Least squares estimators for stochastic differential equations driven by small Levy noises

Hongwei Long *
Department of Mathematical Sciences, Florida Atlantic University, Boca Raton, Florida, USA-hlong@fau.edu

Chunhua Ma
School of Mathematical Sciences and LPMC, Nankai University, Tianjin, China-mach@nankai.edu.cn

Yasutaka Shimizu
Department of Applied Mathematics, Waseda University, Tokyo, Japan-shimizu@waseda.jp

We study parameter estimation for discretely observed stochastic differential equations driven by small Levy noises. There have been many applications of small noise asymptotics to mathematical finance and insurance. Using small noise models we can deal with both applications and statistical inference. We do not impose Lipschitz condition on the dispersion coefficient function and any moment condition on the driving Levy process, which greatly enhances the applicability of our results to many practical models. Under certain regularity conditions on the drift and dispersion functions, we obtain consistency and rate of convergence of the least squares estimator (LSE) of the drift parameter based on discrete observations. The asymptotic distribution of the LSE in our general framework is shown to be the convolution of a normal distribution and a distribution related to the jump part of the driving Levy process. We present some simulation study on a two-factor financial model driven by stable noises.

Keywords: parameter estimation; discrete observations; consistency of LSE; asymptotic distribution of LSE.