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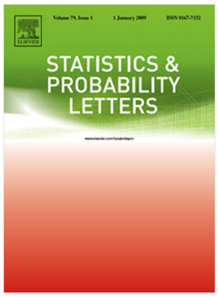

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Asymptotic normality of a wavelet estimator for asymptotically negatively associated errors *

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Abstract: In this paper, we consider the nonparametric regression model $Y_{ni} = g(t_i)+\varepsilon_{ni}$, $1 \le i \le n$ and $n \ge 1$, where $\{t_i\}$ are non-random design points, and $g(\cdot)$ is an unknown Borel measurable function defined on [0,1]. Under some general conditions, we study the asymptotic normality of the wavelet estimator of $g(\cdot)$, where the random errors $\{\varepsilon_{ni}\}$ are asymptotically negatively associated (ANA, for short) random variables. In addition, a simulation study is provided to evaluate the finite sample performance of the wavelet estimator.

Keywords: Asymptotically negatively associated random variables; Wavelet estimator; Asymptotic normality; Nonparametric regression model
Mathematical Subject Classification: 62G05; 62G20

1 Introduction

Consider the following nonparametric regression model:

$$Y_{ni} = g(t_i) + \varepsilon_{ni}, \quad 1 \le i \le n, \quad n \ge 1, \tag{1.1}$$

where the regression function $g(\cdot)$ is an unknown Borel measurable function defined on [0,1], $\{t_i\}$ are non-random design points with $0 \le t_1 \le \cdots \le t_n \le 1$, and $\{\varepsilon_{ni}\}$ are random errors.

It is well known that regression model has many applications in filtering and prediction in communications and control systems, pattern recognition, classification and econometrics, and is an important tool of data analysis. In the last decades, many scholars were interested in the research of weighted estimators of $g(\cdot)$. One can refer to Priestley and Chao [1], Prakasa Rao [2] and the references therein for the independent case; Roussas and Tran [3], Liang and Jing [4] among others for various dependent cases.

One of the most important weight function estimations is wavelet estimation. The wavelet estimator of $g(\cdot)$ was proposed by Antoniadis et al. [5] as follows:

$$\hat{g}_n(t) = \sum_{i=1}^{n} Y_{ni} \int_{A_i} E_m(t,s)ds, \quad A_i = [s_{i-1}, s_i), \tag{1.2}$$

where $A_1, A_2, \cdots, A_n$ is a partition of interval $[0,1]$ with $t_i \in A_i$. The wavelet kernel $E_m(t,s)$ can be defined as follows:

$$E_0(t,s) = \sum_{j\in\mathbb{Z}} \varphi(t-j)\varphi(s-j), \qquad E_m(t,s) = 2^m E_0(2^m t, 2^m s), \tag{1.3}$$

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