Chapter 5 - OLS Asymptotics

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Exercise 5.2

Upload packages

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

Upload database

```
data<-wooldridge::gpa2

attach(data)
```

Use the data in GPA2.RAW for this exercise.

(i) Using all 4,137 observations, estimate the equation

$$colgpa = \beta_0 + \beta_1 hsperc + \beta_2 sat + u$$

and report the results in standard form

```
options(scipen=999) # To avoid sci notation

summary(lm1<-lm(colgpa~hsperc+sat))
```

```
##
## Call:
## lm(formula = colgpa ~ hsperc + sat)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -2.6007 -0.3581  0.0329  0.3963  1.7599
##
## Coefficients:
##                Estimate  Std. Error t value            Pr(>|t|)
## (Intercept)  1.39175672  0.07154243   19.45 <0.0000000000000002 ***
## hsperc      -0.01351923  0.00054947  -24.60 <0.0000000000000002 ***
## sat          0.00147622  0.00006531   22.60 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.5615 on 4134 degrees of freedom
## Multiple R-squared:  0.2734, Adjusted R-squared:  0.2731
## F-statistic: 777.9 on 2 and 4134 DF,  p-value: < 0.00000000000000022
```

The estimated equation is expressed as follows

$$\widehat{colgpa} = 1.39 - 0.013hsperc + 0.0014sat$$

(ii) Reestimate the equation in part (i), using the first 2,070 observations.

```
data2<-data[1:2070,]

summary(lm2<-lm(data2$colgpa~data2$hsperc+data2$sat))
```

```
##
## Call:
## lm(formula = data2$colgpa ~ data2$hsperc + data2$sat)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -2.28027 -0.34910  0.04051  0.38046  1.69464
##
## Coefficients:
##                 Estimate  Std. Error t value            Pr(>|t|)
## (Intercept)   1.43601740  0.09778190   14.69 <0.0000000000000002 ***
## data2$hsperc -0.01274942  0.00071852  -17.74 <0.0000000000000002 ***
## data2$sat     0.00146838  0.00008858   16.58 <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.5395 on 2067 degrees of freedom
## Multiple R-squared:  0.2827, Adjusted R-squared:  0.282
## F-statistic: 407.4 on 2 and 2067 DF,  p-value: < 0.00000000000000022
```

In this case, the estimated equation is given by

$$\widehat{colgpa} = 1.43 - 0.012hsperc + 0.0014sat$$

(iii) Find the ratio of the standard errors on hsperc from parts (i) and (ii). Compare this with the result from (5.10).

```
std1<-0.00054947

std2<-0.00071852

ratio<-round(std1/std2,3)*100

ratio
```

```
## [1] 76.5
```