Identification-robust Inference for Endogeneity Parameters in Linear Structural Models

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Abstract

We provide a generalization of the Anderson-Rubin (AR) procedure for inference on parameters which represent the dependence between possibly endogenous explanatory variables and disturbances in a linear structural equation (endogeneity parameters). We focus on second-order dependence and stress the distinction between regression and covariance endogeneity parameters. Such parameters have intrinsic interest (because they measure the effect of "common factors" which induce simultaneity) and play a central role in selecting an estimation method (because they determine "simultaneity biases" associated with least-squares methods). We observe that endogeneity parameters may not identifiable and we give the relevant identification conditions. We develop identification-robust finite-sample tests for joint hypotheses involving structural and regression endogeneity parameters, as well as marginal hypotheses on regression endogeneity parameters. For Gaussian errors, we provide tests and confidence sets based on standard-type Fisher critical values. For a wide class of parametric non-Gaussian errors (possibly heavy-tailed), we also show that exact Monte Carlo procedures can be applied using the statistics considered. As a special case, this result also holds for usual AR-type tests on structural coefficients. For covariance endogeneity parameters, we supply an asymptotic (identification-robust) distributional theory. Tests for partial exogeneity hypotheses (for individual potentially endogenous explanatory variables) are covered as instances of the class of proposed procedures. The proposed procedures are applied to two empirical examples: the relation between trade and economic growth, and the widely studied problem of returns to education.