Entropic Priors for Bayesian Spectrum Analysis

Renato Vicente
Escola de Artes, Ciências e Humanidades,
Universidade de São Paulo, Brazil
(e-mail: rvicente@usp.br)

Abstract

The process of inferring periodicity from time series data may generate artifacts if prior information is not incorporated in a controlled manner. To address this issue, we follow the method presented in reference [1] and construct an entropic prior distribution that includes into the analysis only information implied by a given likelihood of a parametric model with multiple stationary frequencies (as in [2]). We discuss the entropic prior for the case of a simple periodic model with a single frequency and amplitude that decays exponentially with time. We also apply the method to the spectrum estimation of two real time series: fossil diversity data, for which a periodicity with unexplained causes has been recently reported in [3]; and stock market growth rates, which are of interest in the study of business cycles (as in, for example, [4]).

References:

[1] A. Caticha and R. Preuss, Physical Review E **70**, 046127 (2004).

[2] G.L. Bretthorst, Bayesian Spectrum Analysis and Parameter Estimation, Springer (1988).

[3] R.A. Rohde and R.A. Muller, Nature **434**, 208 (2005).

[4] N. Sarantis, International Journal of Forecasting **17**, 409 (2001).

Key Words: Spectrum Analysis, Entropic Priors