

Lecture 23

11-15-2021

Announcements

There is no section on 11/24

There is no class on 11/29

All outstanding Checkpoints, WP, and PS3 are due next Monday 11/15

Last Week

Last week we discussed Regression Discontinuities

We noted that there were two kinds of RDDs: Sharp and Fuzzy

I put off discussing Fuzzy RDDs other than to say that they are estimated with Instrumental Variables

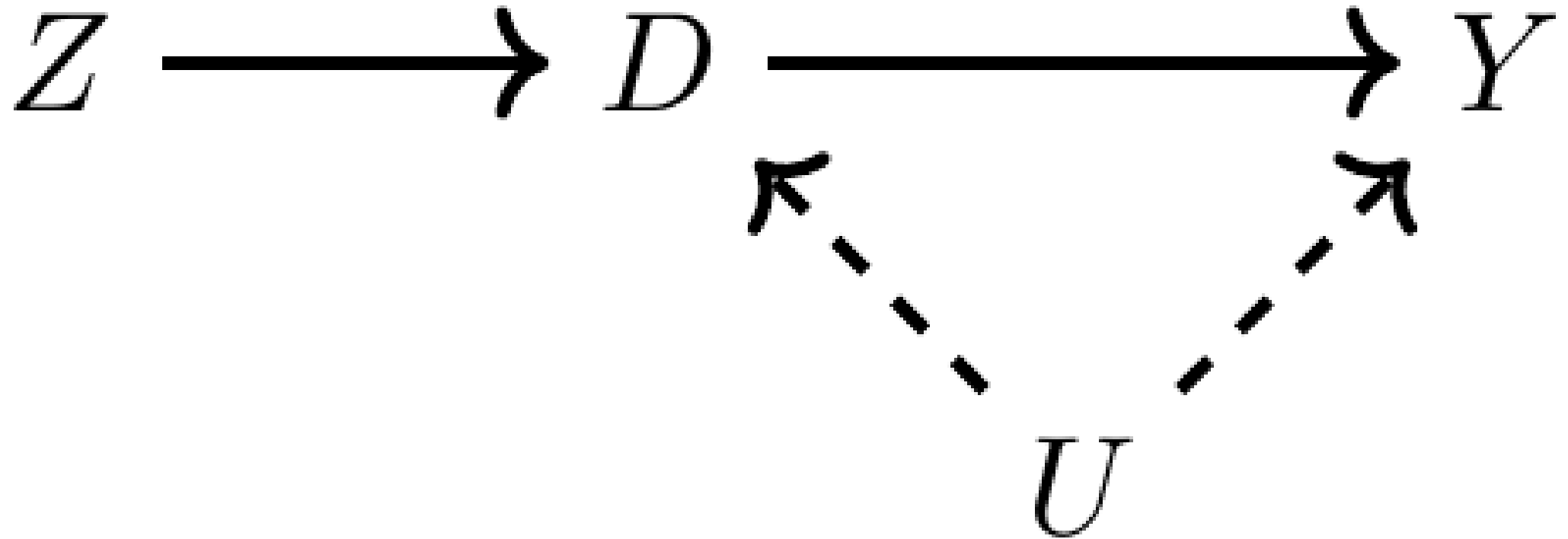
What are we doing this week?

This week we will cover Instrumental Variables (IVs)

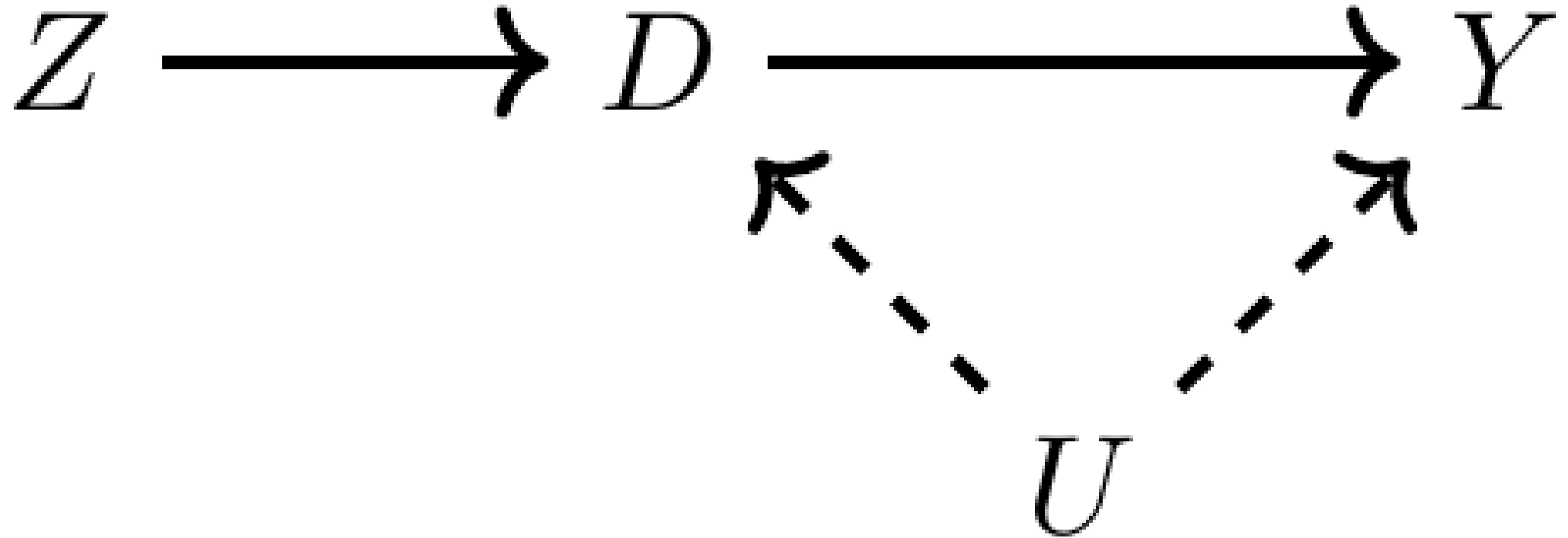
We have seen IVs before in class in the context of RCTs

Our focus this week will be on their application in observational studies

IV Intuition



IV Intuition



Instrumental Variables Requirements

1. The instrument must be relevant
2. The instrument must only affect the outcome (Y) through the treatment (D).

$$Y_i(D_i(Z_i), Z_i) = Y_i(D_i(Z_i))$$

We tend to call IVs Z. If we assume monotonicity, then we get a LATE. Why?

What does an IV identify?

An IV strategy non-parametrically identifies the effect of a treatment for those who respond to the treatment

Monotonicity matters because it means that all of the respondents go in one direct (no defiers!)

The exclusion restriction

Instrumental relevance is easy to test. Run a correlation between the treatment and the instrument.

The exclusion restriction is fundamentally untestable.

Basically everything about an IV conceptually comes down to whether or not we believe the exclusion restriction.

The exclusion restriction: Rain Rain Go Away

We are often interested in why people fight each other. One possibility is that economic deprivation leads to conflict. What's the regression here?

Problem: economic growth is endogenous!

Solution?: Use annual changes in rainfall as an instrument for economic growth (Miguel 2004)

The exclusion restriction: Rain Rain Go Away

Y: Conflict

D: Income

Z: rainfall

Rainfall is plausibly random. What's the problem?

The exclusion restriction: Rain Rain Go Away



The exclusion restriction

Even with a variable that is near random the exclusion restriction may not be satisfied

IV require lots of theory and thinking ahead of time. This also should include what implications might be testable if the exclusion restriction *was* violated

Mathematically, we know that the bigger the complier group the less bias will matter if there is a violation of the exclusion restriction

Revisiting Monotonicity (de Chaisemartin 2017)

Monotonicity can fail in the observational world:

1. Examiner designs
2. Sibling-sex composition
3. Encouragement designs

For next time

We are going to dive into the details of estimation next time

After Wednesday you should have a conceptual idea of what `iv_robust()` is doing