Homework for Chapter 11: Causality with Less Modeling

1. Suppose that you are analyzing the effect of universities and colleges opening during a pandemic on increase in the number of positive cases. Name one strategy that you can use to avoid having to collect data on all types of campus characteristic variables that are constant over time that you may have to control for in your analysis.

Answer: We can apply the method of “fixed effect” here by choosing a certain university or college and observing this university for multiple times. Based on reality, some universities or colleges have repeatedly opened and closed during the covid-19.

1. Intuitively, why would a method that isolates front doors allow you to ignore back doors related to unmeasured variables?

Answer: Isolating front doors here means that we should figure out the variation of treatment variables that is not driven by back doors. During this process, we have already blocked all the back doors and help us ignore back doors related to unmeasured variables because we have already tossed out the parts related to unmeasured variables. Besides, for a randomized controlled experiment, isolating front doors means that we will randomly assign the treatment variables, which is totally not relevant to the unmeasured variables. And for natural experiment, the instrumental variable is exogenous to the DGPs, so it is not relevant to back doors, too. So we could ignore back doors related to unmeasured variables.

1. On robustness tests:
   1. What are robustness tests?

Answer: Rather than testing assumptions are possible, robustness tests is a way of either checking whether we can disprove an assumption, or redoing our analysis in a way that doesn’t reply on that assumption and seeing if the result changes. One way of robustness test is that we detail an assumption we are making, which usually implies a relationship between two variables should not be there, and then we test it. If that relationship is there, then this evidence is against the assumptions.

* 1. What is the purpose of conducting a robustness test?

Answer: The purpose of conducting a robustness test is to check whether our assumptions seem false.

* 1. What are placebo tests?

Answer: A placebo tests refers to a test where we could pretend that treatment is being assigned somewhere it isn’t and check whether I could estimate an effect. If we find an effect, then there must be a bad assumption because the effect is supposed to nothing.

1. Suppose you want to study the effect of attending tutoring sessions on grade point averages (GPA). List at least five variables that impact both attendance of tutoring sessions and students’ GPA. Is it feasible to measure and control for all of the variables?

Answer: Five variables: Willingness to study; Available studying time; The grade year students in; Student’s intelligence; Teacher’s personality. I think it is not feasible to measure and control for all of the variables because there are too many variables that are related to both attendance of tutoring sessions and students’ GPA. And even if we could control for all the variables, the effect we studied just on a very narrow slice of the population and we have to make many strong assumptions.

1. Describe partial identification in your own words.

Answer: The partial identification helps us figure out a range of possibilities of the estimate based on weaker assumptions and a range of possibilities of the remaining assumptions that we must make.

1. Pick any causal diagram from the book other than Figure 11.2.
   1. Reproduce that diagram here.

图示

描述已自动生成

* 1. Select two variables on the diagram without a direct link between them (i.e. no single arrow straight from one of them to the other).

Answer: LaggedCrime and LawAndOrderPolitics

* 1. What variables would you need to control for that will eliminate any relationship between the two variables (you might not need any).

Answer: No variables need to be controlled for (All the paths contain colliders).

* 1. If you looked at the relationship between your two variables from part b, while controlling for the variables from part c, and you got a nonzero result, what would you conclude?

Answer: It means that our assumption, there is no relationship between lagged crime and Law And Other Politics, seems false. Lagged crime and Law And Other Politics are related in a way that is invisible on this diagram.

1. What does it mean to say that the effect of financial deregulation on the rate at which firms go bankrupt is “bounded from above” at 2 percentage points?

Answer: d. The effect is no larger than 2 percentage points

* 1. The effect is 2 percentage points, and it’s a positive effect
  2. The effect is 2 percentage points, and it’s a negative effect
  3. The effect is at least as large as 2 percentage points
  4. The effect is no larger than 2 percentage points
  5. If we’re willing to make an additional, stronger set of assumptions, the effect would be larger than 2 percentage points, but without those assumptions it’s bounded to be lower.