Assessing the Impact of Financial Literacy

Session 1

Today

- **Introductions and ice breakers**

- **Session 1:**
  - **Causal inference framework**
  - **RCT theoretical overview**

- **Session 2:**
  - **Nuts and Bolts of RCTs**

- **Session 3:**
  - **Applications of RCTs in Financial Literacy**

Introductions

- Lets get to know each other first!
- Everyone please answer the following:
  - Name
  - Background (University, degree program, which year)
  - What’s your favorite city to live in and why?
  - If you could pick a superpower, what would it be and why?

Framework for Empirical Methods in Causal Inference

$$Y \ = T\theta + X\beta + \varepsilon$$

Y: Savings

T: Treatment (e.g., Financial literacy training)

X: Other controls

Ideally

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$$\theta = \underbrace{\mathrm{E}(Y^T|\,_T)} - \underbrace{\mathrm{E}(Y^C|\,_T)} = \mathrm{E}(Y^T - Y^C|\,_T)$$

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$$\theta = \underbrace{\mathrm{E}(Y^T \mid T)}_{\substack{\text{Outcome for treated} \\ \text{individuals if they} \\ \text{were treated}}} - \underbrace{\mathrm{E}(Y^C \mid T)}_{\substack{\text{Outcome for treated} \\ \text{individuals had they} \\ \text{not been treated}}} = \mathrm{E}(Y^T - Y^C \mid T)$$

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Unobserved!

Ideally

$$\theta = \underbrace{\mathrm{E}(Y^T|_T)}_{\text{Outcome for treated individuals if they were treated}} - \underbrace{\mathrm{E}(Y^C|_T)}_{\text{Outcome for treated individuals had they not been treated}} = \mathrm{E}(Y^T - Y^C|_T)$$

Unobserved!

So we cannot conduct this comparison!

Instead, we estimate

$$\theta: \mathrm{E}(Y^T|\ _T) - \mathrm{E}(Y^C|\ _C)$$

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$$\theta \colon \mathrm{E}(Y^{T} \mid {}_{T}) - \mathrm{E}(Y^{C} \mid {}_{C})$$

Now, add & subtract $\mathrm{E}(Y^{C} \mid {}_{T})$:

$$\theta = \underbrace{\mathrm{E}(Y^{T} \mid {}_{T}) - \mathrm{E}(Y^{C} \mid {}_{T})}_{} \quad + \quad \underbrace{\mathrm{E}(Y^{C} \mid {}_{T}) - \mathrm{E}(Y^{C} \mid {}_{C})}_{}$$

Instead, we estimate

$$\theta: \mathrm{E}(Y^T|_T) - \mathrm{E}(Y^C|_C)$$

Now, add & subtract $\mathrm{E}(Y^C|_T)$:

$$\theta = \underbrace{\mathrm{E}(Y^T|_T) - \mathrm{E}(Y^C|_T)}_{\text{Average Treatment Effect}} + \underbrace{\mathrm{E}(Y^C|_T) - \mathrm{E}(Y^C|_C)}_{\text{Selection Bias}}$$

If treatment randomly assigned:

Selection bias =

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Selection bias = 0

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Outcome Y is independent of assignment to treatment:

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$$\{Y^T, Y^C\} \perp\!\!\!\perp \mathrm{T} \qquad \longrightarrow \qquad \text{Independence property}$$

If treatment randomly assigned:

Selection bias = 0

Outcome Y is independent of assignment to treatment:

$\{Y^T, Y^C\} \perp\!\!\!\perp \mathrm{T}$ $\longrightarrow$ Independence property

Intuition: This property defines the <u>counterfactual</u>

Had the treatment not existed, then $Y^T = Y^C$

When we don’t have random assignment, we can <u>control</u> for things we think explain selection bias.

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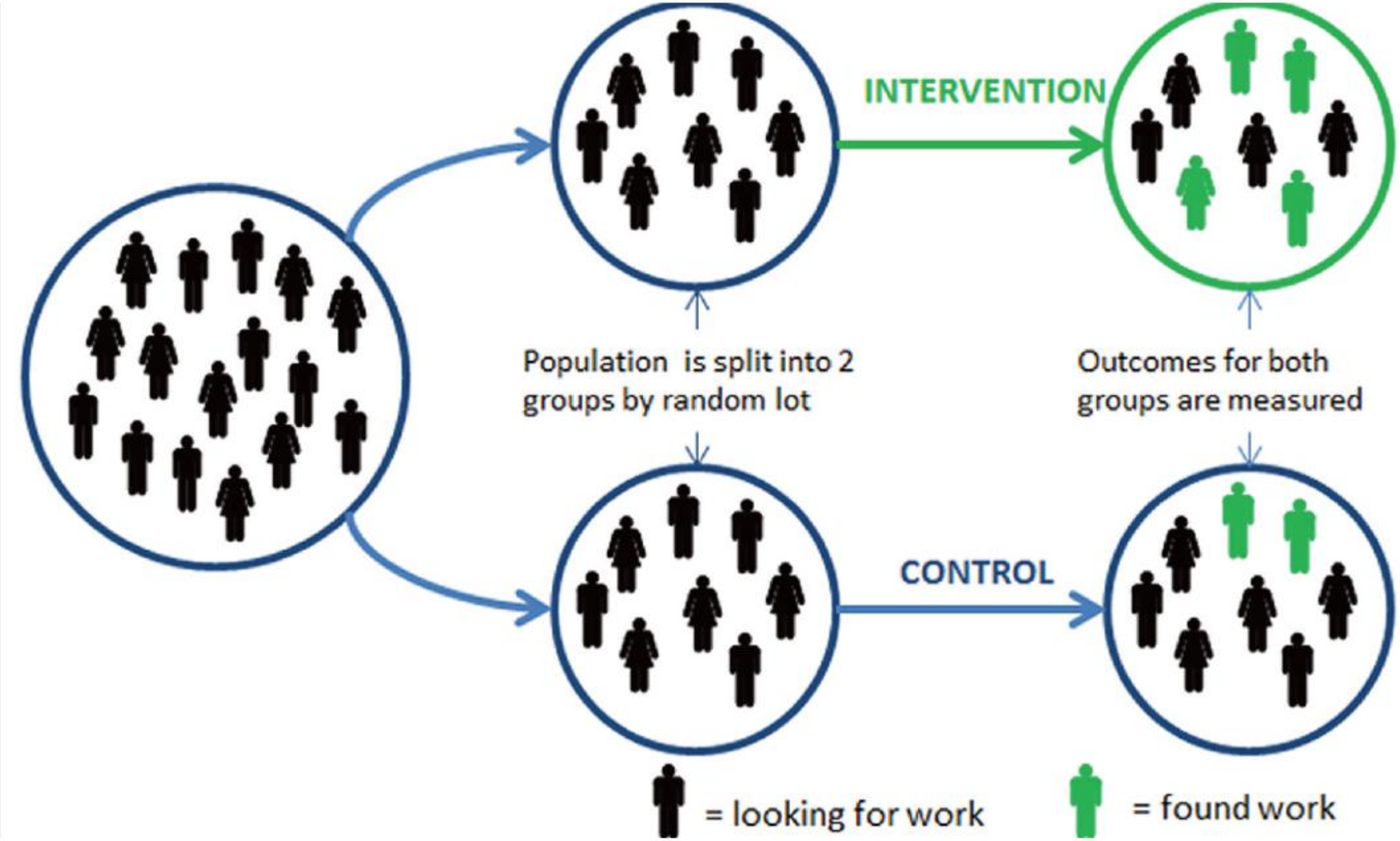
Conditional independence:

$$\{Y^T, Y^C\} \perp\!\!\!\perp \mathrm{T} |\, X_k$$

Randomized Control Trials

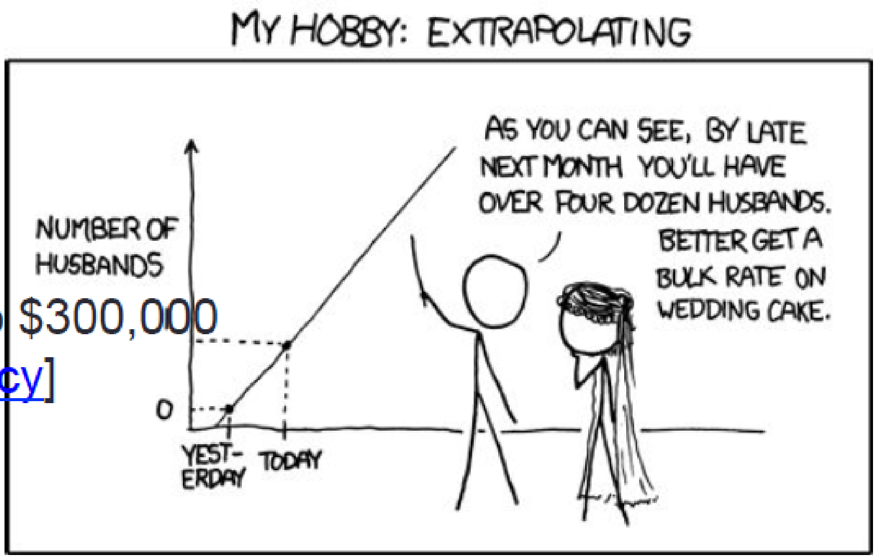
Concept and Applications

What is an RCT?



Why do we like RCTs?

- Randomly assigning treatment reduces selection bias
- Balances both observable *and unobservable* characteristics between treatment and control groups
- Statistically, this means that post-treatment differences can be interpreted as a *causal effect* of treatment
- **Some concerns**
  - Ethical challenges
  - Practical challenges
  - Evaluation is expensive!
    - Study costs range from $50,000 to $300,000 [Coalition for Evidence-Based Policy]
  - External validity challenges



Regression Specification

- RCT regressions are extremely straightforward

- Since Selection/Endogeneity/OVB are, by design, eliminated, we can run a simple OLS:

$$Y_i = \alpha + \beta \cdot Treatment_i + \varepsilon_i$$

Average Treatment Effect: ITT vs TOT/LATE

- We are interested in the Average Treatment Effect of a particular intervention.

- When treatment is randomly assigned, there are two possible reactions within the sample:
  - All assigned to treatment take it up
  - *Some* assigned to treatment take it up

Full Compliance

- Full compliance means:
  - All those assigned the treatment take it up
  - All those assigned to control do not take up the treatment
- In this world, ATE = ITT
- We take the average value of outcome of interest in each group (treatment group and control group) and subtract the two to get ATE.

Partial Compliance

- Full compliance is rare. *Partial* compliance can include:
  - Non-takers in the treatment group
  - Spillovers (Always-takers) in the control group

- When there is partial compliance, we no longer calculate an ATE. Instead, we can estimate the ITT and the TOT/LATE

ITT vs TOT/LATE

- ITT is still calculated the same way, using original assignment to calculate differences in means.
- TOT/LATE estimates effect of treatment on those who took it up.
    - Can we estimate this directly? Why or why not?

TOT/LATE

- We estimate the TOT using an IV strategy:
  - Use assignment to treatment as instrument for being treated:
    - Stage 1: Regress Treatment take-up on Treatment Assignment and obtain predicted values.
    - Stage 2: Regress outcome (Y) on predicted values.
- These regression estimate the local average treatment effect or treatment on treated.

ITT or TOT?

- ITT is more relevant for a policy maker who is interested in expanding the policy elsewhere.
- TOT is relevant for understanding if underlying treatment itself is valuable.
- In practice, both estimates are useful.