Nonparametric density estimation for the small jumps of Lévy processes

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Résumé

We consider the problem of estimating the density of the process associated with the small jumps of a pure jump Lévy process, possibly of infinite variation, from discrete observations of one trajectory. The interest of such a question relies on the observation that even when the Lévy measure is known, the density of the increments of the small jumps of the process cannot be computed. We discuss results both from low and high frequency observations. In a low frequency setting, assuming the Lévy density associated with the jumps larger than 1 in absolute value is known, a spectral estimator relying on the deconvolution structure of the problem achieves minimax parametric rates of convergence with respect to the integrated L2 loss. In a high frequency setting it is possible to remove the assumption that the Lévy measure of the large jumps is known. In that case the rate of convergence depends on the sampling scheme and on the behaviour of the Lévy measure in a neighborhood of zero. An adaptive penalized procedure is also proposed to select the cutoff parameter.

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