Chapter 7

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Exercise 7.7

Upload packages

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

Upload database

```
data<-wooldridge::wage1

attach(data)
```

(i) Use equation (7.18) to estimate the gender differential when educ = 12.5. Compare this with the estimated differential when educ = 0.

```
summary(lm1<-lm(lwage~female+educ+female*educ+exper+expersq+tenure+tenursq))
```

```
##
## Call:
## lm(formula = lwage ~ female + educ + female * educ + exper +
##     expersq + tenure + tenursq)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -1.83265 -0.25261 -0.02374  0.25396  1.13584
##
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.3888060  0.1186871   3.276  0.00112 **
## female      -0.2267886  0.1675394  -1.354  0.17644
## educ         0.0823692  0.0084699   9.725  < 2e-16 ***
## exper        0.0293366  0.0049842   5.886 7.11e-09 ***
## expersq     -0.0005804  0.0001075  -5.398 1.03e-07 ***
## tenure       0.0318967  0.0068640   4.647 4.28e-06 ***
## tenursq     -0.0005900  0.0002352  -2.509  0.01242 *
## female:educ -0.0055645  0.0130618  -0.426  0.67028
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4001 on 518 degrees of freedom
## Multiple R-squared:  0.441,  Adjusted R-squared:  0.4334
## F-statistic: 58.37 on 7 and 518 DF,  p-value: < 2.2e-16
```

The estimated equation is expressed as follows

$$\widehat{log(wage)} = 0.38 - 0.22female + 0.08educ + 0.02exper - 0.0005exper^2 + 0.031tenure - 0.0005tenure - 0.005female \cdot educ$$

Holding other factors fixed, for educ=12.5, we have that

$$\widehat{log(wage)}_{men} = 0.08(12.5) = 1$$

For woman:

$$-0.22(1) + 0.08(12.5) - 0.005 \cdot (1) \cdot (12.5) \approx 0.72$$

Hence, there's a difference between returns in terms of wage in the magnitude of 28%.

(ii) Run the regression used to obtain (7.18), but with $female \cdot (educ - 12.5)$ replacing $female \cdot educ$. How do you interpret the coefficient on female now?

```
v<-female*(educ-12.5)

summary(lm2<-lm(lwage~female+educ+exper+expersq+v+tenure+tenursq))
```

```
##
## Call:
## lm(formula = lwage ~ female + educ + exper + expersq + v + tenure +
##     tenursq)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -1.83265 -0.25261 -0.02374  0.25396  1.13584
##
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.3888060  0.1186871   3.276  0.00112 **
## female      -0.2963450  0.0358358  -8.270 1.14e-15 ***
## educ         0.0823692  0.0084699   9.725  < 2e-16 ***
## exper        0.0293366  0.0049842   5.886 7.11e-09 ***
## expersq     -0.0005804  0.0001075  -5.398 1.03e-07 ***
## v           -0.0055645  0.0130618  -0.426  0.67028
## tenure       0.0318967  0.0068640   4.647 4.28e-06 ***
## tenursq     -0.0005900  0.0002352  -2.509  0.01242 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4001 on 518 degrees of freedom
## Multiple R-squared:  0.441,  Adjusted R-squared:  0.4334
## F-statistic: 58.37 on 7 and 518 DF,  p-value: < 2.2e-16
```

(iii) Is the coefficient on female in part (ii) statistically significant? Compare this with (7.18) and comment.

Yes, it's statistically significant at 1% level, because there's more observations close to the mean value of education in the sample.