Oberseminar Mathematische Stochastik

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Functional limit theorems for perturbed random walks and divergent perpetuities

Abstract:
Let $(\xi_k, \eta_k)_{k\in\mathbb{N}}$ be a sequence of i.i.d. two-dimensional random vectors with arbitrary dependence of the components. A random sequence $(T_n)_{n\in\mathbb{N}}$ defined by

$$T_n := \xi_1 + \ldots + \xi_{n-1} + \eta_n, \quad n \in \mathbb{N}$$

is called a *perturbed random walk*.

I intend to discuss a functional limit theorem for $Y_n(\cdot) := \max\limits_{0\le k\le [n\cdot]} (\xi_1+\ldots+\xi_k+\eta_{k+1})$, properly normalized, in the situation when contributions of $\max\limits_{0\le k\le [n\cdot]} (\xi_1 + \ldots + \xi_k)$ and $\max\limits_{1\le k\le [n\cdot]+1} \eta_k$ to the asymptotic behavior of Y_n are comparable.

The other problem to be addressed is weak convergence in the Skorokhod space of *divergent perpetuities*

$$Z_n(\cdot) := Q_1 + M_1Q_2 + \ldots + M_1M_2 \cdot \ldots M_{[n\cdot]}Q_{[n\cdot]+1},$$

where $(M_k, Q_k)_{k\in\mathbb{N}}$ is a sequence of i.i.d. two-dimensional random vectors with arbitrary dependence of the components.

The presentation is based on two recent papers:

Buraczewski, D. and Iksanov, A.: Functional limit theorems for divergent perpetuities in the contractive case. *Electron. Commun. Probab.* **20** (2015), article 10, 1 – 14,
and
Iksanov, A. and Pilipenko, A.: On the maximum of a perturbed random walk. *Stat. Probab. Lett.* **92** (2014), 168 – 172.