

Problemset 3, Econ 980w, Spring 2019:  
Causality and discrimination

## 1 By hand exercises

### Testing whether there is a causal effect

Suppose you have the following data-set from an experiment on the effect of gender (as implied by the name on an applicant's CV) on her likelihood to be invited for a job interview:

Gender	Invitation
F	0
F	0
F	0
F	1
F	1
M	0
M	1
M	1
M	1

Calculate a test for the null hypothesis that gender does not affect the likelihood to be invited for an interview.

## 2 R exercises

Write code which performs the following:

1. Generate  $n$  pairs of potential outcomes  $Y_i^1, Y_i^0$  which are just independent draws from the standard normal distribution. What is the ATE for this data generating process?
2. Generate  $D = \mathbf{1}(Y_i^1 > Y_i^0)$ , and the corresponding  $Y$  based on the potential outcome equation

$$Y = D \cdot Y^1 + (1 - D) \cdot Y^0.$$

Calculate  $\bar{Y}_1 - \bar{Y}_0$ .

3. Repeat 2, but with  $D = \mathbf{1}(Y_i^1 \leq Y_i^0)$ .
4. Repeat 2, but with  $D$  independent Bernoulli 0.5 draws.
5. Using the data from 4, calculate a 0.95 confidence interval for the  $ATE$ .