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Measuring the Cost of Latency in Likelihood Inference for Continuous-Time Models with Latent Variables

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We establish the asymptotic properties of marginal-information maximum likelihood estimators for discretely-sampled continuous-time diffusion models with latent factors, and compare them to those of full-information estimators. We seek to quantify the cost of latency, which we define as the amount of information lost when a variable is latent instead of observed. We show that the cost of latency depends on the structure of the model, specifically whether the latent variable affects the drift or the diffusion functions. To obtain these results, we employ filtering techniques and develop a new theory of nonlinear continuous-time pseudo-filters based on stochastic partial differential equations. Monte Carlo evidence supports the theoretical findings.

This paper is joint with Chenxu Li (Peking University) and Yuheng Zheng (Princeton University).