Nonparametric Estimation of the Derivatives of a Density by the method of Wavelet for mixing sequences[1]

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Abstract

The problem of estimation of the derivative of a probability density f is considered, using wavelet orthogonal bases. We consider an important kind of dependent random variables, the so-called mixing random variables and investigate the precise asymptotic expression for the mean integrated error of the wavelet estimators. We show that the mean integrated error of the proposed estimator attains the same rate as when the observations are independent, under certain week dependence conditions imposed to the $\{X_i\}$, defined in $\{\Omega, N, P\}$.

Keywords :Nonparametric estimation of a density, Wavelet function, Scaling function, Mixing sequences.

1. Introduction

Nonparametric curve estimation by wavelets has been treated in numerous articles in various setups. These range from the simple Gaussian *iid* error situation to more complicated data structures that often call for a specific algorithm tailored to the problem at hand. The motivation for estimation of density and regression function are widely discussed in Prakasa Rao (1993). Rosenblatt (1991) gives a short review of stochastic curve estimation. In Prakasa Roa (1996), we have studied nonparametric estimation of the derivative of a density by wavelets and the precise asymptotic expression for the mean integrated squared error following techniques of Masry (1994). Estimation of the derivatives of a density was discussed in Prakasa Roa (1997) by the method of wavelets and a precise asymptotic expression for the mean squared error had been obtained. Prakasa Roa (1999) also obtained the precise asymptotic expression of integrated squared error of the wavelet estimators. Now we extend the result to the case of a stochastic process $\{X_i\}$ satisfying mixing conditions. Under certain week dependence conditions imposed to $\{X_i\}$ in $\{\Omega, N, P\}$, it is found that the estimator has similar properties to its counterpart

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