Abstract

The continuity or discontinuity of probability density functions of data often plays a fundamental role in empirical economic analysis. For example, for identification and inference of causal effects in regression discontinuity designs it is typically assumed that the density function of a conditioning variable is continuous at a cutoff point that determines assignment of a treatment. Also, discontinuity in density functions can be a parameter of economic interest, such as in analysis of bunching behaviors of taxpayers. In order to facilitate researchers to conduct valid inference for these problems, this paper extends the binning and local likelihood approaches to estimate discontinuity of density functions and proposes empirical likelihood-based tests and confidence sets for the discontinuity. The proposed methods do not require parametric functional forms of density functions. In contrast to the conventional Wald-type test and confidence set using the binning estimator, our empirical likelihood-based methods (i) circumvent asymptotic variance estimation to construct the confidence sets and test statistics; (ii) are invariant to nonlinear transformations of the parameters of interest; and (iii) offer confidence sets whose shapes are automatically determined by data. Limit theories are developed. Simulations demonstrate the superior finite sample behaviors of the proposed methods. In an empirical application, we assess the identifying assumption of no manipulation of class sizes in the regression discontinuity design studied by Angrist and Lavy (1999).

Keywords: Discontinuity in density; Empirical likelihood; Local likelihood; Nonparametric inference; Regression Discontinuity design.

JEL classification: C14; C21.