ECON HW 4

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library(haven)  
  
data <- read\_dta('C:/Users/Nick/Downloads/WAGE1.DTA')  
data

## # A tibble: 526 x 24  
## wage educ exper tenure nonwhite female married numdep smsa northcen south  
## <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>  
## 1 3.10 11 2 0 0 1 0 2 1 0 0  
## 2 3.24 12 22 2 0 1 1 3 1 0 0  
## 3 3 11 2 0 0 0 0 2 0 0 0  
## 4 6 8 44 28 0 0 1 0 1 0 0  
## 5 5.30 12 7 2 0 0 1 1 0 0 0  
## 6 8.75 16 9 8 0 0 1 0 1 0 0  
## 7 11.2 18 15 7 0 0 0 0 1 0 0  
## 8 5 12 5 3 0 1 0 0 1 0 0  
## 9 3.60 12 26 4 0 1 0 2 1 0 0  
## 10 18.2 17 22 21 0 0 1 0 1 0 0  
## # ... with 516 more rows, and 13 more variables: west <dbl>, construc <dbl>,  
## # ndurman <dbl>, trcommpu <dbl>, trade <dbl>, services <dbl>, profserv <dbl>,  
## # profocc <dbl>, clerocc <dbl>, servocc <dbl>, lwage <dbl>, expersq <dbl>,  
## # tenursq <dbl>

#1.1  
  
lm.fit <- lm( log(data$wage) ~ data$educ + data$exper + (data$expersq))  
lm.fit

##   
## Call:  
## lm(formula = log(data$wage) ~ data$educ + data$exper + (data$expersq))  
##   
## Coefficients:  
## (Intercept) data$educ data$exper data$expersq   
## 0.1279975 0.0903658 0.0410089 -0.0007136

summary(lm.fit)

##   
## Call:  
## lm(formula = log(data$wage) ~ data$educ + data$exper + (data$expersq))  
##   
## 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   
## data$educ 0.0903658 0.0074680 12.100 < 2e-16 \*\*\*  
## data$exper 0.0410089 0.0051965 7.892 1.77e-14 \*\*\*  
## data$expersq -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

#1.2  
  
lm.fit.reduced <- lm( log(data$wage) ~ data$educ + data$exper )  
anova( lm.fit , lm.fit.reduced)

## Analysis of Variance Table  
##   
## Model 1: log(data$wage) ~ data$educ + data$exper + (data$expersq)  
## Model 2: log(data$wage) ~ data$educ + data$exper  
## Res.Df RSS Df Sum of Sq F Pr(>F)   
## 1 522 103.79   
## 2 523 111.34 -1 -7.5543 37.993 1.421e-09 \*\*\*  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

# Exp^2 is statistically significant with a p-value of 1.421 \* 10^-9

#1.3  
  
tenth = lm.fit$coefficients[3]\*10 + lm.fit$coefficients[4]\*(10^2)  
sprintf( "tenth year effect is %f", tenth)

## [1] "tenth year effect is 0.338733"

twentyth = lm.fit$coefficients[3]\*20 + lm.fit$coefficients[4]\*(20^2)  
sprintf( "twentyth year effect is %f", twentyth)

## [1] "twentyth year effect is 0.534754"

thirthyth = lm.fit$coefficients[3]\*30 + lm.fit$coefficients[4]\*(30^2)  
sprintf( "thirtyth year effect is %f", thirthyth)

## [1] "thirtyth year effect is 0.588064"

#1.4  
  
y = ('lm.fit$coefficients[3]\*x + lm.fit$coefficients[4]\*(x^2)')  
zero = -lm.fit$coefficients[3]/lm.fit$coefficients[4]  
zero

## data$exper   
## 57.47096

lm.fit$coefficients[3]\*zero + lm.fit$coefficients[4]\*(zero^2)

## data$exper   
## 0

sprintf("%f years of experience until zero effect. Zero people have this much work experience.", zero)

## [1] "57.470964 years of experience until zero effect. Zero people have this much work experience."

#data$exper