Preprint # 06-18

APPROXIMATE LIKELIHOODS FOR SPATIAL PROCESSES

by

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February 9, 2006

ABSTRACT

Maximum likelihood and related techniques are generally considered the best method for estimating the parameters of spatial models, but exact computation of the likelihood is slow when the number of data points is large. For Gaussian models with parametrically specified covariance function, we consider three alternatives to the exact maximum likelihood estimates that are easier to compute. Statistical properties of these estimators are evaluated in two ways, (a) comparing the asymptotic variance of the proposed estimator with that of MLE, (b) assessing how well standard errors computed from the observed information approach (treating the approximate likelihood as if it were an exact likelihood) correspond to the true standard deviations of the estimators. The information sandwich approach is extensively used as our principal theoretical tool for answering these questions. We evaluate the estimators theoretically and by simulation, and consider the application of the method to spatial estimation of rainfall trends across the south-central U.S. Among our three alternatives to exact MLE, the ``hybrid method'' emerges as the one with the best all-round properties.