

Testing high-dimensional covariate effects in the presence of covariate heterogeneity

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摘要: In this talk, I introduce several tests for the mean effects of high-dimensional covariates on the response. In many applications, different components of covariates usually exhibit various levels of variation, which is ubiquitous in high-dimensional data. To simultaneously accommodate such heteroscedasticity and high dimensionality, we propose a novel test based on an aggregation of the marginal cumulative covariances, requiring no prior information on the specific form of regression models. Our proposed test statistic is scale-invariance, tuning-free and convenient to implement. The asymptotic normality of the proposed statistic is established under the null hypothesis. We further study the asymptotic relative efficiency of our proposed test with respect to the state-of-art universal tests in two different settings: one is designed for high-dimensional linear model and the other is introduced in a completely model-free setting. A remarkable finding reveals that, thanks to the scale-invariance property, even under the high-dimensional linear models, our proposed test is asymptotically much more powerful than existing competitors for the covariates with heterogeneous variances while maintaining high efficiency for the homoscedastic ones.

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