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SEMINAR

"A Method of Matching for Causal Inference without Post-Hoc Balance Checking"

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Thursday, 28th February 2008 – h. 4.30 p.m.
Room 137 – Viale Isonzo 25 - 20135 Milano

Abstract:
In observational studies seeking to make causal inferences, researchers attempt to compensate for the absence of random assignment by selectively pruning observations from the control group until the empirical distribution of pre-treatment covariates is matched between the treated and control groups. This type of matching can greatly reduce model-dependence and the likelihood of biased inferences, either without reducing efficiency much or in some cases by actually increasing efficiency (due to the elimination of unwarrented heterogeneity).
Most existing methods work by limiting observations to common support between the groups, matching a prescribed number of treated and control units, and checking for balance between the groups after the fact. The best current practice is to match in many different ways and to choose the solution with the best balance, although the process is often difficult because the best matching methods and best measures of balance are unknown and because improving balance on one variable can sometimes reduce balance on others. Many existing approaches attempt to compensate for these problems by making assumptions about the functional form of the relationship between the covariates and the treatment or outcome variables, such as linearity or lack of interactions, or other assumptions about the distribution from which the covariates were drawn.
We propose a method of matching that enables the analyst to choose an acceptable level of imbalance ex ante, with a substantively intuitive measure of imbalance, and gives a solution with this level of imbalance and a known level of maximum bias in the causal effect estimate, all without post-hoc balance checking. Our approach also avoids the separate step of finding common support and all linearity, no interaction, and distributional assumptions. The algorithm which implements this method is easy to understand, simple to apply, and computationally very efficient. The method and the level of balance set ex ante is invariant to monotonic transformations on each variable, and improving balance on one variable does not affect balance on others.