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On estimation of nonparametric regression models with autoregressive and moving average errors

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Abstract

The nonparametric regression model with correlated errors is a powerful tool for time series forecasting. We are interested in the estimation of such a model, where the errors follow an autoregressive and moving average (ARMA) process, and the covariates can also be correlated. Instead of estimating the constituent parts of the model in a sequential fashion, we propose a spline-based method to estimate the mean function and the parameters of the ARMA process jointly. We establish the desirable asymptotic properties of the proposed approach under mild regularity conditions. Extensive simulation studies demonstrate that our proposed method performs well and generates strong evidence supporting the established theoretical results. Our method provides a new addition to the arsenal of tools for analyzing serially correlated data. We further illustrate the practical usefulness of our method by modeling and forecasting the weekly natural gas scraping data for the state of Iowa.

Keywords Nonparametric model with correlated errors · Oracally efficient estimation · τ-Mixing · Splines

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