

Efficient estimation and model identification for the single-index varying-coefficient models

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Abstract: The varying-coefficient model has gained a lot of attentions during the past decade, which is an important generalization of the linear regression model. To overcome the “curse of dimensionality” problem, more flexible and more general model, the single-index varying-coefficient model is considered in this presentation. This model includes many types of popular semiparametric models, i.e. single-index models, partially linear models, varying-coefficient models, and so on. It is meaningful to study the statistical inferences of this model. On the other hand, high-dimensionality is an important characteristic of many modern data sets. Then an important problem is to select the significant variables in the studied model. In this presentation, firstly, we establish the semiparametric efficiency bound for the single-index varying-coefficient model, and develop an estimation method based on the efficient estimating equations. We show that the estimator of the finite dimensional parameter is consistent, asymptotically normal and attains the semiparametric efficiency bound. Secondly, a two-stage variable selection procedure is proposed to select the important nonparametric components and parametric components. The oracle properties of the proposed variable selection procedures are shown. We also find that the proposed procedures can divide the predictors into varying-coefficient predictors and constant-coefficient predictors automatically. Some simulation studies and a real data application are conducted to evaluate and illustrate the proposed methods.

Key Words: Estimating equation; group LASSO; variable selection.