Chapter 11 - Further Issues in Using OLS with Time Series Data

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Exercise 11.4

Upload packages

```
library(lmreg)
library(wooldridge)
library(lmtest)
library(tseries)
```

Upload database

```
data<-wooldridge::phillips

attach(data)
```

Use the data in PHILLIPS.RAW for this exercise, but only through 1996.

(i) In Example 11.5, we assumed that the natural rate of unemployment is constant. An alternative form of the expectations augmented Phillips curve allows the natural rate of unemployment to depend on past levels of unemployment. In the simplest case, the natural rate at time t equals unemt21. If we assume adaptive expectations, we obtain a Phillips curve where inflation and unemployment are in first differences:

$$\Delta inf = \beta_0 + \beta_1 \Delta unem + u$$

Estimate this model, report the results in the usual form, and discuss the sign, size, and statistical significance of $\hat{\beta}_1$.

```
diff_inf<-diff(inf)

diff_unem<-diff(unem)

summary(lm1<-lm(diff_inf~diff_unem))
```

```
##
## Call:
## lm(formula = diff_inf ~ diff_unem)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -7.4790 -0.9441  0.1384  1.0889  5.4551
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept) -0.07214    0.30584  -0.236  0.81443
## diff_unem   -0.83281    0.28984  -2.873  0.00583 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.267 on 53 degrees of freedom
## Multiple R-squared:  0.1348, Adjusted R-squared:  0.1185
## F-statistic: 8.256 on 1 and 53 DF,  p-value: 0.005831
```

The estimated equation is expressed as follows

$$\widehat{\Delta inf} = -0.07 - 0.83\Delta unem$$

The coefficient associated to the unemployment variable is equal to -0.83 and have statistical significance at the 1% level. For an unit percent increase in unemployment rate the inflation rate decreases 0.83%.

(ii) Which model fits the data better, (11.19) or the model from part (i)? Explain.

The model in (11.19) presents a R^2 equal to approximately 10%. In the other hand, the model in this exercise presents a R^2 equal to 13%. In this second case, the inclusion of variables in differences might purge trend in the series.