Lab 5

Olivier Bergeron-Boutin

February 23rd, 2021

Intro

IV intuition

How would you describe the intuition behind IV in a single sentence?

IV intuition

How would you describe the intuition behind IV in a single sentence?

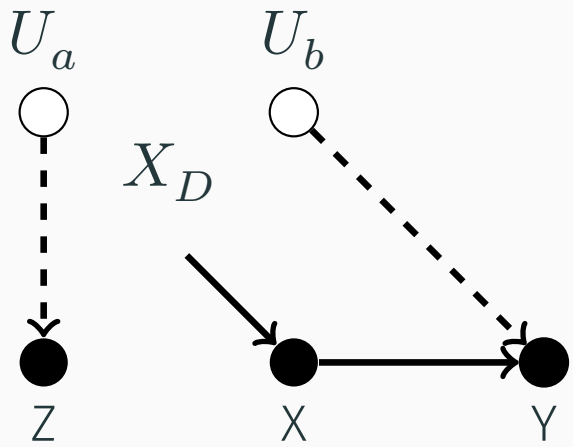
What problem does IV purport to solve that matching/regression don't solve?

IV intuition

How would you describe the intuition behind IV in a single sentence?

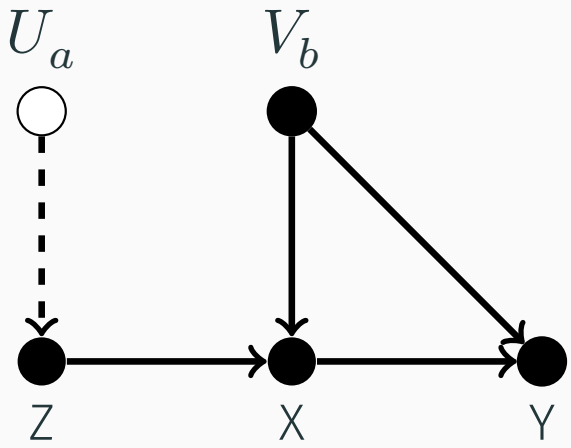
What problem does IV purport to solve that matching/regression don't solve?

DAG setup



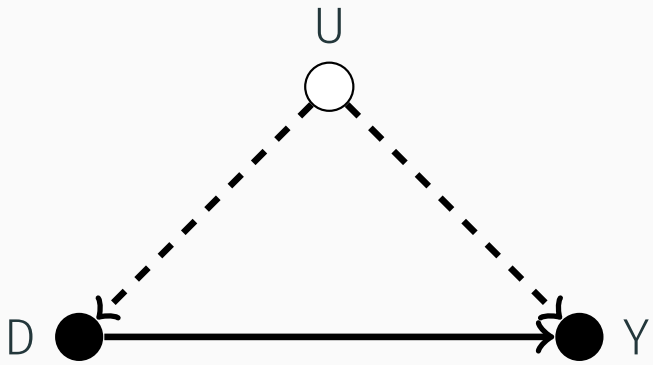
What's going on here? Is the relationship between X and Y identified?

DAG setup



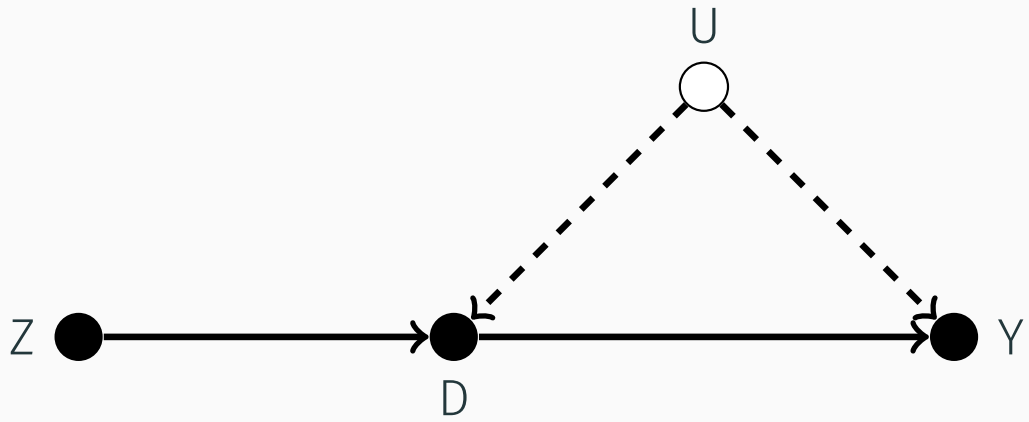
What's going on here? Is the relationship between X and Y identified?

DAG setup



Classic confounder problem...what can we do?

DAG setup



What makes for a good instrument?

There are, of course, our 5 assumptions (see lecture slides)

What makes for a good instrument?

There are, of course, our 5 assumptions (see lecture slides)

But the point is that some of them are untestable, e.g. the exclusion restriction

What makes for a good instrument?

There are, of course, our 5 assumptions (see lecture slides)

But the point is that some of them are untestable, e.g. the exclusion restriction

What's the exclusion restriction again?

What makes for a good instrument?

There are, of course, our 5 assumptions (see lecture slides)

But the point is that some of them are untestable, e.g. the exclusion restriction

What's the exclusion restriction again?

$Y_i(z = 1, d) = Y_i(z = 0, d)$ for $d = 0, 1$

What makes for a good instrument?

There are, of course, our 5 assumptions (see lecture slides)

But the point is that some of them are untestable, e.g. the exclusion restriction

What's the exclusion restriction again?

$Y_i(z = 1, d) = Y_i(z = 0, d)$ for $d = 0, 1$

In plain English, the instrument only matters for the outcome insofar as it affects the treatment

What makes for a good instrument?

There are, of course, our 5 assumptions (see lecture slides)

But the point is that some of them are untestable, e.g. the exclusion restriction

What's the exclusion restriction again?

$Y_i(z = 1, d) = Y_i(z = 0, d)$ for $d = 0, 1$

In plain English, the instrument only matters for the outcome insofar as it affects the treatment

The "encouragement" itself does not affect the outcome

What makes for a good instrument?

There are, of course, our 5 assumptions (see lecture slides)

But the point is that some of them are untestable, e.g. the exclusion restriction

What's the exclusion restriction again?

$Y_i(z = 1, d) = Y_i(z = 0, d)$ for $d = 0, 1$

In plain English, the instrument only matters for the outcome insofar as it affects the treatment

The "encouragement" itself does not affect the outcome

To defend it, often refer to theory - and some people will never buy your argument

What makes for a good instrument?

Causal Inference Mixtape, p.211: “A necessary but not a sufficient condition for having an instrument that can satisfy the exclusion restriction is if people are confused when you tell them about the instrument’s relationship to the outcome.”

What makes for a good instrument?

Causal Inference Mixtape, p.211: “A necessary but not a sufficient condition for having an instrument that can satisfy the exclusion restriction is if people are confused when you tell them about the instrument’s relationship to the outcome.”

More modern (and possibly more convincing) method: placebo tests (also called falsification tests)

3 causal effects

First stage: $Z_i \rightarrow D_i$

3 causal effects

First stage: $Z_i \to D_i$ Second stage: $D_i \to Y_i$

3 causal effects

First stage: $Z_i \to D_i$ Second stage: $D_i \to Y_i$ Reduced form: $Z_i \to Y_i$