Chapter 10 - Basic Regression Analysis with Time Series Data

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Exercise 10.7

Upload packages

```
library(lmreg)
library(wooldridge)
library(dplyr)
```

Upload database

```
data<-wooldridge::consump
```

Use the data set CONSUMP.RAW for this exercise

Estimate a simple regression model relating the growth in real per capita consumption (of nondurables and services) to the growth in real per capita disposable income. Use the change in the logarithms in both cases. Report the results in the usual form. Interpret the equation and discuss statistical significance.

```
lm1<-lm(log(rcons)~ly, data)

summary(lm1)
```

```
##
## Call:
## lm(formula = log(rcons) ~ ly, data = data)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.067133 -0.019936 -0.003976  0.019254  0.055861
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept) -5.54595    0.18089  -30.66   <2e-16 ***
## ly           1.40193    0.01901   73.76   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.02786 on 35 degrees of freedom
## Multiple R-squared:  0.9936, Adjusted R-squared:  0.9934
## F-statistic:  5441 on 1 and 35 DF,  p-value: < 2.2e-16
```

The estimated equation is expressed as follows

$$\widehat{log(rcons)} = -5.54 + 1.40log(y)$$

For an increase of 1% in disposal income per capita the consume of goods and services increases aproximately 1.4%. The both, intercept and β_1 coefficient shows statistical significance at the 1% level. The model has an almost perfect fit, with R-Squared of 99.3%.

(ii) Add a lag of the growth in real per capita disposable income to the equation from part (i). What do you conclude about adjustment lags in consumption growth?

```
lm2<-lm(log(rcons)~lag(ly,1)+lag(ly,0), data)

summary(lm2)
```

```
##
## Call:
## lm(formula = log(rcons) ~ lag(ly, 1) + lag(ly, 0), data = data)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.059662 -0.015735 -0.005147  0.017005  0.054830
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  -5.4280     0.1939 -27.994   <2e-16 ***
## lag(ly, 1)    0.5727     0.2600   2.203   0.0347 *
## lag(ly, 0)    0.8181     0.2668   3.067   0.0043 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.02674 on 33 degrees of freedom
##   (1 observation deleted due to missingness)
## Multiple R-squared:  0.9939, Adjusted R-squared:  0.9935
## F-statistic:  2673 on 2 and 33 DF,  p-value: < 2.2e-16
```

In this case, the estimated model is expressed as follows

$$\widehat{log(rcons)} = -5.42 + 0.57log(y)_t + 0.81log(y)_{t-1}$$

(iii) Add the real interest rate to the equation in part (i). Does it affect consumption growth?

```
lm3<-lm(log(rcons)~ly+log(r3),
        data)
```

```
## Warning in log(r3): NaNs produzidos
```

```
summary(lm3)
```

```
##
## Call:
## lm(formula = log(rcons) ~ ly + log(r3), data = data)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.077222 -0.020134  0.002857  0.021318  0.050144
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) -5.543667   0.185443 -29.894   <2e-16 ***
## ly           1.402632   0.019487  71.979   <2e-16 ***
## log(r3)     -0.006557   0.005107  -1.284    0.211
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.02832 on 26 degrees of freedom
##   (8 observations deleted due to missingness)
## Multiple R-squared:  0.995,  Adjusted R-squared:  0.9946
## F-statistic:  2596 on 2 and 26 DF,  p-value: < 2.2e-16
```

The estimated equation is expressed as follows

$$\widehat{log(rcons)} = -5.54 + 1.40log(y)_t - 0.006log(r3)_t$$

Hence, for an increase of 1% in real interest rate, the consume decreases by 0.006%.