

## Example 5-8

September 12, 2020

```
[ ]: # install the following package and libraries
install.packages("plm")
```

```
library("plm")
library("lmtest")
library("sandwich")
library("car")
```

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

#### Example 5-8 ####

## -----
data("Parity", package = "plm")
fm <- ls ~ ld
pppmod <- plm(fm, data = Parity, effect = "twoways")

## -----

# Wald Test
linearHypothesis(pppmod, "ld = 1", vcov = vcov)
```

| Res.Df | Df | Chisq    | Pr(>Chisq)   |
|--------|----|----------|--------------|
| 1648   | NA | NA       | NA           |
| 1647   | 1  | 98.31836 | 3.562468e-23 |

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

# functions that calculate different covariance estimators
Vw <- function(x) vcovHC(x, method = "white1")
Vcx <- function(x) vcovHC(x, cluster = "group", method = "arellano")
Vct <- function(x) vcovHC(x, cluster = "time", method = "arellano")
Vcxt <- function(x) Vcx(x) + Vct(x) - Vw(x)
Vct.L <- function(x) vcovSCC(x, wj = function(j, maxlag) 1)
Vnw.L <- function(x) vcovNW(x)
Vsccl.L <- function(x) vcovSCC(x)
Vcxt.L <- function(x) Vct.L(x) + Vcx(x) - vcovNW(x, wj = function(j, maxlag) 1)
```

```

# creates table for ols, time fixed effects, country fixed effects, and two-way
→fixed effects models
vcovs <- c(vcov, Vw, Vcx, Vct, Vcxt, Vct.L, Vnw.L, Vsccl.L, Vcxt.L)
names(vcovs) <- c("OLS", "Vw", "Vcx", "Vct", "Vcxt", "Vct.L", "Vnw.L",
                  "Vsccl.L", "Vcxt.L")
tttab <- matrix(nrow = 4, ncol = length(vcovs))
dimnames(tttab) <- list(c("Pooled OLS", "Time FE", "Country FE", "Two-way FE"),
                        names(vcovs))

pppmod.ols <- plm(fm, data = Parity, model = "pooling")
for(i in 1:length(vcovs)) {
  tttab[1, i] <- linearHypothesis(pppmod.ols, "ld = 1",
                                  vcov = vcovs[[i]])[2, 4]
}

pppmod.tfe <- plm(fm, data = Parity, effect = "time")
for(i in 1:length(vcovs)) {
  tttab[2, i] <- linearHypothesis(pppmod.tfe, "ld = 1",
                                  vcov = vcovs[[i]])[2, 4]
}

pppmod.cfe <- plm(fm, data = Parity, effect = "individual")
for(i in 1:length(vcovs)) {
  tttab[3, i] <- linearHypothesis(pppmod.cfe, "ld = 1",
                                  vcov = vcovs[[i]])[2, 4]
}

pppmod.2fe <- plm(fm, data = Parity, effect = "twoways")
for(i in 1:length(vcovs)) {
  tttab[4, i] <- linearHypothesis(pppmod.2fe, "ld = 1",
                                  vcov = vcovs[[i]])[2, 4]
}

print(t(round(tttab, 6)))

```

|         | Pooled OLS | Time FE  | Country FE | Two-way FE |
|---------|------------|----------|------------|------------|
| OLS     | 0.000000   | 0.000000 | 0.000000   | 0.000000   |
| Vw      | 0.000000   | 0.000000 | 0.000000   | 0.000000   |
| Vcx     | 0.001032   | 0.000869 | 0.070773   | 0.119787   |
| Vct     | 0.000000   | 0.000000 | 0.000000   | 0.000000   |
| Vcxt    | 0.000966   | 0.000842 | 0.071866   | 0.121614   |
| Vct.L   | 0.000000   | 0.000000 | 0.001861   | 0.000748   |
| Vnw.L   | 0.000000   | 0.000000 | 0.000030   | 0.000000   |
| Vsccl.L | 0.000000   | 0.000000 | 0.000076   | 0.000013   |
| Vcxt.L  | 0.000648   | 0.000672 | 0.075022   | 0.129857   |