ABSTRACT

The instrumental variable (IV) method is an approach to estimating a causal relationship in the presence of unmeasured confounders. A central concern in most studies using the IV method is that the IV is not perfectly valid in the sense that it is correlated with unmeasured confounders. This project will contribute to improved methodology for using the IV method. The project will develop a new, more interpretable sensitivity analysis for IV studies that is calibrated to observed covariates. A new way of designing IV studies to make the study less sensitive to the proposed IV
being invalid (i.e., correlated with unmeasured confounders) also will be
developed. The approach will involve setting up a matched comparison
between a group of subjects with a high level of the IV and a group of
subjects with a low level of the IV in such a way that the IV is a strong
predictor of the treatment that is received in the two groups. Finally, a new
IV method for studies with binary outcomes will be developed that is easier
to implement and more robust than existing methods.

A main goal of many empirical studies in the social sciences is to provide
evidence about the effects caused by policies or treatments. For practical
and/or ethical reasons, most such studies are observational rather than
randomized studies. A central difficulty for observational studies is that
because treatments were not randomly assigned, the subjects receiving
different treatments may not be comparable so differing outcomes after
treatment may not be effects caused by the treatment. The instrumental
variable (IV) method is an approach for estimating a causal relationship
that can overcome unmeasured confounding. The basic idea is to use an
"instrumental" variable to extract variation in the treatment that is
unrelated to the unmeasured confounders, and then use this variation to
estimate the causal effect of the treatment on the outcome. This project
will provide ways to better assess sensitivity of results from using the IV
methods to concerns that the proposed IV is related to unmeasured
confounders (and thus not a valid IV), and better ways to make use of an
IV when the outcome of the study is a binary variable. The project also will
develop and disseminate freely available software for implementing the
new methods. By offering rigorous analysis in complex setting otherwise
not suited for experimentation, improved methodology for observational
studies has the potential to lead to improved policies and practices of both
public and private institutions.

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