Chapter 10 - Regression Analysis with Time Series Data

Thalles Quinaglia Liduares

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Upload packages

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

Upload database

```
data<-wooldridge::volat

attach(data)
```

Exercise 10.9

Use the data in VOLAT.RAW for this exercise. The variable `rsp500` is the monthly return on the Standard & Poor's 500 stock market index, at an annual rate. (This includes price changes as well as dividends.) The variable `i3` is the return on three- month T-bills, and `pcip` is the percentage change in industrial production; these are also at an annual rate.

(i) Consider the equation

$$rp500_t = \beta_0 + \beta_1 pcip_t + \beta_2 i3_t + u_t$$

What signs do you think β_1 and β_2 should have?

The expected sign on `pcip` is positive. As this index for industrial production increases, the economic activity also tends to increase, *ceteris paribus*. So, the index of SP (represented by `rsp500``), tends to increases, as well.

As the interest rate on the treasury increases, it becomes more profitable to invest resources in these treasury stocks, *ceteris paribus*. In this way, less resources are invested in businesses, which tends to decrease the S&P index. Hence, the expected sign of this coefficient is negative.

(ii) Estimate the previous equation by OLS, reporting the results in standard form. Interpret the signs and magnitudes of the coefficients.

```
lm1<-lm(rsp500~pcip+i3)

summary(lm1)
```

```
##
## Call:
## lm(formula = rsp500 ~ pcip + i3)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -157.871  -22.580    2.103   25.524  138.137
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept) 18.84306    3.27488   5.754 1.44e-08 ***
## pcip         0.03642    0.12940   0.281   0.7785
## i3          -1.36169    0.54072  -2.518   0.0121 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 40.13 on 554 degrees of freedom
##   (1 observation deleted due to missingness)
## Multiple R-squared:  0.01189,    Adjusted R-squared:  0.008325
## F-statistic: 3.334 on 2 and 554 DF,  p-value: 0.03637
```

The estimated equation is expressed as follows

$$\widehat{rsp500} = 18.84 + 0.03pcip - 1.36i3$$

Hence, the estimated coefficients have the expected sign.

For an unit variation in `pcip` the `rsp500` increases 0.03 points. On the other hand, for an unit variation in `i3` the `rsp500` decreases by 1.36 points.

(iii) Which of the variables is statistically significant?

The `pcip` do not show statistical significance at anyy level. On the other hand, the variable `i3` shows statistical significance at the 5% level.

(iv) Does your finding from part (iii) imply that the return on the S&P 500 is predictable? Explain.

This simple model shows a poor capacity of explain the variation of S & P index. In more detailed and robust models, the dynamics of S & P index could be more investigated.