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Estimation and hypothesis test for single-index multiplicative models. (English)

Zbl 1420.62154

Test 28, No. 1, 242-268 (2019).

Summary: Estimation and hypothesis tests for single-index multiplicative models are considered in this paper. To estimate unknown single-index parameter, we propose a profile least product relative error estimator coupled with a leave-one-component-out method. For the hypothesis testing of parametric components, a Wald-type test statistic is proposed. The asymptotic properties of the estimators and test statistics are established, and a smoothly clipped absolute deviation penalty is employed to select the relevant variables. The resulting penalized estimators are shown to be asymptotically normal and have the oracle property. A score-type test statistic is then proposed for checking the validity of single-index multiplicative models. The quadratic form of the scaled test statistic has an asymptotic chi-squared distribution under the null hypothesis and follows a noncentral chi-squared distribution under local alternatives, converging to the null hypothesis at a parametric convergence rate. Simulation studies demonstrate the performance of the proposed procedure and a real example is analyzed to illustrate its practical usage.

MSC:

62G05 Nonparametric estimation
62G08 Nonparametric regression and quantile regression
62G20 Asymptotic properties of nonparametric inference

Cited in 1 Document

Keywords:

kernel smoothing; local linear smoothing; model checking; single index; variable selection

Full Text: DOI

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