On Uniform Inference in Nonlinear Models with Endogeneity

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Abstract

This paper explores the uniformity of inference for parameters of interest in nonlinear econometric models with endogeneity. The notion of uniformity arises in the models we consider, because the behavior of standard estimators of these parameters is shown to vary with where they lie in the parameter space. Consequently, inference becomes nonstandard in a fashion that is loosely analogous to inference complications found in the unit root and weak instruments literature, as well as the models recently studied in (Andrews and Cheng 2012a), and (Chen, Ponomareva, and Tamer 2011). Our main illustrative example is the standard sample selection model, where the parameter is the intercept term. ((Heckman 1990), (Andrews and Schafgans 1998) and (Lewbel 1997a)). We show that with selection on unobservables, asymptotic theory for estimating this parameter is not standard. In contrast if selection is known to be on observables only, asymptotic distribution theory can be standard. Consequently, there is a discontinuity in the limiting distribution theory for an estimator despite it being uniformly consistent. This discontinuity prevents standard inference procedures from being uniformly valid, and motivates the development of new methods, for which we establish asymptotic properties. It is then illustrated how the new inference procedure can be useful in other nonlinear models with endogenous variables.

JEL Classification: C12,C13,C14,C15.

Keywords: Selection on observables and unobservables, uniform inference, fixed and drifting sequences of parameters.

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Instrument-free Estimation of Endogenous Treatment Effects with an Application to Online Advertising

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Abstract

In this paper we aim to conduct inference on the “lift” effect generated by an online advertisement display: specifically we want to analyze if the presence of the brand ad among the advertisements on the page increases the overall number of consumer clicks on that page. A distinctive feature of online advertising is that the ad displays are highly targeted - the advertising platform evaluates the (unconditional) probability of each consumer clicking on a given ad which leads to a higher probability of displaying the ads that have a higher a priori estimated probability of click. As a result, inferring the causal effect of the ad display on the page clicks by a given consumer from typical observational data is difficult. To address this we use the large scale of our dataset and propose a multi-step an estimator that focuses on the tails of the consumer distribution to estimate the true causal effect of an ad display. This “identification at infinity” (Chamberlain (1986)) approach alleviates the need for an instrument but results in nonstandard asymptotics, motivating inference methods proposed in Khan and Nekipelov (2016). To validate our estimates, we use a set of large scale randomized controlled experiments that Microsoft has run on its advertising platform. Our non-experimental estimates turn out to be quite close to the results of the randomized controlled trials.