Minisymposium 5 - Finanznumerik (Computational Finance)

Numerical Analysis for Lévy Copula Processes

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We consider the valuation of derivative contracts on baskets where prices of single assets are Lévy like Feller processes of tempered stable type. The dependence among the marginals' jump structure is parametrized by a Lévy copula. For marginals of regular, exponential Lévy type in the sense of Boyarchenko and Levendorskii we show that the infinitesimal generator $\mathcal{A}$ of the resulting Lévy copula process is a pseudo-differential operator whose principal symbol is a distribution of anisotropic homogeneity.

We analyze the jump measure of the corresponding Lévy copula processes. We prove the domains of their infinitesimal generators $\mathcal{A}$ are certain anisotropic Sobolev spaces. In these spaces and for a large class of Lévy copulas, we prove a Garding inequality for $\mathcal{A}$.

We design a wavelet-based dimension-independent tensor product discretization for the efficient numerical solution of the parabolic Kolmogoroff equation $u_t + \mathcal{A}u = 0$ arising in valuation of derivative contracts under possibly stopped Lévy copula processes. We show that diagonal preconditioning yields bounded condition number of the resulting matrices.