Properties of calibration estimators of the average causal effect - a comparative study of balancing approaches

Ingeborg Waernbaum[1]

[1] *Uppsala University, Sweden, ingeborg.waernbaum@statistik.uu.se*

Causal analyses with observational data require adjustment for confounding variables. Properties of semi-parametric estimators using fitted propensity scores, conditional outcomes and a combination thereof with different degrees of flexibility of parametric models have been in focus in the causal literature in recent years. Early guidance to model selection suggested that model specification, fitting and balance checking could be performed in an iterative procedure. This was followed by proposals of, now standard, doubly robust AIPW estimators that fit parametric models for the propensity score and conditional outcomes given covariates.

More recently, a class of weighting estimators have been proposed that directly aim at incorporating covariate balance in the estimation process through calibration/entropy maximization.

Since covariate balance is not a sufficient condition for identification of the true propensity score the general calibration estimator, using finite constraints, has an asymptotic error which depends on the covariance of the error of an implicit propensity score fit and the conditional outcomes. Although here, as for the AIPW estimators, robustness properties are implicit in the estimation procedure.

In this talk we describe weighting estimators within the more recent calibration/entropy balancing proposals (Tan, 2020, Chan et al. 2016) and other alternatives to propensity score estimation such as RKHS (Wong and Chan, 2018) and CBPS (Imai and Ratkovic 2014, Fan et al. 2018). We describe and compare asymptotic properties for calibration/entropy balancing estimators using Kullback-Leibler and quadratic Rényi divergence (Källberg and Waernbaum, 2020) with the related calibration estimator proposed by Tan and the CBPS estimator.

The estimators are applied to data from the Swedish Childhood Diabetes Register in a study of the effect of school achievements on complications Type 1 Diabetes Mellitus. The finite-sample properties of the estimators are investigated in a simulation study also including an evaluation of proposed variance estimators.

Joint with David Källberg and Emma Persson, Umeå University.