Principles of Econometrics 5th edition Hill Test Bank

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

Multiple Choice

1. Consider the probability density function of a random variable that is normally distributed. The center of this distribution is called the _____ and the measure of the dispersion of this random variable is called the _____.

   a. sample mean; sample variance
   b. conditional mean; conditional variance
   c. sample variance; sample mean
   d. conditional variance; conditional mean

Ans: b
Level: Easy – Knowledge
AACSB: Reflective Thinking
Section: 2.1

2. In an economic model that uses income to predict monthly expenditures on entertainment, _____ would be the dependent variable.

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

Ans: b
Level: Easy – Comprehension
AACSB: Reflective Thinking
Section: 2.1

3. In an economic model that uses income to predict monthly expenditures on entertainment, _____ would be the independent or explanatory variable.

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

Ans: a
Level: Easy – Comprehension
AACSB: Reflective Thinking
Section: 2.1

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4. If a randomly selected data pair (y_i, x_i) for $i = 1, \ldots, n$ are assumed to follow the same joint probability density function, then we say that the data pairs are ____.

a. random variables
b. statistical inferences
c. identically distributed
d. statistically independent

Ans: c
Level: Easy – Knowledge
AACSB: Reflective Thinking
Section: 2.2

5. Let e_i be a random error term and x_i be an independent random variable. If we can say that x is strictly exogenous, then which of the following must hold?

a. $E(e_i \mid x_i) = 0$
b. $E(e_i \mid x_i) \neq 0$
c. $\text{cov}(e_i, x_i) = 0$
d. $\text{cov}(e_i, x_i) \neq 0$

Ans: a
Level: Easy – Comprehension
AACSB: Reflective Thinking
Section: 2.2

6. If the conditional variation of the random errors is not constant (i.e., $\text{var}(e_i \mid x_i) \neq \sigma^2$), then we say that random errors are ____.

a. homoscedastic
b. exogenous
c. heteroskedastic
d. serially correlated

Ans: c
Level: Easy – Knowledge
AACSB: Reflective Thinking
Section: 2.2

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7. The OLS estimators for β_1 and β_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 – Knowledge
AACSB: Reflective Thinking
Section: 2.3

8. Suppose you have the following estimated regression equation: $\hat{y} = 3.41 + 12.89x$. What would the forecast value be when the independent variable is 15.00?

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

Ans: a
Level: Medium – Application
AACSB: Analytic
Section: 2.3

9. Suppose you have estimated a simple linear demand equation for single-game tickets for a minor league baseball team. The estimated equation is $\hat{q} = 4.58 - 0.51p$ where q is the number of tickets sold measured in thousands and p is the dollar price of a ticket. Further assume that the point of the means is $(\bar{p}, \bar{q}) = (10.25, 3.19)$. Given this information and everything else held constant, the estimate of the price elasticity of demand for tickets is ____.

a. -0.16
b. 1.64
c. 0.16
d. -1.64

Ans: d
Level: Medium – Application
AACSB: Analytic
Section: 2.3

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10. 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: Easy – Knowledge
AACSB: Reflective Thinking
Section: 2.4

11. If b_1 is an estimator for β_1 such that $E(b_1) = \beta_1$, then it must be the case that b_1 is ____.

a. an efficient estimator
b. an unbiased estimator
c. a linear estimator
d. a preferred estimator

Ans: b
Level: Easy – Comprehension
AACSB: Reflective Thinking
Section: 2.5

12. Under the Gauss-Markov Theorem when the first five assumptions of the Simple Linear Regression Model are met, what estimators of β_1 and β_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: Hard – Synthesis
AACSB: Analytic
Section: 2.5

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13. If we use $\frac{\sum \hat{e}_i^2}{N}$ as an estimator of σ^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: Easy – Comprehension
AACSB: Reflective Thinking
Section: 2.7

14. 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: Hard – Synthesis
AACSB: Analytic
Section: 2.8

15. Suppose you have the 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. How do you interpret the estimated value of γ_1?

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 entertainment 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: Medium – Application
AACSB: Analytic
Section: 2.8

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16. Suppose you have the 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. How do you interpret the estimated value of γ_2?

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 entertainment 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: Medium – Application
AACSB: Analytic
Section: 2.8

17. Suppose you have estimated the equation $\hat{y} = 33.75 + 1.45(MALE)$ where y is annual income in thousands and *MALE* is an indicator variable such that it takes the value of 1 for males and the value of 0 for females. According to this model, the average income for females is ____.

a. $33,750
b. $35,200
c. $32,300
d. undetermined

Ans: a
Level: Medium – Comprehension
AACSB: Analytic
Section: 2.9

18. Suppose you have estimated the equation $\hat{y} = 33.75 + 1.45(MALE)$ where y is annual income in thousands and *MALE* is an indicator variable such that it takes the value of 1 for males and the value of 0 for females. According to this model, the average income for males is ____.

a. $33,750
b. $35,200
c. $32,300
d. undetermined

Ans: b
Level: Medium – Comprehension
AACSB: Analytic
Section: 2.9

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Short Answer/Essay

19. Suppose you obtain *N* randomly selected data pairs from a population. Let (y_i, x_i) denote the i^{th} pair, *i = 1, ..., N*. Briefly explain what each of the following terms mean.

a. random variable
b. statistically independent
c. identically distributed
d. random sample

Ans:

a. The values y_i and x_i are not known until they are observed.

b. Each (y_i, x_i) pair are not related to all other (y_j, x_j) pairs, $i \neq j$, since each pair is randomly selected.

c. Since each (y_i, x_i) pair is selected from the same population, it is assumed that each pair have the same joint probability density function.

d. all (y_i, x_i) data pairs are identically distributed.

Level: Easy – Knowledge
AACSB: Reflective Thinking
Section 2.2

20. Briefly summarize the six assumptions of the Simple Linear Regression Model.

Ans:

1. **Econometric Model: All data pairs (y_i, x_i) collected from a population satisfy the relationship $y_i = \beta_1 + \beta_2 x_i + e_i$, *i = 1, ..., N*.**
2. **Strict Exogeneity: The conditional expected value of the random error, e_i, is zero. That is, $E(e_i \mid \vec{x}) = 0$ where $\vec{x} = (x_1, x_2, ..., x_n)$.**
3. **Conditional Homoscedasticity: conditional variance of the error is constant. That is, $Var(e_i \mid \vec{x}) = \sigma^2$.**
4. **Conditionally Uncorrelated Errors: the conditional covariance of random errors is zero. That is, $cov(e_i, e_j \mid \vec{x}) = 0$ for $i \neq j$.**
5. **Explanatory Variables Must Vary: x_i must take at least two different values.**
6. **(Optional) Error Normality: conditional distribution of the random error is normally distributed. That is, $e_i \mid \vec{x} \sim N(0, \sigma^2)$.**

Level: Easy – Knowledge
AACSB: Reflective Thinking
Section 2.2

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