

**Poster #29****Cole Chapman****PhD Candidate, College of Pharmacy****Pharmaceutical Socio-Economics****Title of Research:** Identification using Nonlinear Instrumental Variables Estimators: Another Cautionary Note**Other Authors:** John M. Brooks**Introduction/Purpose:**

Nonlinear two-stage residual inclusion (2SRI) estimators have become increasingly favored for instrumental variables analysis of empirical models with inherently nonlinear dependent variables. Adoption of this method is largely attributable to suggestions made based upon simulation evidence showing that nonlinear 2SRI generates consistent estimates of population average treatment effects. However, this has been shown only in a unique scenario with regards to treatment effect heterogeneity and conditions underlying treatment choice. This research contributes by examining the ability to generate absolute estimates of population average treatment effects (ATE) and local average treatment effects (LATE) using common IV estimators, across alternative scenarios of treatment effect heterogeneity and sorting-on-the-gain.

**Experimental Design:**

Monte Carlo simulation methods are employed. Six scenarios are considered that vary by (1) whether treatment decision makers are "sorting-on-the-gain", such that individuals with greater potential benefit from treatment are more likely to be treated, and (2) whether factors theorized to exist affect outcomes, the effectiveness of treatment on outcomes, or both. In each scenario, estimates generated by nonlinear 2SRI, nonlinear 2SPS, and 2SLS are compared to true estimates of ATE and LATE.

**Results:**

2SLS generated unbiased estimates of LATE across all scenarios. LATE estimates generated by 2SLS could be used to estimate ATE when heterogeneity was non-essential. 2SRI generated unbiased estimates of ATE only when heterogeneity was solely a product of the assumed nonlinear functional relationship between the dependent variable and all independent variables. 2SRI generated biased estimates of ATE when heterogeneity was essential.

**Conclusions:**

Despite claims that nonlinear 2SRI is methodologically superior to 2SLS or 2SPS, this is only true under specific settings. If LATE is the parameter of interest, 2SLS is an ideal method that relies on minimal assumptions. If ATE is the research goal, researchers must be careful to consider the added strong assumptions necessary to identify this parameter using nonlinear 2SRI methods.