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CAUSAL INFERENCE USING POTENTIAL OUTCOMES FOR A GENERAL ASSIGNMENT SCHEME

Abstract:

Recent years have witnessed a significant surge of interest in causal inference under a potential outcomes framework, with applications to such diverse fields as sociology, behavioral sciences, biomedical sciences, and so on. In a finite population setting, we consider causal inference on treatment contrasts from an experimental design using potential outcomes. Adopting an approach that integrates such causal inference with finite population sampling, this is done with reference to a general scheme for assigning experimental units to treatments, along with general linear unbiased estimators of the treatment means. The assignment scheme allows the possibility of randomization restrictions, such as stratification, and unequal replications. We examine how tools from finite population sampling can be employed to develop a unified theory for our general setup. As a major breakthrough, it is shown that unbiased estimation of the sampling variance of any treatment contrast estimator is possible under conditions milder than Neymannian strict additivity. The consequences of departure from such conditions are also touched upon. Our approach applies readily to the situation where the treatments have a general factorial structure.

Keywords:

Finite population sampling, linear unbiased estimator, Neymannian strict additivity, variance estimation.

JEL Classification: C13, C83, C90