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## **Outliers and the instrumental variables estimator in the linear regression model with endogeneity**

*Wednesday, 15 September 2021 14:20 (20 minutes)*

In a linear regression model, endogeneity (i.e., a correlation between some explanatory variables and the error term) makes the classical OLS estimator biased and inconsistent. When instrumental variables (i.e., variables that are correlated with the endogenous explanatory variables but not with the error term) are available to partial out endogeneity, the IV estimator is consistent and widely used in practice. The effect of outliers on the OLS estimator is carefully studied in robust statistics, but surprisingly, the effect of outliers on the IV estimator has received little attention in previous research, with existing work mostly focusing on robust covariance estimation.

In this presentation, we use the forward search algorithm to investigate the effect of outliers (and other contamination schemes) on various aspects of the IV-based estimation process. The algorithm begins the analysis with a subset of observations that does not contain outliers and then increases the subset by adding one observation at a time until all observations are included and the entire sample is analyzed. Contaminated observations are included in the subset in the final iterations. During the process, various statistics and residuals are monitored to detect the effects of outliers.

We use simulation studies to investigate the effect of known outliers occurring in the (i) dependent, (ii) exogenous or (iii) endogenous explanatory, or (iv) instrumental variable. Summarizing the results, we propose and implement a method to identify outliers in a real data set where contamination is not known in advance.

### **Keywords**

endogeneity, instrumental variables, forward search algorithm

### **Special/invited session**

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