

Session 15: Panel Data Exercises

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1. Open R (`Rstudio`).
2. Install (if not previously installed) and load packages `AER` and `plm`.
3. Load `Grunfield` data set from package `AER`. When loading data specify package name; use `data(..., package="...")` command.
4. Explore `Grunfield` data set. Is this a balanced or unbalanced panel?
5. Estimate regression model for real capital investment (`invest`) with real value of the firm (`value`) and real value of the capital stock (`capital`). Treat data as a cross-section.
6. Estimate the regression in `step 5` but also control for individual Fixed Effects; use `as.factor(...)` for the additional variable of individual effects within the `lm(...)` command.
7. Estimate the regression in `step 5` but also control for individual and time fixed effects.
8. Estimate regressions in `steps 5, 6 and 7` with `plm(...)` command from `plm` package.
9. Compare regression outputs from `steps 5, 6 and 7` and in `step 8` from `plm` package.
10. Estimate the regression in `step 5` but also control for Random Effects; use `plm(...)` command from `plm` package.
11. Compare regression output in `step 6` and `step 10`. What do you observe? Confirm your observations with Hausman test; use `phptest(..., ...)` command from `plm` package.
12. Use R script and `CAPMfactors.txt` data from Brightspace to download stock prices for `AAPL`, `MSFT` and `AMZN` and organise them into a panel with CAPM factors.
13. Following the approach in `step 6` estimate a panel CAPM model with interaction terms for individual effects.

14. Estimate univariate CAPM models for AAPL, MSFT and AMZN and compare these outputs to output in **step 13**. What do you observe? Confirm your observations with F-test; use `linearHypothesis(...)` command from `car` package. *Note that this is a simplified and slightly modified script from the Week 3 session.*
15. Load `Guns` data set. Follow approach in **step 2** but do not specify package.
16. Estimate a set of simple regressions on the relationship of violent crimes and gun laws in the U.S. Use `log()` transformation for the violent crimes and estimate regressions for the cross-section, individual and both individual and time FE. Use both LSDV (manual) approach and `plm(...)` command from `plm` package. What do you observe for cross-section and FE regressions output? Which output is in-line with your expectations?
17. Load `Fatalities` data set. Follow approach in **step 2** but do not specify package.
18. Obtain Fatalities Rate (number of fatalities over population and multiplied by 1000, since population is measured in thousands in the data set).
19. Estimate a set of simple regressions as in **step 16** on the relationship of Fatalities Rate and Alcohol Taxes in the U.S. What do you observe for cross-section and FE regressions output? Which output is in-line with your expectations?
20. Using two periods of observations only investigate if the Alcohol Tax policy had a statistically significant impact on the Fatalities Rate in the U.S..