GENERALISED LINEAR CEPSTRAL MODELS
FOR THE SPECTRUM OF A TIME SERIES

Abstract

The paper introduces the class of generalised linear models with Box-Cox link for the spectrum of a time series. The Box-Cox transformation of the spectral density is represented as a finite Fourier polynomial, with coefficients, that we term generalised cepstral coefficients, providing a complete characterisation of the properties of the random process. The link function depends on a power transformation parameter and encompasses the exponential model (logarithmic link), the autoregressive model (inverse link), and the moving average model (identity link). One of the merits of this model class is the possibility of nesting alternative spectral estimation methods under the same likelihood-based framework, so that the selection of a particular parametric spectrum amounts to estimating the transformation parameter. We also show that the generalised cepstral coefficients are a one to one function of the inverse partial autocorrelations of the process, which can be used to evaluate the mutual information between the past and the future of the process.