

Econ 444 Elementary Econometrics (Fall 2007)

SUMMARY of CHAPTER 1  
and  
HOMEWORK EXERCISE: 1

Due at the beginning of class on Monday, October 1

## 1 KEY TERMS AND CONCEPTS

Dependent variable. Independent, or explanatory, variable.

Population regression:

$$E(Y|X) = \beta_0 + \beta_1 X. \quad (1)$$

Regression coefficients (constant, or intercept, term,  $\beta_0$ , and slope coefficient,  $\beta_1$ ).  
Stochastic error, term  $\epsilon$ :

$$Y = \beta_0 + \beta_1 X + \epsilon. \quad (2)$$

Sample regression equation

$$\hat{Y}_i = \hat{\beta}_0 + \hat{\beta}_1 X_i \quad (3)$$

Residual  $e_i$ :

$$e_i = Y_i - \hat{Y}_i \quad (4)$$

## 2 HOMEWORK EXERCISES: 1

1. State with reasons whether the following statements are true or false.

(1.a) The stochastic error term  $\epsilon_i$  and the residual  $e_i$  mean the same thing, and their values are the same in each application.

(1.b) The population Regression and the sample Regression are always the same when OLS is used to compute the sample regression.

(1.c) The residual  $e_i$  is always zero for each  $i$  when OLS is correctly applied to data.

**2.** Let  $Y$  be the expected demand for a Beatles CD and  $X$  be the price of the CD. Imagine that the demand at each level of the price depends on whether or not it rains. The probability that it rains is  $1/2$ . When the price is \$9, the demand will be 21 copies if it rains, and 25 copies if it does not rain. When the price is \$12, the demand will be 12 copies if it rains and, 16 copies if it does not rain. When the price is \$16, the demand will be 0 copy if it rains, and 4 copies if it does not rain.

(2.a) Compute the expected demand at each level of the price.

(2.b) Write down the population regression as a function of  $X$  for this example.

(2.c) Is the function in (2.a) linear or nonlinear?

**3.** Imagine that you have data of demand of the CD at the price levels of \$9, \$12, an \$16 for three CD stores on various days in the preceding example. Suppose that the data were as follows:

**Table 1 Observed Demand for a Beatles CD**

Observation	Price	The observed number of copies of the CD demanded
i	$X_i$	$Y_i$
(1)	(2)	(3)
1	9	21
2	12	16
3	16	4

(3.a) I computed the OLS estimate of the slope coefficient,  $\hat{\beta}_1$ , and it was -2.46. Then I computed the OLS estimate of the constant term,  $\hat{\beta}_0$ , and it was 44. Write down the sample regression equation.

(3.b) Are the population regression and the sample regression identical in this example?

(3.c) Compute the OLS residual for each level of price.

(3.d) Compute the stochastic error term for each level of price, using the expected values you computed in (2.a).

(3.e) Are the stochastic error term and the residual the same at each level of price?

### **3 ADDITIONAL ADVANCED PROBLEMS**

This is not part of homework.

Studenmund p.27, Exercise 6-a. b. c.