

Nonparametric Estimation for Conditional Distribution Functions and Time-Varying Transformation Models with Longitudinal Data

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SUMMARY

Regression methods for longitudinal analyses have mostly focused on conditional-mean based models. In many situations, the relevant scientific questions could be better studied by modeling the conditional distributions of the outcome variables as a function of time and other covariates. In this paper, we propose a time-varying nonparametric approach for modeling the conditional cumulative distribution functions (CDF) and the time-varying covariate effects, and develop a two-step method for estimating the conditional CDF's and the time-varying parameters. Applications and finite sample properties of our modeling and estimation procedures are demonstrated through a prospective cohort study of obesity and cardiovascular risk factors, and a simulation study. Theoretical properties, including the large sample expressions of bias, variance and mean squared error, have been developed for the two-step local polynomial estimators. Our approach provides a useful addition to the statistical tools in longitudinal analysis when the conditional-mean based methods are inappropriate.