Problem Set I

Gov 51, Spring 2025

February 13, 2025

Make sure to cite your sources if you have gotten help for this question.

1 Instrumental Variable

1.1 Assumptions

Can you please list the major assumptions for instrumental variables and interpret them in a few sentences?

1.2 Type of observations

Write down four types of observations in a IV study. And list their behavior implications on the potentail outcome: $Y(Z_i, T_i(Z_i))$. Make sure you explain briefly of your proof.

1.3 Wald Estimator

What is Encouragement term? What is Intention to Treat (ITT) term? What is Wald Estimator?

2   Matching

What is the identifying assumption of matching? Write down the math expression and interpret with a few sentences.

3   Bonus question

Assume we only have compliers and never takers (one-sided compliance). Prove that LATE (Wald Estimatro) is equal to ATT:

$$E(Y_i(1) - Y_i(0)|T_i = 1)$$

To make things easier, we also assume instrumental variable is randomized, so that:

$$E(Y_i(T_i)|Z_i = 1) = E(Y_i(T_i)|Z_i = 0)$$