Examples 7-6 through 7-10

September 11, 2020

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

library("plm")

# import the data and run calculate diff2 from Example 7-5
data("DemocracyIncome", package = "pder")

#### Example 7-5 ####

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

# differenced Generalized Method of Moments estimator
diff1 <- pgmm(democracy ~ lag(democracy) + lag(income) |
              lag(democracy, 2:99)| lag(income, 2),
              DemocracyIncome, index=c("country", "year"),
              model="onestep", effect="twoways", subset = sample == 1)
```

[9]:
```
##---------------------------------Block 1---------------------------------

# two-step GMM estimator
diff2 <- update(diff1, model = "twosteps")
coef(summary(diff2))
```

	Estimate	Std. Error	z-value	Pr(>|z|)
lag(democracy)	0.554007280	0.10783032	5.13776889	2.780195e-07
lag(income)	0.001843585	0.06053787	0.03045341	9.757054e-01

[11]:
```
##---------------------------------Block 2---------------------------------

#### Example 7-6 ####

## ------------------------------------------------------------------------
data("DemocracyIncome", package = "pder")
data("DemocracyIncome25", package = "pder")
pdim(DemocracyIncome25)
```

```
## ------------------------------------------------------------------------

# GMM estimator (differenced) using democracy and income (with lags) as␣
 ↪instruments
diff25 <- pgmm(democracy ~ lag(democracy) + lag(income) |
               lag(democracy, 2:99) + lag(income, 2:99),
               DemocracyIncome25, model = "twosteps")

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

# different estimations of the GMM estimator
diff25lim <- pgmm(democracy ~ lag(democracy) + lag(income) |
                  lag(democracy, 2:4)+ lag(income, 2:4),
                  DemocracyIncome, index=c("country", "year"),
                  model="twosteps", effect="twoways", subset = sample == 1)
diff25coll <- pgmm(democracy ~ lag(democracy) + lag(income) |
                   lag(democracy, 2:99)+ lag(income, 2:99),
                   DemocracyIncome, index=c("country", "year"),
                   model="twosteps", effect="twoways", subset = sample == 1,
                   collapse = TRUE)
sapply(list(diff25, diff25lim, diff25coll), function(x) coef(x)[1:2])
```

```
Balanced Panel: n = 25, T = 7, N = 175
```

lag(democracy)	0.4066085	0.4678152	0.50272735
lag(income)	-0.1713431	-0.1257871	-0.04221125

[12]:
```
##---------------------------------Block 3-------------------------------

#### Example 7-7 ####

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

# system GMM. the option for transformation "ld" stands for level and difference
# the default option for transformation is "d" for difference for the␣
 ↪differenced GMM
sys2 <- pgmm(democracy ~ lag(democracy) + lag(income) |
             lag(democracy, 2:99)| lag(income, 2),
             DemocracyIncome, index = c("country", "year"),
             model = "twosteps", effect = "twoways",
             transformation = "ld")
coef(summary(sys2))
```

	Estimate	Std. Error	z-value	Pr(>|z|)
lag(democracy)	0.6175939	0.05713917	10.808591	3.134483e-27
lag(income)	0.1199633	0.01791565	6.696003	2.141970e-11

[13]:
```
##---------------------------------Block 4---------------------------------

#### Example 7-8 ####

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

# vcov() computes the inconsistent, classical variance
sqrt(diag(vcov(diff2)))[1:2]
```

lag(democracy) 0.0479495262967923 **lag(income)** 0.0464590309368824

[14]:
```
##---------------------------------Block 5---------------------------------

# vcovHC() computes the the robust variance
sqrt(diag(vcovHC(diff2)))[1:2]
```

lag(democracy) 0.107830323178524 **lag(income)** 0.0605378690820666

[15]:
```
##---------------------------------Block 6---------------------------------

#### Example 7-9 ####

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

# Sargan-Hansen test
sargan(diff2)
```

```
Sargan test

data:  democracy ~ lag(democracy) + lag(income) | lag(democracy, 2:99) |  ...
chisq = 49.881, df = 44, p-value = 0.251
alternative hypothesis: overidentifying restrictions not valid
```

[16]:
```
##---------------------------------Block 7---------------------------------

# Sargan-Hansen test
sargan(sys2)
```

```
Sargan test

data:  democracy ~ lag(democracy) + lag(income) | lag(democracy, 2:99) |  ...
chisq = 55.678, df = 54, p-value = 0.4114
alternative hypothesis: overidentifying restrictions not valid
```

[17]:
```
##---------------------------------Block 8---------------------------------

sapply(list(diff25, diff25lim, diff25coll),
       function(x) sargan(x)[["p.value"]])
```

chisq 0.918900723054548 **chisq** 0.071049335121177 **chisq** 0.215313896323952

[18]:
```
#### Example 7-10 ####

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

# test for autocorrelation
mtest(diff2, order = 2)
```

```
Arellano-Bond autocorrelation test of degree 2

data:  democracy ~ lag(democracy) + lag(income) | lag(democracy, 2:99) |  ...
normal = 0.88094, p-value = 0.3784
alternative hypothesis: autocorrelation present
```