Title:
Bayesian Inference of Discretely Sampled Markov Processes with Closed-Form Likelihood Expansions

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ABSTRACT:
We propose a new Bayesian methodology for estimation of a wide class of multi-dimensional jump-diffusion models. Our approach is based on the closed-form (CF) likelihood approximations of Aï t-Sahalia (2002, 2008). Bayesian inference requires the use of MCMC, and the CF likelihood can become inaccurate when the parameters θ are far in the tails of the posterior distribution. The CF likelihood does not integrate to 1 for multivariate models. While the normalizer is very close to 1 for values of θ close to the maximum likelihood estimate (MLE), it can differ markedly from 1when θ is far from the MLE. The samplers can therefore become stuck (typically) in the tails of the posterior distribution. We propose a MCMC algorithm that addresses the intractable normalizers while avoiding using numerical approximations to the normalizer. The efficacy of our approach is demonstrated in a simulation study of the Cox-Ingersoll-Ross (CIR) and Heston models.