COLLOQUIUM

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Properties of Stationary Solutions of the SDE $\mathbf{dV_t = V_{t-}dU_t + dL_t}$

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Abstract

The generalized Ornstein-Uhlenbeck process driven by a bivariate Lévy process $(\xi_t, \eta_t)_{t\geq 0}$ with starting random variable V_0 (usually assumed independent of $(\xi_t, \eta_t)_{t\geq 0}$) is defined as $\mathrm{V}_t = e^{-\xi_t}\left(V_0 + \int_0^t e^{\xi_{s-}} d\eta_s\right), \quad t \geq 0$. It is the unique solution of the stochastic differential equation $\mathrm{dV}_t = V_{t-}dU_t + dL_t, \quad t \geq 0$ where $(U_t, L_t)_{t\geq 0}$ is again a bivariate Lévy process, completely determined by $(\xi_t, \eta_t)_{t\geq 0}$. In particular it holds $\xi_t = -\log(\mathcal{E}(\mathcal{U})_\sqcup), \sqcup \geq \prime$, with $\mathcal{E}(\mathcal{U})$ denoting the Doléans-Dade Exponential of U, which forces the process U to have no jumps which are smaller or equal to -1.

In this talk the solution of the given SDE for a general bivariate Lévy process $(U_t, L_t)_{t\geq 0}$ is treated. Hereby we also allow dependance of the starting random variable on $(U_t, L_t)_{t\geq 0}$. We determine necessary and sufficient conditions for the existence of strictly stationary solutions and develop some of their distributional properties like expectation, autocorrelation and tail behaviour.

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