List 01. Panel analysis

Nikita V. Artamonov

September 29, 2024

Necessary Python package: `pandas, numpy, linearmodels`[1]

Contents

1 Baseline model **1**

2 Models with lags & differences **5**

1 Baseline model

#**1**. For the panel `Grunfeld` consider a regression

inv on value & capital

Remark: here `firm` is an individual index, `year` is a time index.

1. write down the specification of a baseline model
2. import the dataset and set a MultiIndex over a pandas DataFrame (please, mind individual and time indices).
3. Is the panel balanced or not?
4. Evaluate matrices of regression design $\boldsymbol{y}, \boldsymbol{X}$
5. Fit the model using Pooling, RE, FE (within) and FD estimators

[1] `conda install -c conda-forge linearmodels` `pip install linearmodels`

- via matrices of regression design
- via regression specification

and report the fitting result.

6. For each model test the significance of coefficients. Perform both non-robust and robust test.
7. Test overall significance of each model. Perform both non-robust and robust test
8. Perform Hausman test

#**2** (Gun Laws and the Effect on Crime). For the panel `Guns` consider a regression

$$\log(\text{violent}) \text{ on law } (+ \text{ another regressors})$$

Remark: here `state` is an individual index, `year` is a time index.

1. write down the specification of a baseline model
2. import the dataset and set a MultiIndex over a pandas DataFrame (please, mind individual and time indices).
3. Is the panel balanced or not?
4. Evaluate matrices of regression design $\boldsymbol{y}, \boldsymbol{X}$ (law is categorical!)
5. Fit the model using Pooling, RE, FE (within) and FD estimators
   - via matrices of regression design
   - via regression specification

   and report the fitting result.
6. For each model test the significance of coefficients. Perform both non-robust and robust test.
7. Test overall significance of each model. Perform both non-robust and robust test
8. Perform Hausman test

#**3**. For the panel `EmplUK` consider a regression

log(emp) on log(wage), log(capital), log(output)

Remark: here `firm` is an individual index, `year` is a time index.

1. write down the specification of a baseline model
2. import the dataset and set a MultiIndex over a pandas DataFrame (please, mind individual and time indices).
3. Is the panel balanced or not?
4. Evaluate matrices of regression design $\boldsymbol{y}, \boldsymbol{X}$
5. Fit the model using Pooling, RE, FE (within) and FD estimators
   - via matrices of regression design
   - via regression specification

   and report the fitting result.
6. For each model test the significance of coefficients. Perform both non-robust and robust test.
7. Test overall significance of each model. Perform both non-robust and robust test
8. Perform Hausman test

#**4**. For the panel `Wages`[2] consider a regression

lwage on ed, exp, exp^2, south, smsa, married, bluecol

Remark: here `id` is an individual index, `time` is a time index.

1. write down the specification of a baseline model
2. import the dataset and set a MultiIndex over a pandas DataFrame (please, mind individual and time indices).
3. Is the panel balanced or not?

[2]In the panel ed is time-invariant!

4. Evaluate matrices of regression design $\boldsymbol{y}, \boldsymbol{X}$
5. Fit the model using Pooling, RE, FE (within) and FD estimators
   - via matrices of regression design
   - via regression specification

   and report the fitting result.
6. For each model test the significance of coefficients. Perform both non-robust and robust test.
7. Test overall significance of each model. Perform both non-robust and robust test
8. Perform Hausman test

#**5** (Production costs of Turkish banks). For the panel `TurkishBanks` consider a regression

log(cost) on log(output) (+ another regressors)

Remark: here `id` is an individual index, `year` is a time index.

1. write down the specification of a baseline model
2. import the dataset and set a MultiIndex over a pandas DataFrame (please, mind individual and time indices).
3. Is the panel balanced or not?
4. Evaluate matrices of regression design $\boldsymbol{y}, \boldsymbol{X}$
5. Fit the model using Pooling, RE, FE (within) and FD estimators
   - via matrices of regression design
   - via regression specification

   and report the fitting result.
6. For each model test the significance of coefficients. Perform both non-robust and robust test.
7. Test overall significance of each model. Perform both non-robust and robust test
8. Perform Hausman test

2 Models with lags & differences

#**1**. For the panel `Grunfeld` consider a regression

$$\Delta\text{inv on } \Delta\text{value \& } \Delta\text{capital}$$

Remark: here `firm` is an individual index, `year` is a time index.

1. Fit the model using Pooling, RE, FE (within) and FD estimators and report the fitting result.
2. For each model test the significance of coefficients. Perform both non-robust and robust test.
3. Test overall significance of each model. Perform both non-robust and robust test
4. Perform Hausman test

#**2**. For the panel `Grunfeld` consider a regression

$$\text{inv}_{\text{it}} \text{ on } \text{value}_{\text{it}}, \text{ value}_{\text{i,t-1}}, \text{ capital}_{\text{it}}, \text{ capital}_{\text{i,t-1}}$$

Remark: here `firm` is an individual index, `year` is a time index.

1. Fit the model using Pooling, RE, FE (within) and FD estimators and report the fitting result.
2. For each model test the significance of coefficients. Perform both non-robust and robust test.
3. Test overall significance of each model. Perform both non-robust and robust test
4. Perform Hausman test

#**3**. For the panel `EmplUK` consider a regression

$$\Delta\log(\text{emp}) \text{ on } \Delta\log(\text{wage}), \Delta\log(\text{capital}), \Delta\log(\text{output})$$

Remark: here `firm` is an individual index, `year` is a time index.

1. Fit the model using Pooling, RE, FE (within) and FD estimators and report the fitting result.

2. For each model test the significance of coefficients. Perform both non-robust and robust test.

3. Test overall significance of each model. Perform both non-robust and robust test

4. Perform Hausman test

#**4**. For the panel `EmplUK` consider a regression

$$\log(\text{emp})_{\text{it}} \text{ on } \log(\text{wage})_{\text{it}}, \log(\text{wage})_{\text{i,t-1}}, \log(\text{capital})_{\text{it}}, \log(\text{capital})_{\text{i,t-1}}, \log(\text{output})_{\text{it}}, \log(\text{output})_{\text{i,t-1}}$$

Remark: here `firm` is an individual index, `year` is a time index.

1. Fit the model using Pooling, RE, FE (within) and FD estimators and report the fitting result.

2. For each model test the significance of coefficients. Perform both non-robust and robust test.

3. Test overall significance of each model. Perform both non-robust and robust test

4. Perform Hausman test

#**5** (Production costs of Turkish banks). For the panel `TurkishBanks` consider a regression

$$\Delta\log(\text{cost}) \text{ on } \Delta\log(\text{output}) \text{ (+ another regressors)}$$

Remark: here `id` is an individual index, `year` is a time index.

1. Fit the model using Pooling, RE, FE (within) and FD estimators and report the fitting result.

2. For each model test the significance of coefficients. Perform both non-robust and robust test.

3. Test overall significance of each model. Perform both non-robust and robust test

4. Perform Hausman test

#**6** (Production costs of Turkish banks). For the panel `TurkishBanks` consider a regression

$$\log(\text{cost})_{\text{it}} \text{ on } \log(\text{output})_{\text{it}}, \log(\text{output})_{\text{i,t-1}}, (+ \text{ another regressors})$$

Remark: here `id` is an individual index, `year` is a time index.

1. Fit the model using Pooling, RE, FE (within) and FD estimators and report the fitting result.
2. For each model test the significance of coefficients. Perform both non-robust and robust test.
3. Test overall significance of each model. Perform both non-robust and robust test
4. Perform Hausman test