

# New Development of Semiparametric Modeling of Longitudinal Data

Jianqing Fan

Department of Operation Research and Financial Engineering, Princeton University, Princeton, NJ 08544

*E-Mail:* jqfan@Princeton.EDU

*Abstract:* Improving efficiency for regression coefficients and predicting trajectories of individuals are two important aspects in analysis of longitudinal data. Both involve estimation of the covariance function. Yet, challenges arise in estimating the covariance function of longitudinal data collected at irregular time points. A class of semiparametric models for the covariance function is proposed by imposing a parametric correlation structure while allowing a nonparametric variance function. A kernel estimator is developed for the estimation of the nonparametric variance function. Two methods, a quasi-likelihood approach and a minimum generalized variance method, are proposed for estimating parameters in the correlation structure. We introduce a semiparametric varying coefficient partially linear model for longitudinal data and propose an estimation procedure for model coefficients by using a profile weighted least squares approach. Sampling properties of the proposed estimation procedures are studied and asymptotic normality of the resulting estimators is established. Finite sample performance of the proposed procedures is assessed by Monte Carlo simulation studies. The proposed methodology is illustrated by an analysis of a real data example.