

## Instrumental variable methods with set-valued residuals

Andrew Chesher

A scalar outcome  $Y$  is determined by  $Y = h(X, U)$  with  $X$  and  $U$  possibly co-varying but  $U$ , with probability distribution  $G$ , distributed independently of variates  $W$  which do not appear in the function  $h(\cdot, \cdot)$ . This instrumental variable (IV) model arises in structural econometric modeling and more widely in settings in which explanatory variables are measured with error. With few exceptions application has been limited to cases in which the function  $h(\cdot, \cdot)$  is such that  $U$  is a single-valued function of  $(Y, X)$ . This rules out many interesting cases in which  $Y$  is discrete or  $U$  is not one-dimensional. In this paper we study problems in which  $U$  is a set-valued function of  $(Y, X)$ . In such cases the IV model may be only partially identifying. Drawing on joint work with Adam Rosen I show how results from random set theory can be deployed to characterize the identified sets of pairs  $(h, G)$  supported by an IV model and a particular probability distribution of  $(Y, X, W)$ . The results are illustrated for particular examples. Developing useful inferential procedures poses significant challenges for asymptotic theory.

Link to a paper: <http://www.cemmap.ac.uk/wps/cwp041414.pdf>