

Homework 1 for 4371/7371 Spring 2012.

Due at 3:00pm on April 11th. 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.

Wooldridge: Problem 3.1 3.2, 3.4, 3.5, 3.6, 3.8.

In the following regression, we assume that Assumptions MLR1-6 hold.

1. Suppose the relationship among college grade point average (colGPA), high school GPA (hsGPA) and the achievement test score is the following:

$$colGPA = \beta_0 + \beta_1 ACT + \beta_2 hsGPA + u.$$

We assume that MLR1-MLR4 hold in the model. We expect that  $\beta_1$  and  $\beta_2$  are both positive in the model.

- (a) Suppose we only regress colGAP on ACT and obtain  $\widetilde{colGAP} = \tilde{\beta}_0 + \tilde{\beta}_1 ACT$ . Will  $\tilde{\beta}_1$  be an unbiased estimator for  $\beta_1$ ? If yes, please explain. If not, what is the sign of the bias of  $\tilde{\beta}_1$ ?
2. I regress log CEO salary ( $\log(\text{salary})$ ) on log firm sales ( $\log(\text{sales})$ ), CEO tenure (ceoten, measured in years) and squared CEO tenure ( $\text{ceoten}^2$ , measured in years) and obtain:

$$\widehat{\log(\text{salary})} = 4.71 + 0.227 \log(\text{sales}) + 0.045 \text{ceoten} - 0.0012 \text{ceoten}^2.$$

- (a) What is the effect of changing the CEO tenure from 10 years to 11 years on holding other factors fixed?
- (b) What is the effect of changing the CEO tenure from  $k$  year to  $k+1$  years on holding other factors fixed?
- (c) Interpret the slope parameter on  $\log(\text{sales})$ .
3. We use the scrap rate (the number of defective items out of every 100 produced) to measure the effect of the worker training on productivity, so a decrease in the scrap rate reflects higher worker productivity.  $hrsemp$  is the annual hours of training per

employee, *sales* is annual firm sales (in dollars) and *employ* is the number of firm employees.

$$\widehat{\log(\textit{scrap})} = 12.46 - 0.029\textit{hrsemp} - 0.962 \log(\textit{sales}) + 0.761 \log(\textit{employ})$$

(5.69)    (0.023)                    (0.453)                    (0.407)

with  $n=29$ ,  $SST=64.18$  and  $SSR=47.34$ .

- (a) interpret the coefficient on *hrsemp*,  $\log(\textit{sales})$  and  $\log(\textit{employ})$ .
- (b) Test the hypothesis that *hrsemp* has no effect on  $\log(\textit{scrap})$  at 5% significance level against the 2-sided alternative that *hrsemp* has an effect on  $\log(\textit{scrap})$ .
- (c) Test the hypothesis that the elasticity of *scrap* with respect to *employ* is 0.5 against the alternative hypothesis that the elasticity is greater than 0.5 at 5% significance level.
- (d) If you want to make a statement that "I am 99% confident that  $\beta_{\log(\textit{employ})}$  is greater than \_\_\_". Construct a confidence interval for you to make this statement.