**Directions**: We will go through and implement the Callaway and Sant’anna, Sun and Abraham, Borusyak, et al. and canonical twoway fixed effects model (which assumes constant treatment effects) using the Cheng and Hoekstra castle doctrine dataset. Our goal is to focus on implementation using available code in Stata and/or R as well as interpretation.

**Constant treatment effects model using TWFE**

1. Report the twoway fixed effects model regressing l\_homicide onto a post-treatment dummy (post) in table 1 below. Adjust standard errors for clustering at the state level (sid).
2. Implement the Bacon decomposition and put the information in Table 2.
3. Estimate a dynamic event study plot using t-1 and t-2 as the baseline comparison years. Produce a figure for TWFE. What is each lead and lag attempting to measure and under what conditions will it be unbiased?

**Table 1: Results**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **TWFE** | **CS Simple** | **CS Group** | **SA** | **BJS** | **2SDID** |
| Overall ATT | 0.069\*\* | 0.1104\*\* | 0.1084\*\* |  |  |  |
|  | (0.034) | (0.0409) | (0.0357) |  |  |  |

**Table 2: Bacon decomposition information**

|  |  |  |  |
| --- | --- | --- | --- |
| **Types of contrasts** | **Number of comparisons** | **Weight** | **Avg DiD** |
| Never treated 2x2s |  | 0.899 | 0.078 |
| Not yet treated 2x2s |  | 0.077 | -0.029 |
| Already treated 2x2s |  | 0.024 | 0.078 |

29 never-treated states (they have ‘na’ missing observations for effyear variable) and 5 treatment dates (2005 to 2009):

* 2005: 1 state (Florida) 🡪 red warning
* 2006: 13 states
* 2007: 4 states 🡪 red warning
* 2008: 2 states 🡪 red warning
* 2009: 1 state 🡪 red warning

Since I have 5 treatment groups and 1 untreated group (never treated), that means I have 5 squared or 25 2x2 contrasts that TWFE will be calculating and weighting to get 0.077.

**Aggregation method**

1. Now estimate the model using Callaway and Sant’anna and Sun and Abraham’s estimators. Report the simple ATT in Table 1. Compare your answer to column 1.
2. Next estimate an event study model using Callaway and Sant’anna. How does it compare with what you found using the constant treatment effects model?
3. Next estimate an event study model using Sun and Abraham. How does that compare with what you found using both Callaway and Sant’anna and TWFE? Explain how this procedure is similar to Callway and Sant’anna by explicitly noting who the comparison group is in each.

**Imputation method**

1. Finally, estimate the same with 2SDID and BJS.