

Homework 3 for 4371 Spring 2012.

Due at 3:00pm on May 2nd. No late homework will be accepted. Please turn in in class only in case I don't receive your homework. That is, do not put your homework in my mailbox or slip it into my office in case I don't get it. Please remember to write your name(s) legibly and to write the course number on the top of the first page.

1. I have the following regression results:

$$\begin{aligned} \widehat{\log(\text{salary})} = & \quad 4.57 \quad +0.188 \log(\text{sales}) \quad +0.1 \log(\text{mktval}) \\ & (0.25) \quad (0.04) \quad (0.049) \\ & -0.0022\text{profmarg} \quad +0.026\text{ceoten} \quad -0.0092(\text{ceoten} + \text{comten}) \\ & (0.0021) \quad (0.007) \quad (0.0033) \\ \widehat{\log(\text{salary})} = & \quad 4.57 \quad +0.188 \log(\text{sales}) \quad +0.1 \log(\text{mktval}) \\ & (0.25) \quad (0.04) \quad (0.049) \\ & -0.0022\text{profmarg} \quad +.0078\text{ceoten} \quad -0.0092(\text{comten} - \text{ceoten}) \\ & (0.0021) \quad (0.0054) \quad (0.0033) \end{aligned}$$

with $n = 177$, $SST=64.646$ and $SSR=41.856$. mktval denotes the market value of the firm, profmarg the profit as a percentage of sales, ceoten is years as CEO with the current company, and comten is total years with the company. Note that the SST and SSR will be identical in both equations.

- (a) Describe in details how you can test the null hypothesis that total impact ceoten and comten on $\log(\text{salary})$ is equal to zero ($\beta_{\text{ceoten}} + \beta_{\text{comten}} = 0$) after we control for other effects against the 2-sided alternatives. Then use the previous regression results to complete your test.
- (b) What are the estimated coefficients if we run the regression:

$$\begin{aligned} \log(\text{salary}) = & \beta_0 + \beta_1 \log(\text{sales}) + \beta_2 \log(\text{mktval}) + \beta_3 \text{profmarg} \\ & + \beta_4 \text{ceoten} + \beta_5 \text{comten} + u. \end{aligned}$$

(Hint: Use the regression results above.)

- (c) Interpret the coefficients on $\log(\text{sales})$, profmarg , and ceoten .
- (d) What are the SST and SSR from the new regression?
- (e) Compute the unbiased estimator for σ^2 .
- (f) Test the overall significance from the new regression.

- (g) Use the following regression results to test $H_0 : \beta_{ceoten} = \beta_{comten} = 0$ against $H_1 : H_0$ is not true at 5% significance level.

$$\log(\widehat{salary}) = 4.62 + 0.158 \log(sales) + 0.112 \log(mktval) - 0.002 profmarg, \quad (1)$$

$SSR = 45.02$. Use F-test and calculate the F-statistic based on the SSR formula and R^2 formula.

2. I have the following regression results:

$$\begin{array}{rcc} \widehat{wage} = & 0.623 & -2.27female & +0.506educ \\ & (0.672) & (0.279) & (0.05) \end{array}$$

with $n=526$, $SST=7160$ and $SSR= 5307$. Also, $wage$ denotes hourly wage, $female$ is a dummy variable which is equal to 1 if the person is female and 0 otherwise, and $educ$ is the education in years.

- Interpret the estimate of the slope parameter on $female$ and $educ$.
- Write down the OLS regression lines for men and women respectively. Test the null hypothesis that the these two regression lines are identical at 5% significance level. (15 points)
- Construct 95% 2-sided CI for β_{educ} .
- Use the F -test to test for the overall significance of this regression.
- Suppose we know that males generally have more education than females. Then, if I regress $wage$ on $female$ only and get,

$$\widehat{wage} = \tilde{\beta}_0 + \tilde{\beta}_1 female.$$

Then will $\tilde{\beta}_1$ be greater or smaller than -2.27? Why?