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Dynamic modelling of abundance data

In order to understand the dynamic of an ecosystem along time, we propose to construct and study two models of time series on specific compact sets.
The first one deals with relative abundance and is defined on the simplex. Our approach is based on a general construction of infinite memory models, called chains with complete connections, and we study a specific case with a Dirichlet transition kernel.
The second model tries to predict the presence or the absence of each species in the ecosystem along time, and is actually a dynamic version of a probit regression.
In both models, simple conditions ensuring the existence of stationary paths are given, and we discuss inference methods based on likelihood maximization, some other convex optimization, and the use of panel data.