Poisson Driven Stationary Markovian Models

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We propose a simple but yet powerful method to construct strictly stationary Markovian models with given but arbitrary invariant distributions. The idea is based on a Poisson transform modulating the dependence structure in the model. An appealing feature of our approach is that we are able to fully control
the underlying transition probabilities and therefore incorporate them within standard estimation methods. We analyse some specific cases in both discrete and continuous time, and in particular focus on models with invariant distributions belonging to the gamma family or well-known transformations of it. Given the representation of the transition density, a Gibbs sampler algorithm, based on the slice method, is proposed and implemented. The resulting methodology is of particular interest for the estimation of certain continuous time models, such as diffusion processes. A real data example, consisting of monthly minima of Standard and Poor's 500 index and Tokyo Stock Price index data, is used to illustrate both the construction and estimation through a generalized extreme value stationary diffusion process.