Bernoullis Tafelrunde

Graduate Student Seminar

15 November 12:15-13:00
Hybrid seminar
Seminar room 00.003, Spiegelgasse 1 / Zoom

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Mod-ϕ approximation schemes: theory and applications to credit risk

Abstract

The theory of mod-ϕ approximation schemes [1] provides a general framework for the approximation of sequences of discrete random variables using signed measures. It relies on Fourier analysis techniques in the Wiener algebra and was originally inspired by the notion of mod-ϕ convergence [2]. This technique can be used to derive refined asymptotic results for many quantities of interest in probabilistic combinatorics and number theory (e.g. number of disjoint cycles in a random permutation, number of prime divisors of a random integer, number of irreducible factors of a random polynomial, etc.). In this talk I will start by introducing and motivating the basic definitions of mod-ϕ convergence and mod-ϕ approximation schemes. I will then discuss some applications in the context of credit risk. In particular I will show how to construct a mod-Poisson approximation for the distribution of total portfolio losses, which can be understood as a refinement of the classical Poisson approximation. The technique is compared with other approximation techniques commonly used for the estimation of risk measures and for the pricing of credit derivatives in factor copula models (Panjer recursion, Monte Carlo simulation, importance sampling, large deviations approximation, Stein-Chen's method) and it is shown to be computationally faster and substantially more accurate.

[1] Chhaibi, Delbaen, Méliot, Nikeghbali, "Mod-ϕ convergence: Approximation of discrete measures and harmonic analysis on the torus", Annales de l'Institut Fourier, vol. 70, 2020, pp. 1115–1197.
[2] Féray, Méliot, Nikeghbali, "Mod-ϕ convergence: Normality zones and precise deviations", Springer, 2016.