Exercícios Práticos

```r
require(wooldridge)
```

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

C1

(i)

Espera-se um sinal negativo na variável $\log(dist)$.

```r
lprice <- log(kielmc$price)

ldist <- log(kielmc$dist)


reg1 <- lm(lprice ~ ldist, data = kielmc)

summary(reg1)
```

```
##
## Call:
## lm(formula = lprice ~ ldist, data = kielmc)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -1.22356 -0.28076 -0.05527  0.27992  1.29332
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  8.25750    0.47383  17.427  < 2e-16 ***
## ldist        0.31722    0.04811   6.594 1.78e-10 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4117 on 319 degrees of freedom
## Multiple R-squared:  0.1199, Adjusted R-squared:  0.1172
## F-statistic: 43.48 on 1 and 319 DF,  p-value: 1.779e-10
```

(ii)

```r
lintst <- log(kielmc$intst)

larea <- log(kielmc$area)

lland <- log(kielmc$land)
```

```
reg2 <- lm(price ~ ldist + lintst + larea + lland + rooms + baths + age, data = kielmc)

summary(reg2)
```

```
##
## Call:
## lm(formula = price ~ ldist + lintst + larea + lland + rooms +
##     baths + age, data = kielmc)
##
## Residuals:
##    Min     1Q Median     3Q    Max
## -82784 -21630  -2338  16941 137980
##
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept) -368607.52   64267.77  -5.735 2.29e-08 ***
## ldist          -789.94    5737.53  -0.138  0.89058
## lintst        -5940.12    4575.52  -1.298  0.19516
## larea         54057.22    7528.45   7.180 5.09e-12 ***
## lland          7655.72    3635.85   2.106  0.03603 *
## rooms          2975.77    2535.04   1.174  0.24134
## baths         10654.86    3798.61   2.805  0.00535 **
## age            -293.40      62.26  -4.713 3.68e-06 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 30490 on 313 degrees of freedom
## Multiple R-squared:  0.5132, Adjusted R-squared:  0.5023
## F-statistic: 47.13 on 7 and 313 DF,  p-value: < 2.2e-16
```

Os resultados conflitantes podem ser explicados pela colinearidade entre as variáveis independentes.

(iii)

```
lintst2 <- lintst^2
```

```
reg3 <- lm(price ~ ldist + lintst + larea + lland + rooms + baths + age + lintst2, data = kielmc)

summary(reg3)
```

```
##
## Call:
## lm(formula = price ~ ldist + lintst + larea + lland + rooms +
##     baths + age + lintst2, data = kielmc)
##
## Residuals:
##    Min     1Q Median     3Q    Max
## -88835 -21113  -2828  17741 129458
##
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept) -1.410e+06  2.483e+05  -5.676 3.16e-08 ***
## ldist        1.588e+04  6.780e+03   2.342  0.01981 *
```

```
## lintst        1.948e+05   4.657e+04    4.184 3.73e-05 ***
## larea         5.420e+04   7.324e+03    7.401 1.27e-12 ***
## lland         1.061e+04   3.602e+03    2.946  0.00346 **
## rooms         2.886e+03   2.466e+03    1.170  0.24272
## baths         8.881e+03   3.718e+03    2.389  0.01750 *
## age          -2.940e+02   6.057e+01   -4.855 1.91e-06 ***
## lintst2      -1.164e+04   2.688e+03   -4.331 2.00e-05 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 29660 on 312 degrees of freedom
## Multiple R-squared:  0.5408, Adjusted R-squared:  0.529
## F-statistic: 45.93 on 8 and 312 DF,  p-value: < 2.2e-16
```

Agora os resultados se mostraram estatísticamente significantes, e a forma funcional quadrática da variável distância da casa até a rodovia interestadual se mostrou correlacionada com a variável *dist*, se mostrando nessa última regressão.

(iv)

```
ldist2 <- ldist^2
```

```
reg4 <- lm(price ~ ldist + lintst + larea + lland + rooms + baths + age + lintst2 + ldist2, data = kielm
```

```
summary(reg4)
```

```
##
## Call:
## lm(formula = price ~ ldist + lintst + larea + lland + rooms +
##     baths + age + lintst2 + ldist2, data = kielmc)
##
## Residuals:
##    Min     1Q Median     3Q    Max
## -89365 -21233  -3310  18018 128226
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) -2259628.9   757425.0  -2.983  0.00308 **
## ldist         239168.0   188086.6   1.272  0.20447
## lintst        150354.6    59734.3   2.517  0.01234 *
## larea          53326.0     7355.6   7.250 3.33e-12 ***
## lland           9455.5     3728.8   2.536  0.01171 *
## rooms           2686.8     2470.2   1.088  0.27758
## baths           8824.3     3715.7   2.375  0.01816 *
## age             -288.6       60.7  -4.755 3.04e-06 ***
## lintst2        -8851.5     3567.6  -2.481  0.01363 *
## ldist2        -11930.5    10043.0  -1.188  0.23576
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 29640 on 311 degrees of freedom
## Multiple R-squared:  0.5429, Adjusted R-squared:  0.5296
## F-statistic: 41.03 on 9 and 311 DF,  p-value: < 2.2e-16
```

Não se mostrou significativo.

C2

(i)

```
lwage <- log(wage1$wage)

exper2 <- (wage1$exper)^2

reg5 <- lm(lwage ~ educ + exper + exper2, data = wage1)

summary(reg5)
```

```
##
## Call:
## lm(formula = lwage ~ educ + exper + exper2, data = wage1)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -1.96387 -0.29375 -0.04009  0.29497  1.30216
##
## Coefficients:
##                Estimate Std. Error t value Pr(>|t|)
## (Intercept)   0.1279975  0.1059323    1.208    0.227
## educ          0.0903658  0.0074680   12.100  < 2e-16 ***
## exper         0.0410089  0.0051965    7.892 1.77e-14 ***
## exper2       -0.0007136  0.0001158   -6.164 1.42e-09 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4459 on 522 degrees of freedom
## Multiple R-squared:  0.3003, Adjusted R-squared:  0.2963
## F-statistic: 74.67 on 3 and 522 DF,  p-value: < 2.2e-16
```

(ii)

Sim, é significante a nível de 1%.

(iii)

```
x <- mean(wage1$exper)

x
```

```
## [1] 17.01711
```

O retorno esperado para o quinto ano de experiência é de aproximadamente 6%. Já com vinte anos é de 3,5%.

(iv)

O valor no qual acréscimos marginals passam a diminuir *log(wage)* é de 11,21 (basta calcular a derivada de *wage* em relação a *exper* e igualar a zero).