On the Approximate Maximum Likelihood Estimation for Diffusion Processes

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Abstract

The transition density of a diffusion process does not admit an explicit expression in general, which prevents the full maximum likelihood estimation (MLE) based on discretely observed sample paths. Aït-Sahalia (1999, 2002) proposed asymptotic expansions to the transition densities of diffusion processes, which lead to an approximate maximum likelihood estimation (AMLE) for parameters. Built on Aït-Sahalia (2002, 2008)'s proposal and analysis on the AMLE, we establish the consistency and convergence rate of the AMLE, which reveal the roles played by the number of terms used in the asymptotic density expansions and the sampling interval between successive observations. We find conditions under which the AMLE has the same asymptotic distribution as that of the full MLE. A first order approximation to the Fisher information matrix is proposed.