Statistical Inference in partially observed (and possibly controlled) fractional linear systems

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Abstract

We consider real-valued processes $X = (X_t, \, t \geq 0)$ and $Y = (Y_t, \, t \geq 0)$, representing the signal and the observation respectively, governed by the following homogeneous linear system of stochastic differential equations:

$$\begin{cases} dX_t &= -\vartheta X_t dt + u(t)dt + dW_t^H \, , \quad X_0 = 0 \, , \\ dY_t &= \mu X_t dt + dV_t^H \, , \quad Y_0 = 0. \end{cases} \tag{1}$$

where $u = (u(t), \, t \geq 0)$ is a control of the signal. Here, $V^H = (V_t^H, \, t \geq 0)$ and $W^H = (W_t^H, \, t \geq 0)$ are independent normalized fBm with the same Hurst parameter $H \in (0, 1)$ and the coefficients ϑ and $\mu \neq 0$ are constants.

We suppose that parameter $\vartheta > 0$ is unknown and is to be estimated given the observed trajectory $Y^T = (Y_t, \, 0 \leq t \leq T)$ for a control u in the proper class.

The present talk is devoted to the large sample asymptotic properties of the Maximum Likelihood Estimator (MLE) for ϑ in the partially observed and "optimally" controlled fractional diffusion system (1).

Applications for discrete time fractional partially observed linear models will also be discussed.