Assignment #3

ECON 5783 — University of Arkansas

Prof. Kyle Butts

These assignments should be completed in groups of 1 or 2 but submitted individually. My preference is for you to use Rmarkdown files to have your code, results, and your answers to the questions intermixed. Since I am not requiring you to code in R for these assignments, you can use latex or microsoft word to write up answers alternatively. Not that in these cases, I would like you to upload your code seperately.

Coding Exercise

This assignment serves as an introduction to Monte-Carlo simulations and will assess your understanding of causal assumptions needed in different methods (today's is difference-in-means). Monte-Carlo simulations are a common strategy to assess the performance of estimators. The main idea is that you generate a dataset that either does or does not satisfy the underlying assumptions of a method and assess how the estimator does.

In our case, we have the difference-in-means estiamtor which requires the independence assumptions, i.e. that the treated and untreated potential outcomes $Y_i(1)$ and $Y_i(0)$ are independent of treatment status D_i.

In the file `break_the_simulation_1.qmd`, there is a complete example of a monte carlo simulation. In it, we generate 1000 example datasets that satisfy the independence assumption and estimate the difference-in-means estimator. You can see how we run Monte Carlo simulations in the code and then display the estimates in a histogram. Note that the distribution of DIM estimates falls at the true treatment effect.

Your task is to break this simulation by modifying the `dgp_broken` function. To break it, I want you to change the data generating process to *break the identifying assumption* of the difference-in-means estimator. Please avoid doing silly things, e.g. changing the treatment effect so that the estimate is shifted.

After doing so, describe what you did in the `## Describe your thinking` section.