Econ 613: Applied Econometrics

Assignment 3: Panel Data

Due on April 26th at 11 pm EST.

Exercise 1 Links to the datasets

- population.csv
- crime_long.csv
- officers.csv

Exercise 2 Data Manipulation

We consider the data *population.csv* and *crime_long.csv*. Population contains population count per period and unit, as well as ethnic composition. *crime_long* contains reported crime counts (variable crimes) per crime type, district unit, and periods. A period is a month.

- Calculate total crime per month and plot the time series of crime.
- Merge the two datasets by districts-units and period.
- Construct a panel data of unit over time with the following variables
  - Total crimes per resident
  - Violent crimes per resident
  - Property crimes per resident
  - Median income
  - Share of black, Hispanic, and white residents

Exercise 3 Panel Data: Introduction

We consider the data $officers.csv$, which contains deployment data (which unit they are assigned to) and the number of arrests per officer.

We consider the following model.

$$A_{ijt} = \beta\tau_{it} + \gamma Z_{jt} + \epsilon_{ijt} \tag{1}$$

where τ is the tenure of the officer, and Z_{jt} are district-level controls for total crimes, median income, share of black, hispanic and white residents. Estimate β and γ.

Exercise 4 Panel Data: More controls

We consider the data $officers.csv$, which contains deployment data (which unit they are assigned to) and the number of arrests per officer.

We consider the following model.

$$A_{ijt} = \beta\tau_{it} + \gamma Z_{jt} + \psi_j + \kappa_t + \epsilon_{ijt} \tag{2}$$

where τ is the tenure of the officer, and Z_{jt} are district-level controls for total crimes, median income, share of black, hispanic and white residents. Estimate β and γ. ψ_j is a set of district fixed effects. κ_t are year and month fixed effects. Estimate β, γ, ψ and κ.

Exercise 5 Panel Data: Individual fixed effects

We consider the data $officers.csv$, which contains deployment data (which unit they are assigned to) and the number of arrests per officer.

We consider the following model.

$$A_{ijt} = \alpha_i + \beta\tau_{it} + \gamma Z_{jt} + \psi_j + \kappa_t + \epsilon_{ijt} \tag{3}$$

where τ is the tenure of the officer, and Z_{jt} are district-level controls for total crimes, median income, share of black, hispanic and white residents. Estimate β and γ. ψ_j is a set of district fixed effects. κ_t are year and month fixed effects. Finally α_i are individual fixed effects.

- Implement a within, between, and first difference estimator for the parameter β. Then, compare the estimated values.
- Use a GMM approach to estimate all parameters (including fixed effects) in one step.