Abstract

A new model for long-memory time series is introduced. It involves two memory parameters, d and c, say, and characterizes the correlation decay as a mixture of polynomial and logarithmic rates. This model includes as its special case the standard long memory model with a single memory parameter, d, in which the correlations decay only at a polynomial rate. Examples illustrating some situations in which the standard model does not apply but the new model does do so are presented. A mathematical definition of the class of dual parameter long memory models is given and this class is extended to include also the class of dual parameter intermediate memory models. The class of parametric dual-parameter FARIMA models, called DFARIMA models, is also introduced and the notions of strong, weak and mixed long and intermediate memory are defined. Non-parametric and semi-parametric estimation of the parameters of the new model by the dual parameter extensions of the standard log- periodogram and local Whittle methods is considered together with the maximum likelihood estimation of the parameters of the DFARIMA model. Asymptotic properties of the estimates are investigated and it is shown that the standard single-parameter estimation methods can be badly biased when the dual parameter model holds. The usefulness of the asymptotic results for observed series of finite length is investigated by a simulation study. An application of the dual parameter model to internet packet traffic is also discussed.

Key Words: Slow Decay of Correlations; Slowly varying spectral density function; Log-Periodogram method; Local Whittle Method; Bellcore Ethernet data; Long Memory Time Series