Exercícios Práticos

```
require(wooldridge)
```

```
## Loading required package: wooldridge
```

C5

```
reg1 <- lm(educ ~ exper + tenure, data = wage1)

summary(reg1)
```

```
##
## Call:
## lm(formula = educ ~ exper + tenure, data = wage1)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -12.4285  -1.3536  -0.2055   1.6550   5.9791
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) 13.574964   0.184324  73.647  < 2e-16 ***
## exper       -0.073785   0.009761  -7.559 1.83e-13 ***
## tenure       0.047680   0.018337   2.600  0.00958 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.63 on 523 degrees of freedom
## Multiple R-squared:  0.1013, Adjusted R-squared:  0.09791
## F-statistic: 29.49 on 2 and 523 DF,  p-value: 7.327e-13
```

```
residual <- residuals(reg1)

reg2 <- lm(lwage ~ residual, data = wage1)

summary(reg2)
```

```
##
## Call:
## lm(formula = lwage ~ residual, data = wage1)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -2.12919 -0.32803 -0.07126  0.31626  1.51357
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  1.62327    0.02066   78.56   <2e-16 ***
```

```
## residual     0.09203    0.00788   11.68   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4739 on 524 degrees of freedom
## Multiple R-squared:  0.2066, Adjusted R-squared:  0.205
## F-statistic: 136.4 on 1 and 524 DF,  p-value: < 2.2e-16
```

```
reg3 <- lm(lwage ~ educ + exper + tenure, data = wage1)

summary(reg3)
```

```
##
## Call:
## lm(formula = lwage ~ educ + exper + tenure, data = wage1)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -2.05802 -0.29645 -0.03265  0.28788  1.42809
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept) 0.284360   0.104190   2.729  0.00656 **
## educ        0.092029   0.007330  12.555  < 2e-16 ***
## exper       0.004121   0.001723   2.391  0.01714 *
## tenure      0.022067   0.003094   7.133 3.29e-12 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4409 on 522 degrees of freedom
## Multiple R-squared:  0.316,  Adjusted R-squared:  0.3121
## F-statistic: 80.39 on 3 and 522 DF,  p-value: < 2.2e-16
```

O coeficiente $\hat{r_1}$ é aproximadamente o mesmo que o coeficiente de *educ*.

C6

(i)

```
reg4 <- lm(IQ ~ educ, data = wage2)

summary(reg4)
```

```
##
## Call:
## lm(formula = IQ ~ educ, data = wage2)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -50.228  -7.262   0.907   8.772  37.373
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  53.6872     2.6229   20.47   <2e-16 ***
## educ          3.5338     0.1922   18.39   <2e-16 ***
```

```
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 12.9 on 933 degrees of freedom
## Multiple R-squared:  0.2659, Adjusted R-squared:  0.2652
## F-statistic:   338 on 1 and 933 DF,  p-value: < 2.2e-16
```

(ii)

```
reg5 <- lm(log(wage) ~ educ, data = wage2)

summary(reg5)
```

```
##
## Call:
## lm(formula = log(wage) ~ educ, data = wage2)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -1.94620 -0.24832  0.03507  0.27440  1.28106
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept) 5.973062   0.081374   73.40   <2e-16 ***
## educ        0.059839   0.005963   10.04   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4003 on 933 degrees of freedom
## Multiple R-squared:  0.09742,    Adjusted R-squared:  0.09645
## F-statistic: 100.7 on 1 and 933 DF,  p-value: < 2.2e-16
```

(iii)

```
reg6 <- lm(log(wage) ~ educ + IQ, data = wage2)

summary(reg6)
```

```
##
## Call:
## lm(formula = log(wage) ~ educ + IQ, data = wage2)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -2.01601 -0.24367  0.03359  0.27960  1.23783
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) 5.6582876  0.0962408  58.793  < 2e-16 ***
## educ        0.0391199  0.0068382   5.721 1.43e-08 ***
## IQ          0.0058631  0.0009979   5.875 5.87e-09 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
```

```
## Residual standard error: 0.3933 on 932 degrees of freedom
## Multiple R-squared:  0.1297, Adjusted R-squared:  0.1278
## F-statistic: 69.42 on 2 and 932 DF,  p-value: < 2.2e-16
```

(iv)

$$0.0391199 + 0.0058631 * 3.5338 = 0,059839 = \tilde{\delta_1}$$

É possível observar que $\tilde{\beta_1} = \hat{\beta_1} + \hat{\beta_2}\tilde{\delta_1}$.