Improving Semiparametric Estimation of Longitudinal Data with Covariance Function

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Abstract

In this dissertation, we aim to improve efficiency of estimation in longitudinal data under generalized semiparametric varying-coefficient models. First, we investigate a profile weighted least square approach for model estimation by utilizing within subject correlations. Several methods for incorporating the within subject correlations are explored, including quasi-likelihood approach(QL), minimum generalized variance approach (MGV), the quadratic inference function approach (QIF) and newly proposed weighted least square approach (WLS). Our simulation study shows that the covariance assisted estimation is more efficient then working independence approach. Second, we apply the above methods to more complex generalized semiparametric varying-coefficient models that not only describe time-constant effects and time-varying effects as above but also model covariate-varying effects. The asymptotic properties of the estimators are derived theoretically. The simulation study show that our methods considering correlation structure in estimation is more efficient than assuming independence. The proposed estimation methods are applied to two real data sets. Both show that our methods by using correlation structure in estimation gain efficiency and provide more information from data, which will have broad application in longitudinal data that correlation often exists.

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