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Wavelet Regression with Long Memory Infinite Moving Average Errors

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Abstract

We consider the wavelet-based estimators of mean regression function with long memory infinite moving average errors and investigate the rates of convergence of estimators based on thresholding of empirical wavelet coefficients. We show that these estimators achieve nearly optimal minimax convergence rates within a logarithmic term over a large class of non-smooth functions that involve many jump discontinuities, where number of discontinuities may grow polynomially fast with sample size. Therefore, in the presence of long memory moving average noise, wavelet estimators still achieve nearly optimal convergence rates and provide explicitly the extraordinary local adaptability in handling discontinuities. The theory is illustrated with some numerical examples.

A technical result in our development is to establish Bernstein-type exponential inequalities for an infinite weighted sums of i.i.d. random variables under certain cumulant or moment assumptions. These large and moderate deviation inequalities may be of independent interest.

Keywords: Infinite moving average processes, long range dependence data, minimax estimation, nonlinear wavelet-based estimator, rates of convergence.

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