Journal of Applied Probability & Statistics Vol. **3**, No. 2, 243–261

On the Optimality of Wavelet-Based Nonparametric Regression with Censored Data

Linyuan Li[1]

Department of Mathematics and Statistics, University of New Hampshire, U. S. A.

Email Address: linyuan@math.unh.edu

Brenda MacGibbon[2]

Département de Mathématiques, Université du Québecà Montréal, Canada

Email Address: macgibbon.brenda@uqam.ca

Christopher Valenta

Information Resources Inc, New Jersey, U. S. A.

Email Address: cdvalenta@yahoo.com

Abstract

Consider the heteroscedastic regression model $Y = g(X)+\sigma(X)\,\varepsilon$, where the function g belongs to a large range of Besov function classes $B^{\alpha}_{p,q},\ \alpha > 1/p,\ p \geq 1,\ q \geq 1$, σ is a "smooth" function and random error ε is assumed independent of X. The response variable Y is also subjected to randomly right censoring. We consider the wavelet-based estimation of the nonparametric regression function g and investigate the asymptotic rates of convergence of estimators based on thresholding of the empirical wavelet coefficients. By proving that L^2 approximation of the empirical wavelet coefficients by an average of i.i.d. random variables holds at a sufficiently fast rate, we show that these estimators achieve nearly optimal minimax convergence rates within logarithmic terms over a large range of Besov function classes $B^{\alpha}_{p,q}$, a feature not available for the linear estimators when $p < 2$. This result is analogous to that in the standard heteroscedastic regression model without any censoring.

Keywords: Censored data, minimax estimation, nonlinear wavelet-based estimator, nonparametric regression, rates of convergence.

2000 Mathematics Subject Classification: 62G07, 62G20.

[1]Research supported in part by the NSF grant DMS-0604499.

[2]Research supported in part by NSERC of Canada and FQRNT of Quebec.