

Spectral density estimation through a regularized inverse problem

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Abstract

In the study of stationary stochastic processes on the real line, the covariance function and the spectral density function are parameters of considerable interest. They are equivalent ways of expressing the temporal dependence in the process. In this article, we consider the spectral density function and propose a new estimator that is not based on the periodogram; the estimator is derived through a regularized inverse problem. A further feature of the estimator is that the data are not required to be observed on a grid. When the regularization condition is based on the function's first derivative, we give the estimator in closed form as well as a bound on its mean squared error. Our numerical studies compare our new estimator of the spectral density to several well known estimators, and we demonstrate its increased statistical efficiency combined with much faster computation time.