On the construction of high-dimensional models for dependent default times

Jan-Frederik Mai

Technische Universität München, Germany
mai_jan@rocketmail.com

The talk is based on joint work with German Bernhart, Damiano Brigo and Matthias Scherer

Session: 22. Multivariate stochastic modelling in finance, insurance and risk management

Several financial applications require a mathematical model for $(X_1, \ldots, X_d)$, where component X_k denotes the random future time point, when the k-th asset in a portfolio of size $d \gg 2$ defaults. This high-dimensional modeling task is difficult in general because typical applications require the model to be low-parametric and efficient to simulate on a standard PC, while at the same time being realistic enough to capture common stylized facts. The use of a min-stable multivariate exponential (MSMVE) distribution in the sense of [Esary, Marshall (1974)] can be seen as a natural candidate in many cases.
(a) We show how to define low-parametric MSMVEs from parametric families of Bernstein functions, and how to simulate them efficiently. The key here is a novel stochastic representation for one-factor MSMVEs based on strong IDT processes, worked out in [Mai, Scherer (2014), Bernhart et al. (2014)].
(b) We derive a novel characterization for the subfamily of Marshall–Olkin distributions in terms of Markovianity, which sets this subfamily apart as a class of probability laws for dependent default times satisfying many practically desirable axioms, see [Brigo et al. (2014)].

References

[Bernhart et al. (2014)] G. Bernhart, J.-F. Mai, M. Scherer, Constructing min-stable multivariate exponential distributions from Bernstein functions, *working paper* (2014).

[Brigo et al. (2014)] D. Brigo, J.-F. Mai, M. Scherer, On the Markovianity of multivariate default indicators and its impact on simulation for economics and finance, *working paper* (2014).

[Esary, Marshall (1974)] J.D. Esary, A.W. Marshall, Multivariate distributions with exponential minimums, *Annals of Statistics* **2** (1974) pp. 84–98.

[Mai, Scherer (2014)] J.-F. Mai, M. Scherer, Characterization of extendible distributions with exponential minima via processes that are infinitely divisible with respect to time, *Extremes* **17** (2014) pp. 77–95.