

File: Ch02, Chapter 2, The Simple Linear Regression Model

Multiple Choice

1. In an economic model that uses income to predict monthly expenditures on entertainment, what is the dependent variable?

- a.) income
- b.) monthly expenditures on entertainment
- c.) income elasticity
- d.) demand for entertainment

Ans: b

Level: Easy

Section: 2.1

2. In an economic model that uses income to predict monthly expenditures on entertainment, what is the independent or explanatory variable?

- a.) income
- b.) monthly expenditures on entertainment
- c.) income elasticity
- d.) demand for entertainment

Ans: a

Level: Easy

Section: 2.1

3. Which of the following is NOT an assumption of the Simple Linear Regression Model?

- a.) The value of  $y$ , for each value of  $x$ , is
$$y = \beta_1 + \beta_2 x + e$$
- b.) The variance of the random error  $e$  is
$$\text{var}(e) = \sigma^2$$
- c.) The covariance between any pair of random errors  $e_i$  and  $e_j$  is zero
- d.) The parameter estimate of  $\beta_1$  is unbiased.

Ans: d

Level: Moderate

Section: 2.2

4. The OLS estimators for  $\beta_1$  and  $\beta_2$  are formulas derived by minimizing \_\_\_\_\_.

- a.) the sum of the error terms or residuals

- b.) the sum of the squared residuals
- c.) the slope of the regression line
- d.) the fit of the regression line to the observed data.

Ans: b

Level: Easy

Section: 2.3

5. Applying the OLS model to our data give us the following regression equation:

$$\hat{y} = 3.41 + 12.89 x.$$

What would the forecast value be when the independent variable is 15.0?

- a.) 196.76
- b.) 16.30
- c.) 244.50
- d.) 32.19

Ans: a

Level: Easy

Section: 2.3

6. In the OLS model, what happens to  $\text{var}(b_1)$  as the sample size (N) increases?

- a.) it also increases
- b.) it decreases
- c.) it does not change
- d.) cannot be determined without more information

Ans: b

Level: Moderate/Difficult

Section: 2.4

7. If  $b_1$  is an estimator for  $\beta_1$  such that  $E(b_1) = \beta_1$ , then it must be the case that

- a.)  $b_1$  is an efficient estimator
- b.)  $b_1$  is an unbiased estimator
- c.)  $b_1$  is a linear estimator
- d.)  $b_1$  is a preferred estimator

Ans: b

Level: Moderate

Section: 2.4 & 2.5

8. Under the Gauss-Markov Theorem when assumptions SR1 – SR5 are met, what estimators of  $\beta_1$  and  $\beta_2$  may have smaller variances than  $b_1$  and  $b_2$ ?

- a.) none
- b.) a non-linear estimator
- c.) a normally distributed estimator
- d.) an estimator derived from economic theory

Ans: b

Level: Difficult

Section: 2.5

9. What mathematical theorem allows for normally distributed least squares estimators when assumptions SR1 – SR5 hold but the error term is NOT normally distributed?

- a.) Central Limit Theorem
- b.) Gauss-Markov Theorem
- c.) Law of Large Numbers
- d.) the Least Squares Principle

Ans: a

Level: Easy

Section: 2.6

10. If we use  $\frac{\sum \hat{e}_i^2}{N}$  as an estimator of  $\sigma^2$  it is \_\_\_\_\_, but it can be corrected by \_\_\_\_\_.

- a.) biased, changing the numerator to  $\sum e_i^2$
- b.) non-linear, changing the denominator to  $N - 2$
- c.) biased, changing the denominator to  $N-2$
- d.) non-linear, taking the log of each term.

Ans: c

Level: Moderate

Section: 2.7

11. Which of the following non-linear adjustments CANNOT be accommodated using OLS?

- a.) including an independent variable that has been raised to a power
- b.) taking a logarithmic transformation of the dependent variable
- c.) including a binary indicator variable
- d.) raising parameters to a power

Ans: d

Level: Moderate

Section: 2.8

12. How do you interpret the estimated value of  $\gamma_1$  in the following equation:

$$\ln(ENT\_EXP) = \gamma_1 + \gamma_2 (INCOME) + e$$

where *INCOME* is annual household income (in thousands) and *ENT\_EXP* is annual entertainment expenses?

- a.) the income elasticity of entertainment
- b.) when multiplied by 100 it is the percentage increase in entertainment expenses associated with an additional \$1000 in income
- c.) the increase in entertain expenses associated with a 1% increase in income
- d.) the average of the logarithm of entertainment expenses for a household with zero income

Ans: d

Level: Moderate

Section: 2.8

13. How do you interpret the estimated value of  $\gamma_2$  in the following equation:

$$\ln(ENT\_EXP) = \gamma_1 + \gamma_2 (INCOME) + e$$

where *INCOME* is annual household income (in thousands) and *ENT\_EXP* is annual entertainment expenses?

- a.) the income elasticity of entertainment
- b.) when multiplied by 100 it is the percentage increase in entertainment expenses associated with an additional \$1000 in income
- c.) the increase in entertain expenses associated with a 1% increase in income
- d.) the average of the logarithm of entertainment expenses for a household with zero income

Ans: b

Level: Moderate

Section: 2.8

14. You have estimated the following equation using OLS:

$$\hat{y} = 33.75 + 1.45 \text{ MALE}$$

where *y* is annual income in thousands and *MALE* is an indicator variable such that it is 1 for males and 0 for females. According to this model, what is the average income for females?

- a.) \$33,750
- b.) \$35,200
- c.) \$32,300

d.) cannot be determined

Ans: a

Level: Easy

Section: 2.9

15. You have estimated the following equation using OLS:

$$\hat{y} = 33.75 + 1.45 \text{ } MALE$$

where  $y$  is annual income in thousands and  $MALE$  is an indicator variable such that it is 1 for males and 0 for females. According to this model, what is the average income for males?

a.) \$33,750

b.) \$35,200

c.) \$32,300

d.) cannot be determined

Ans: b

Level: Easy

Section: 2.9