A framework for causal analysis

Applied Microeconomics

Hans-Martin von Gaudecker & Florian Zimmermann

Does hospital treatment improve health?

- A "yes" Might seem obvious
- But: Infectious diseases, maltreatment / overtreatment might be worse than no treatment… (fancy health insurance that makes doctor rich + uncritical mind…)
- NHIS one of the most important studies at the intersection of health / social sciences in the U.S.
- Two questions might help us…

Data: 2005 U.S. National Health Interview Survey

- Whether the respondent was a patient in a hospital overnight in the past 12 months (0 = No, 1 = Yes)
- The respondent’s general health status (1 = Poor, 2 = Fair, 3 = Good, 4 = Very Good, 5 = Excellent)

Cross-tabulated NHIS data

Hospitalised	Sample Size	Mean Health Status	Std. Error
Yes	7,774	3.21	0.014
No	90,049	3.93	0.003

Defining Potential Outcomes

- Let $\omega \in \Omega$ denote all relevant characteristics of an agent.
- There are no restrictions on ω – heterogeneity can be of any kind.
- Let $s \in S$ denote the (treatment, policy) state. Focus on $S = 0, 1$ for now.
- The potential outcomes of agent ω are denoted by:

  $Y(0; \omega), Y(1; \omega)$

Treatment Effects

The individual-level treatment effect is defined as:

$$Y(1;\omega) - Y(0;\omega)$$

This is also known as the individual-level causal effect or the Marshallian c.p. effect.

The Evaluation Problem

At any point in time, for any given individual ω, we observe either $Y(0;\omega)$ or $Y(1;\omega)$. That is, we observe somebody with characteristics ω either in state $s=0$ or in state $s=1$.

There is no way to construct the unobserved quantity without further assumptions.

Brief group discussion: OLS & PO

OLS assumptions:

- $Y = \alpha + \beta \cdot S + \epsilon$
- $E[\epsilon|S] = 0$
- Regularity conditions

How does this relate to the potential outcome framework?

Don’t discuss potential violation of the assumptions!

Assignment Mechanisms

Let $\tau \in \mathrm{T}$ be an assignment rule mapping types to treatments: $\tau : \omega \to S$.

Group discussion: Assignment mechanisms

1. Describe the most plausible (in your view) assignment mechanismmm which generated the NHIS data.
2. Try to think in a very abstract way: What are typical assignment mechanisms out there?