MULTIVARIATE LOCAL POLYNOMIAL FITTING FOR MARTINGALE NONLINEAR REGRESSION MODELS

ZHAN-QIAN LU

Department of Mathematics, The Hong Kong University of Science and Technology, Clear Water Bay, Kowloon, Hong Kong, China

(Received November 20, 1997; revised May 22, 1998)

Abstract. Local polynomial modelling is a useful tool for nonlinear time series analysis. For nonlinear regression models with martingale difference errors, this paper presents a simple proof of local linear and local quadratic fittings under apparently minimal short-range dependence condition. Explicit formulae for the asymptotic bias and asymptotic variance are given, which facilitate numerical evaluations of these important quantities. The general theory is applied to nonparametric partial derivative estimation in nonlinear time series. A bias-adjusted method for constructing confidence intervals for first-order partial derivatives is described. Two examples, including the sunspots data, are used to demonstrate the use of local quadratic fitting for modelling and characterizing nonlinearity in time series data.

Key words and phrases: Partial derivative estimation, nonlinearity in time series, confidence intervals, nonparametric estimation, sunspots data.