

Causal Inference - Problem Set 5

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Due to: 20/10

Question 1

(a) What's the necessary assumptions to the Synthetic Control Method be consistent? Give the intuition.

As Robert McClelland and Sarah Gault pointed out¹,

No region in the pool of potential donor regions can have a similar policy change. The policy in the affected region cannot affect the outcome in the pool of donor regions. To avoid possible interpolation bias, the variables used to form the weights must have values for the donor pool regions that are similar to those for the affected region. The values of those variables for the policy region cannot be outside any linear combination of the values for the donor pool. Finally, those variables and the outcome must have an approximate linear relationship. (McClelland and Gault 2017, 2).

(b) Give examples where the above condition does not apply. Explain what condition was violated and why in your examples.

The above condition does not apply for a study where it has been analyzed the impact of a regional program. More specifically, the analysis would be biased if the states in the pool of donor regions were affected by the program by some spill-over effect.

(c) How the model above relates to the difference-in-difference model?

Synthetic Control Method differs from difference-in-difference because the latter requires that variables have fixed relationships over the time, while the former mitigates that issue creating

¹ I would like to mention that all the answer in this activity were based on Robert McClelland and Sarah Gault work. See: McClelland, Robert, and Sarah Gault. 2017. "The Synthetic Control Method as a Tool to Understand State Policy," March, 46.

a control group from a “weighted sum of donor regions chosen from a pool of potential candidates” (McClelland and Gault 2017, 3).

(d) How you construct a consistent SC estimator? Give all steps of your algorithm.

There are six main steps to construct SC estimator. First, one has to identify predictors of outcome variables, which is variables that could affect the treatment results. Second, one has to identify donor regions to synthesize the control region, excluding states that had any sort of similar policy in the selected period. Third, one has to choose a method for selecting predictor weights. Fourth, one has to assess the pretreatment period goodness of fit of synthetic control state. Fifth, one has to conduct placebo test on states in the donor pool to evaluate the significance of the results for the treated state. Sixth, one has to conduct sensitivity analyses to further test the credibility of the results. (McClelland and Gault 2017, 7-8)

Question 2

Summarize the section 3 of Abadie et al (2010) and explain, in your own words, how the authors evaluated the Effect of California’s Tobacco Control Program.

In order to sum up, the authors showed that the Tobacco Control Program had an impact on the cigarette consumption. By using the Synthetic Control Method, they created a control version of California experience and it seems like they have approved the policy.