processes. The average size of clusters of extremes is quantified by the extremal index. Another point of view is that of conditional distributions. Suppose we're hit by a shock today. What should we prepare ourselves for in the next few days? And how did things get so bad in the first place? The classic framework of regular variation provides answers revealing an intricate mathematical structure in the distributions governing extremes. Working with data, we need tools to highlight interactions between extremes over time. Both the extremogram and the spectral tail process are fast, nonparametric techniques, useful for data exploration and model selection.

Gilles Stupfler: Extreme versions of Wang risk measures and their estimation.

Among the many possible ways to study the right tail of a real-valued random variable, a particularly general one is given by considering the family of its Wang distortion risk measures. This class of risk measures encompasses various interesting indicators such as the widely used Value-at-Risk and Tail Value-at-Risk, which are especially popular in actuarial science, for instance. We start by building simple extreme analogues of Wang distortion risk measures. Special cases of the risk measures of interest include the extreme Value-at-Risk as well as the recently introduced extreme Conditional Tail Moment. Adapted estimators of the resulting extreme Wang distortion risk measures are then introduced when the random variable of interest has a heavy-tailed distribution and their asymptotic normality is shown. The finite sample performance of our estimators is assessed on a simulation study.

Maud Thomas: Tail index estimation, concentration and adaptivity.

In the univariate domain, the fundamental theorem of Extreme Value Theory (EVT) asserts that if a distribution function belongs to the max- domain of attraction of a distribution G_γ then G_γ is necessarily of type: $G_\gamma(x) = \exp\big(-(1+\gamma x)^{-1/\gamma}\big)$ One of the most studied estimator of the tail index was proposed by Hill in 1975 for $\gamma > 0$. Its construction can be split in two steps:

rst selection of the largest order statistics followed by the estimation of γ from these selected order statistics. The statistician has then to face a bias-variance dilemma: if the number of order statistics is too large, the Hill estimator suffers a large bias, if it is too small, then the variance is large. In this talk, we will combine Talagrand's concentration inequality for smooth functions of independent exponentially distributed random variables with three major tools of EVT: the quantile transform, Karamata's repre- sentation for regularly varying functions, and Renyi's characterisation of the joint distribution of order statistics of exponential samples. This will allow us to first establish concentration inequalities for the Hill process and then build on these concentration inequalities to analyse the performance of a variant of Lepski's rule in order to propose an adaptive version of the Hill estimator.

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Gwladys Toulemonde: Spatial dependence issues for extremes.

The multivariate extreme value theory deals with the tail behavior of a multivariate distribution and distinguishes three different forms of extremal dependence: asymptotic dependence, asymptotic independence and exact independence. However, the multivariate framework is inadequate for predicting or simulating values at unobserved sites. Therefore in the last years there has been a general consensus on the representation of the extreme spatial variability by max-stable processes that are infinite dimensional generalizations of multivariate distributions for the maxima. The drawback of these processes is that they admit only two types of dependence structures in their finite dimensional distributions: asymptotic dependence or exact independence. In applications, such as environmental ones, different types of extremal dependencies including asymptotic independence could be present according to the distance between two locations. Following recent advances in the literature (Wadsworth and Tawn, 2013), the main part of the talk consists in presenting a general spatial model which ensures extremal dependence at small distances, possible independence at large distances and asymptotic independence at intermediate distances. Parametric inference is performed using a pairwise composite likelihood approach. Finally we apply our modeling framework to analyze daily precipitations over the East of Australia, using block maxima over the observation period and exceedances over a large threshold. Pursuing the same goal, an alternative approach will be introduced generalizing the Ramos and Ledford (2009) approach. Their model as the proposed generalization deal with the three different forms of extremal dependence and a possible exploitation in a spatial framework will be discussed.

Julien Trufin: Model points and Tail-VaR in life insurance.

Often, actuaries replace a group of heterogeneous life insurance contracts (different age at policy issue, contract duration, sum insured, etc.) with a representative one in order to speed the computations. The present work aims to homogenize a group of policies by controlling the impact on Tail-VaR and related risk measures.