Example 10-14

September 11, 2020

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

library(spData)
install.packages("spDataLarge")
library("pder")
library("plm")
library("splm")
library("spdep")
library("lmtest")
```

[2]:
```
##---------------------------------Block 1--------------------------------

#### Example 10-14

## ------------------------------------------------------------------------
data("EvapoTransp", package = "pder")
data("etw", package = "pder")

# panel model with spatial and serial correlation
evapo <- et ~ prec + meansmd + potet + infil + biomass + plantcover +
  softforbs + tallgrass + diversity + matgram + dwarfshrubs + legumes
semsr.evapo <- spreml(evapo, data=EvapoTransp, w=etw,
                      lag=FALSE, errors="semsr")
summary(semsr.evapo)
```

```
ML panel with , AR(1) serial correlation, spatial error correlation

Call:
spreml(formula = evapo, data = EvapoTransp, w = etw, lag = FALSE,
    errors = "semsr")

Residuals:
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
-2.2598 -0.5000  0.0209 -0.0469  0.4198  2.3730
```

```
Error variance parameters:
    Estimate Std. Error t-value  Pr(>|t|)
psi 0.166538   0.048267  3.4503 0.0005599 ***
rho 0.866527   0.024556 35.2877 < 2.2e-16 ***

Coefficients:
               Estimate  Std. Error t-value  Pr(>|t|)
(Intercept)  0.86604110  0.56232635  1.5401  0.123535
prec        -0.12963576  0.15433822 -0.8399  0.400939
meansmd      0.01896769  0.00445226  4.2602 2.042e-05 ***
potet        0.55114397  0.33582766  1.6412  0.100766
infil        0.02351347  0.02187619  1.0748  0.282445
biomass      0.00233540  0.00030511  7.6542 1.945e-14 ***
plantcover   0.01917420  0.11033208  0.1738  0.862033
softforbs    0.13235937  0.04146285  3.1922  0.001412 **
tallgrass    0.17454017  0.05409913  3.2263  0.001254 **
diversity    0.04077520  0.03578975  1.1393  0.254579
matgram     -0.02981440  0.03304014 -0.9024  0.366861
dwarfshrubs  0.09840506  0.05412693  1.8180  0.069058 .
legumes     -0.01630359  0.00559113 -2.9160  0.003546 **
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

[3]:
```
##---------------------------------Block 2---------------------------------
# t test
coeftest(plm(evapo, EvapoTransp, model="pooling"))
```

```
t test of coefficients:

               Estimate  Std. Error t value  Pr(>|t|)
(Intercept)  1.07699252  0.16858645  6.3884 4.485e-10 ***
prec        -0.20795429  0.03756344 -5.5361 5.480e-08 ***
meansmd      0.02274891  0.00648884  3.5058 0.0005045 ***
potet        0.76794143  0.08837988  8.6891 < 2.2e-16 ***
infil        0.05564773  0.03103026  1.7933 0.0736434 .
biomass      0.00010371  0.00038920  0.2665 0.7900058
plantcover   0.04465691  0.15780076  0.2830 0.7773207
softforbs    0.10430509  0.05829972  1.7891 0.0743214 .
tallgrass    0.17301265  0.07866758  2.1993 0.0284057 *
diversity    0.01621414  0.05133289  0.3159 0.7522648
matgram     -0.06953728  0.04900063 -1.4191 0.1566140
dwarfshrubs  0.07145072  0.07713510  0.9263 0.3548227
legumes     -0.01944683  0.00811509 -2.3964 0.0169976 *
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

[4]:
```
##---------------------------------Block 3---------------------------------
# t test omitting the spatial error term
coeftest(spreml(evapo, EvapoTransp, w=etw, errors="sem"))
```

```
z test of coefficients:

              Estimate Std. Error z value  Pr(>|z|)
(Intercept)  1.0625398  0.5660491  1.8771 0.0605022 .
prec        -0.1556424  0.1533498 -1.0150 0.3101294
meansmd      0.0179289  0.0039623  4.5249 6.043e-06 ***
potet        0.5325736  0.3274930  1.6262 0.1039042
infil        0.0221105  0.0193959  1.1400 0.2543036
biomass      0.0023116  0.0002860  8.0824 6.348e-16 ***
plantcover   0.0163067  0.0972885  0.1676 0.8668886
softforbs    0.1319485  0.0365432  3.6108 0.0003053 ***
tallgrass    0.1766059  0.0476921  3.7030 0.0002130 ***
diversity    0.0383890  0.0315495  1.2168 0.2236855
matgram     -0.0310060  0.0291469 -1.0638 0.2874258
dwarfshrubs  0.1044045  0.0478209  2.1832 0.0290180 *
legumes     -0.0166536  0.0049294 -3.3784 0.0007290 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```