Economic Growth

Problems Sets

Winter Semester 2025

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Problem Set 4

Convergence analysis with GDP data

One can use the GDP data of the Penn World Table to analyze convergence with Barro-type regressions. Consider a data set with per capita gdp time series of a sample of countries.

Exercise 1

(1) Recall the system of structural equations for the sample with countries $i = 1, \ldots, n$ over a period of $t = 1, \ldots, T$ years

$$\ln y_{i,t} - \ln y_{i,t-1} = b^0 + b^1 \ln y_{i,t-1} + \varepsilon_{i,t}$$

(2) Do you remember the OLS estimators for b^1 and b^0

$$\begin{aligned} \widehat{b^1} &= \frac{cov(\ln y_{i,t} - \ln y_{i,t-1},\, \ln y_{i,t-1})}{var(\ln y_{i,t-1})} \\ \widehat{b^0} &= \overline{\ln y_{i,t} - \ln y_{i,t-1}} - \widehat{b^1}\, \overline{\ln y_{i,t-1}} \end{aligned}$$

Apply the OLS estimation and interpret the results!

(3) Do you see a reason to investigate conditional convergence?

(4) Consider the country specific regression for conditional convergence

$$\ln y_{i,t} - \ln y_{i,t-1} = b_i^0 + b^1\ \ln y_{i,t-1} + \varepsilon_{i,t}$$

(5) Do you remember how to derive the country fixed effects estimators?

(6) Compute the common slope estimator $\widehat{b^1}$ from

$$(\ln y_{i,t} - \ln y_{i,t-1}) - (\ln y_{i,T} - \ln y_{i,1})/T = b^1\,(\ln y_{i,t-1} - \overline{\ln y_{i\_}}) + (\varepsilon_{i,t} - \overline{\varepsilon_i})$$

and the country specific intercepts $\widehat{b_i^0}$ according to

$$\widehat{b_i^0} = \overline{\ln y_{i,t} - \ln y_{i,t-1}} - \widehat{b^1}\, \overline{\ln y_{i,t-1}}$$

for each particular country i.

(7) Compare your results with the unconditional estimators.