A Stationary Nonparametric Model for Time Series

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Stationary processes have been used as statistical models for dependent quantities evolving in time. Stationarity is a desirable model property, however, the need to define a stationary density limits the capacity of such models to incorporate the changeability of the data arising in many real life phenomena. Alternative models have been proposed, usually resulting in a compromise, sacrificing the ability to establish properties of estimators, in favour of greater modelling flexibility. We present a family of processes with nonparametric stationary densities, which retain the desirable statistical properties for inference, while achieving substantial modelling flexibility, matching those achievable with a non stationary model. For the sake of clarity we restrict attention to first order processes.

Posterior simulation involves an intractable normalizing constant. We therefore present a latent extension of the model which enables exact inference through an MCMC scheme with a reversible jump type update. Numerical illustrations are presented.

Keywords:
Stationary time series; Mixture of Dirichlet process model; Latent model.