Example 2-1

September 12, 2020

[ ]:
```
# first install the following packages and library
install.packages("pder")
install.packages("plm")
library("plm")
```

[3]:
```
##---------------------------------Block 1---------------------------------

#### Example 2-1 ####

## ------------------------------------------------------------------------
data("TobinQ", package = "pder")

## ------------------------------------------------------------------------

# pdata.frame() creates a panel for the data
# when no option is given, the default is to order by the first two columns
# it is assumed that the first column in the data is an individual index
# and the second column is a time index
pTobinQ <- pdata.frame(TobinQ)

# using the index option orders the panel in a specific way.
# here the data is ordered by individual
pTobinQa <- pdata.frame(TobinQ, index = 188)

# here the data is ordered by the identifier "cusip"
pTobinQb <- pdata.frame(TobinQ, index = c('cusip'))

# here the data is ordered by the both the identifer "cusip" and the year
pTobinQc <- pdata.frame(TobinQ, index = c('cusip', 'year'))
```

[4]:
```
##---------------------------------Block 2---------------------------------

# pdim() inspects the individual and time dimensions of the data
pdim(pTobinQ)
```

```
Balanced Panel: n = 188, T = 35, N = 6580
```

[5]:
```
##---------------------------------Block 3---------------------------------

# pdim() also has an index option. just like pdata.frame() the default
# option assumes that the first two columns are the individual and time indexes
pdim(TobinQ, index = 'cusip')
pdim(TobinQ)
```

```
Balanced Panel: n = 188, T = 35, N = 6580


Balanced Panel: n = 188, T = 35, N = 6580
```

[6]:
```
##---------------------------------Block 4---------------------------------

# the index can be extracted from pdata.frame() using the index() function
head(index(pTobinQ))
```

	cusip	year
2	2824	1951
3	2824	1952
4	2824	1953
5	2824	1954
6	2824	1955
7	2824	1956

[7]:
```
##---------------------------------Block 5---------------------------------

# Qeq is the formula for the variable ikn through qn
Qeq <- ikn ~ qn

# pooled estimator, within estimator, and between estimator
Q.pooling <- plm(Qeq, pTobinQ, model = "pooling")
Q.within <- update(Q.pooling, model = "within")
Q.between <- update(Q.pooling, model = "between")

## ------------------------------------------------------------------------

# Q.within returns the model formula and coefficients
Q.within

# summary() returns a more detailed account of the model
# including the residuals, coefficients, and significance
summary(Q.within)
```

```
Model Formula: ikn ~ qn

Coefficients:
       qn
```

```
0.0037919



Oneway (individual) effect Within Model

Call:
plm(formula = Qeq, data = pTobinQ, model = "within")

Balanced Panel: n = 188, T = 35, N = 6580

Residuals:
      Min.    1st Qu.     Median    3rd Qu.       Max.
-0.2163093 -0.0452458 -0.0084941  0.0336543  0.6184391

Coefficients:
     Estimate Std. Error t-value  Pr(>|t|)
qn 0.00379195 0.00017264  21.964 < 2.2e-16 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Total Sum of Squares:    36.657
Residual Sum of Squares: 34.084
R-Squared:      0.070185
Adj. R-Squared: 0.042833
F-statistic: 482.412 on 1 and 6391 DF, p-value: < 2.22e-16
```

[8]:
```
##---------------------------------Block 6---------------------------------

# fixef() computes the individual effects
# the default option returns the individual intercepts
head(fixef(Q.within))

# the "dfirst" option returns the individual effects differenced from the first␣
 ↪individual
head(fixef(Q.within, type = "dfirst"))

# the "dmean" option returns the individual effects differenced from their mean
head(fixef(Q.within, type = "dmean"))
```

2824 0.145289553462578 **6284** 0.128054669908768 **9158** 0.258083550235257 **13716** 0.11001096409583 **17372** 0.126725131506809 **19411** 0.16948907060528

6284 -0.0172348835538101 **9158** 0.112793996772679 **13716** -0.0352785893667485 **17372** -0.0185644219557695 **19411** 0.0241995171427012 **19519** -0.0103823714194997

2824 -0.0142134012585866 **6284** -0.0314482848123968 **9158** 0.0985805955140919 **13716** -0.0494919906253351 **17372** -0.0327778232143561 **19411** 0.00998611588411463

[9]:
```
##---------------------------------Block 7--------------------------------

# linear model estimation of the within estimator.
# lm()'s default is to remove the first level of the factor.
# these fixed effects are equal the "dfirst" option of fixef()
head(coef(lm(ikn ~ qn + factor(cusip), pTobinQ)))
```

(Intercept) 0.145289553462579 **qn** 0.00379194827975207 **factor(cusip)6284** -0.0172348835538104 **factor(cusip)9158** 0.112793996772678 **factor(cusip)13716** -0.0352785893667488 **factor(cusip)17372** -0.0185644219557697