1. Introduction

`treatrew` is a STATA routine for estimating Average Treatment Effects by *reweighting on propensity score*. Depending on the model specified (probit or logit), `treatrew` provides consistent estimation of Average Treatment Effects under the hypothesis of "selection on observables". Conditional on a pre-specified set of observable exogenous variables **x** – thought of as those driving the non-random assignment to treatment – `treatrew` estimates the Average Treatment Effect (ATE), the Average Treatment Effect on Treated (ATET) and the Average Treatment Effect on Non-Treated (ATENT), as well as these parameters conditional on the observable factors **x** (i.e., ATE(**x**), ATET(**x**) and ATENT(**x**)).

In the literature, a plethora of reweighting estimators have been proposed. This paper presents the user-written STATA command `treatrew` implementing the *reweighting on propensity score* estimator as proposed by Rosenbaum and Rubin (1983) in their seminal article, where parameters' standard errors can be obtained either analytically (using Wooldridge, 2010, p. 920-930) or via bootstrapping. The command `treatrew` assumes that the propensity score specified by the user is correct. Thus, it is severely sensitive to propensity score misspecification.

The paper is organized as follows: section 2 provides the statistical description of the *reweighting on propensity score* estimator; section 3 provides the formulas for calculating the causal parameters and their standard errors; section 4 presents the syntax of `treatrew` (i.e., its STATA help-file), and an application to real data; section 5 concludes the paper.

2. The *reweighting* estimator of treatment effects: a brief overview

Reweighting is a valuable approach to estimate (binary) treatment effects in a non-experimental statistical setting, when units' non-random assignment to treatment is due to *selection on observables*. The idea behind the reweighting procedure is quite straightforward: when the treatment is not randomly assigned, we expect that the treated and untreated units present very different distributions of their *observable* characteristics. This may happen either because of units' self-selection into the experiment (units may ponder the net cost-benefit gain of participating or not), or because of the selection process operated by an external entity (such as, for instance, a public agency managing a subsidization program whose explicit objective is that of selecting beneficiaries with peculiar characteristics to maximize the policy effect). Many examples can be drawn both from social and epidemiological statistical settings.

If this is the case, the distribution of the variables feeding into **x** could be strongly *unbalanced*. To establish again a *balance* in these distributions, a suitable way could be that of "reweighting" the observations using their "probability of becoming treated", that is, according to their *propensity score*. A possible reweighting estimation protocol is as follows:

1. estimate the propensity score (based on **x**) by a Logit or a Probit getting the predicated probability p_i ;
2. build weights as $1/p_i$ for the treated observations, and $1/(1-p_i)$ for the untreated observations;
3. calculate the ATE simply by a comparison of the weighted means of the two groups (for instance, by a *weighted regression*).

This particular weighting scheme is based on the *inverse probability regression* (Robins et al., 2000; Brunell and Dinardo, 2004) and the intuitive idea is that of penalizing (advantaging) treated units with higher (lower)