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

Thalles Quinaglia Liduares

2022-04-17

Exercise 11.13

Upload packages

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

Upload database

```
data<-wooldridge::beveridge

attach(data)
```

Use the data in BEVERIDGE.RAW to answer this question. The data set includes monthly observations on vacancy rates and unemployment rates for the U.S. from December 2000 through February 2012.

(i) Find the correlation between `urate` and `urate_1`. Would you say the correlation points more toward a unit root process or a weakly dependent process?

```
round(100*cor(urate, urate_1, use = "complete.obs"), 2)
```

```
## [1] 99.58
```

The correlation between these two variables are very high, almost close to one. This implies that the variables are not weakly dependent.

(ii) Repeat part (i) but with the vacancy rate, `vrate`.

```
cor(urate, vrate)
```

```
## [1] -0.8432421
```

Similarly, the correlation is quite high, but in this case it is negative.

(iii) The Beveridge Curve relates the unemployment rate to the vacancy rate, with the simplest relationship being linear:

$$urate_t = \beta_0 + \beta_1 vrate_t + u_t$$

where $_1 <0 $ is expected. Estimate β_0 and β_1 by OLS and report the results in the usual form. Do you find a negative relationship?

```
summary(lm1<-lm(urate~vrate))
```

```
##
## Call:
## lm(formula = urate ~ vrate)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -2.1399 -0.9063 -0.1726  0.7893  2.9342
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  17.1194     0.5920   28.92   <2e-16 ***
## vrate        -3.7414     0.2068  -18.09   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.202 on 133 degrees of freedom
## Multiple R-squared:  0.7111, Adjusted R-squared:  0.7089
## F-statistic: 327.3 on 1 and 133 DF,  p-value: < 2.2e-16
```

The estimated equation is expressed as follows

$$\widehat{urate}_t = 17.11 - 3.74vrate$$

(iv) Explain why you cannot trust the confidence interval for β_1 reported by the OLS output in part (iii). [The tools needed to study regressions of this type are presented in Chapter18.]

As we see, the correlation between these variables are very high, what might implicate of failure of CLM assumptions.

(v) If you difference urate and vrate before running the regression, how does the estimated slope coefficient compare with part (iii)? Is it statistically different from zero? [This example shows that differencing before running an OLS regression is not always a sensible strategy. But we cannot say more until Chapter 18.]

```
d.urate<-diff(urate)

d.vrate<-diff(vrate)
```

```
summary(lm2<-lm(d.urate~d.vrate))
```

```
##
## Call:
## lm(formula = d.urate ~ d.vrate)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.54257 -0.13705 -0.03429  0.06847  0.66571
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.03705    0.01781   2.080   0.0394 *
## d.vrate     -0.02760    0.10732  -0.257   0.7974
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2058 on 132 degrees of freedom
## Multiple R-squared:  0.0005008,  Adjusted R-squared:  -0.007071
## F-statistic: 0.06614 on 1 and 132 DF,  p-value: 0.7974
```

The coefficients vary significantly, however they do not show statistical significance.