TD 1 : Difference in Difference

Exercise 1

The role of monetary policy during the Great Depression has been the subject of much controversies among economists. If central banks had accepted to play the role of lender of last resort for banks, would this crisis have been less important ? On the one hand, Social Darwinists consider that "any aid to a present bad bank is the surest mode of preventing the establishment of a future good bank." And Keynesians consider that the main cause of the Great Depression is a contraction of the demand on the markets (both goods and labor markets).On the other hand, Milton Friedman claimed a few decades later that the Federal Reserve foolishly restricted credit to banks as the Great Depression unfolded.

In this exercise, we are going to evaluate empirically the role of monetary policy on the evolution of a bank crisis. In Mississippi, one of the main local bank (the Caldwell's bank) collapsed in November 1930, generating a bank run. Mississippi has a particularity : the State is supervised by two different regional Federal Reserve Banks [1]. In particular, Mississippi's Sixth District is supervised by the Federal Bank of Atlanta while the Eighth District is supervised by the Federal Bank of Saint Louis. These two Federal Banks followed different strategies to cope with the collapse of the Caldwell's bank. The Federal Bank of Atlanta increased bank lending about 40% following the Caldwell's collapse, whereas Saint Louis didn't change its policy. In the file *banks_ TD1.dta*, you will find for each day the number of bank in activity in both districts.

1. Import the data in Stata and graph the times series `bib6` and `bib8`, the number of banks in business for each district. Indicate the Caldwell's collapse (November 1st of 1930) and the bank run (December 19th of 1930).
2. Select data corresponding to the 1st July of each year. Compute the number of bank in activity for each year in each district and draw the corresponding graph. Draw the number of banks in each district and the counterfactual derived from a DiD strategy.
3. Make some robustness check considering other day than July 1st (for instance September 15th).
4. Estimate the average marginal effect of the Atlanta policy on the probability to survive between July 1st 1930 and July 1st 1931. Test the nullity of this average effect (assuming that no new bank appears during this period). [Note : to do so you can build a dataset of banks $\times$ years and run an OLS regression.]

1. There are twelve regional Federal Reserve Banks that are jointly responsible for implementing the monetary policy set forth by the Federal Open Market Committee : `https://commons.wikimedia.org/wiki/File:Federal_Reserve_Districts_Map_-_Banks_%26_Branches.png#/media/File:Federal_Reserve_Districts_Map_-_Banks_&_Branches.png`

Exercise 2

We consider an American State where some healthcare measure D (like a public insurance scheme) is introduced for a subpopulation (that we will denote by a binary variable G. $G = 1$ if an individual belongs to the targetted subpopulation and 0 otherwise) at date $T = 0$. The outcome of interest is denoted Y and is for instance an indicator of the health status of individual. We observe Y, G for two large and unselected samples at $T = -1$ and at $T = 1$.

1. Difference in Differences
   (a) If you decide to estimate the effect of D on Y for the subpopulation that is directly directed by the treatment, which regression will you run ?
   (b) What is the limit in probability of your estimator ?
   (c) Under which assumption on the potential outcomes can you interpret this limit as an average treatment effect ? Explain.
   (d) What could cause a failure of this strategy ?
2. Difference in Difference in Differences
   (a) Imagine that the public insurance scheme in this State (Stata that we will denote by $S = 1$ from now on) is implemented simultaneously to a federal policy affecting all subpopulations in every States (for instance, we suppose that some benefits are introduced for the subpopulation $G = 1$ in the 50 States). What would be the problem with the previous DiD estimator ?
   (b) An econometrician estimates the following linear regression :

$$\begin{aligned} Y =& \beta_0 + \beta_1 \mathbb{1}\{S = 1\} + \beta_2 G + \beta_3 \mathbb{1}\{T = 1\} \\ &+ \beta_4 G \mathbb{1}\{T = 1\} + \beta_5 \mathbb{1}\{S = 1\}\mathbb{1}\{T = 1\} + \beta_6 G \mathbb{1}\{S = 1\} \\ &+ \beta_7 G \mathbb{1}\{S = 1\}\mathbb{1}\{T = 1\} + \varepsilon. \end{aligned}$$

   Express the limit in probability of $\widehat{\beta}_7$ as a function of $E(Y|S, G, T)$.
   (c) Under which assumption can we interpret this limit as $E(Y(1) - Y(0)|S = 1, G = 1, T = 1)$? Comment this assumption.