

Randomized Experiments / Trials

Estimate the effect of X on Y
grants $\rightarrow$ Yes
 $\rightarrow$ No
firm performance

sleep deprived $\rightarrow$ Yes
 $\rightarrow$ No
decision making
Such as bids

u : unobserved factors
affecting Y e.g. firm size
cognitive ability

$\downarrow$
not correlated with X

if X is randomly assigned

can estimate the effect of X on Y

Randomization $\rightarrow$ often infeasible / unethical

$\rightarrow$ concerns over generalizing

Ch. : 2 Simple Regression Model

Objective : estimate the effect of

X on Y
indep. var. dep. var.
regressor regressand

e.g. educ wage
trade pollution

The simple linear regression (SLR) model
assumes X and Y to be linearly
related.

Population model / data generating process (DGP)

$$y = \beta_0 + \beta_1 x + u$$

intercept slope unobserved or error term

$$\Delta y = \beta_1 \Delta x + \Delta u$$

β_1 : Δy for $\Delta x = 1$ (all else const.)

To estimate β_0 & β_1 : 2 eqⁿs or
assⁿs

$$E(u) = 0$$

(harmless in models with intercept)

e.g. $y \rightarrow \text{wage}$
 $x \rightarrow \text{educ.}$
 $u \rightarrow \text{ability}$

$$E(u|x) = E(u)$$

(strong ass'n)

$= 0$ (given ass'n on top)

$$E(\text{abil.} | 12 \text{ yrs. educ.})$$

$$= E(\text{abil.} | 16 \text{ yrs. educ.})$$

$$= E(\text{abil.} | 20 \text{ yrs. educ.})$$

$$E(x \cdot u) = 0$$

$$\Rightarrow \text{corr.}(x, u) = 0$$

Estimates $\hat{\beta}_0$ and $\hat{\beta}_1$ are such that

$$\frac{1}{n} \sum_i (y_i - \hat{\beta}_0 - \hat{\beta}_1 x_i) = 0$$

$$\frac{1}{n} \sum_i x_i (y_i - \hat{\beta}_0 - \hat{\beta}_1 x_i) = 0$$

n : sample size

i : obs. i .

$1, \dots, n$