LSE-type estimation for stochastic processes with small Levy noise

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Abstract

Consider a stochastic differential equation whose driving noise is asemimartingale. The goal is to estimate the parameter in the drift from discrete samples in a fixed finite time interval under the asymptotics that the driving noise is vanishing. Our estimator is based on the least squares estimator (LSE) proposed by Long et al. (2013, J.Multivariate Analysis), but we further employ a filter to exclude some 'large' shocks exceeding a given threshold that would affect the drift estimation. This filtered LSE can be asymptotically equivalent to the LSE under a suitable choice of the threshold, and the finite sample performance is much better than that of the LSE with much stability. We also show the "mighty convergence" of the proposed estimator under the small noise asymptotics. Although the asymptotic distribution of the LSE is not normal, we often observe that the filtered LSE behaves as if it is asymptotically normal. We shall try to justify this phenomena by taking a threshold suitably under a certain situation.