

Ch 02: The Simple Regression Model

1. A dependent variable is also known as a(n) _____.
 a. explanatory variable
 b. control variable
 c. predictor variable
 d. response variable

ANSWER: d

2. If a change in variable x causes a change in variable y , variable x is called the _____.
 a. dependent variable
 b. explained variable
 c. explanatory variable
 d. response variable

ANSWER: c

3. In the equation $y = \beta_0 + \beta_1 x + u$, β_0 is the _____.
 a. dependent variable
 b. independent variable
 c. slope parameter
 d. intercept parameter

ANSWER: d

4. In the equation $y = \beta_0 + \beta_1 x + u$, what is the estimated value of β_0 ?

a. $\bar{y} - \hat{\beta}_1 \bar{x}$
 b. $\bar{y} + \beta_1 \bar{x}$
 c.
$$\frac{\sum_{i=1}^n (x_i - \bar{x})(y_i - \bar{y})}{\sum_{i=1}^n (x_i)^2}$$

d.
$$\sum_{i=1}^n xy$$

ANSWER: a

5. In the equation $c = \beta_0 + \beta_1 i + u$, c denotes consumption and i denotes income. What is the residual for the 5th observation if $c_5 = \$500$ and $\hat{c}_5 = \$475$?

- a. \$975
 b. \$300
 c. \$25
 d. \$50

ANSWER: c

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6. What does the equation $\hat{y} = \hat{\beta}_0 + \hat{\beta}_1 x$ denote if the regression equation is $y = \beta_0 + \beta_1 x_1 + u$?
- The explained sum of squares
 - The total sum of squares
 - The sample regression function
 - The population regression function

ANSWER: c

7. If x_i and y_i are positively correlated in the sample then the estimated slope is _____.
- less than zero
 - greater than zero
 - equal to zero
 - equal to one

ANSWER: b

8. The sample correlation between x_i and y_i is denoted by _____.
- $\hat{\beta}_1$
 - $\hat{\sigma}_x$
 - $\hat{\sigma}_y$
 - $\hat{\rho}_{xy}$

ANSWER: d

9. Consider the following regression model: $y = \alpha_0 + \beta_1 x_1 + u$. Which of the following is a property of Ordinary Least Square (OLS) estimates of this model and their associated statistics?
- The sum, and therefore the sample average of the OLS residuals, is positive.
 - The sum of the OLS residuals is negative.
 - The sample covariance between the regressors and the OLS residuals is positive.
 - The point (\bar{x}, \bar{y}) always lies on the OLS regression line.

ANSWER: d

10. The explained sum of squares for the regression function, $y_i = \beta_0 + \beta_1 x_1 + u_1$, is defined as _____.

- $\sum_{i=1}^n (y_i - \bar{y})^2$
- $\sum_{i=1}^n (y_i - \hat{y})^2$
- $\sum_{i=1}^n \hat{u}_i$
- $\sum_{i=1}^n (u_i)^2$

ANSWER: b

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11. If the total sum of squares (SST) in a regression equation is 81, and the residual sum of squares (SSR) is 25, what is the explained sum of squares (SSE)?

- a. 64
- b. 56
- c. 32
- d. 18

ANSWER: b

12. If the residual sum of squares (SSR) in a regression analysis is 66 and the total sum of squares (SST) is equal to 90, what is the value of the coefficient of determination?

- a. 0.73
- b. 0.55
- c. 0.27
- d. 1.2

ANSWER: c

13. Which of the following is a nonlinear regression model?

- a. $y = \alpha_0 + \beta_1 x^{1/2} + u$
- b. $\log y = \alpha_0 + \beta_1 \log x + u$
- c. $y = 1 / (\alpha_0 + \beta_1 x) + u$
- d. $y = \alpha_0 + \beta_1 x + u$

ANSWER: c

14. In a regression equation, changing the units of measurement of only the independent variable does not affect the _____.

- a. dependent variable
- b. slope
- c. intercept
- d. error term

ANSWER: c

15. Which of the following is assumed for establishing the unbiasedness of Ordinary Least Square (OLS) estimates?

- a. The error term has an expected value of 1 given any value of the explanatory variable.
- b. The regression equation is linear in the explained and explanatory variables.
- c. The sample outcomes on the explanatory variable are all the same value.
- d. The error term has the same variance given any value of the explanatory variable.

ANSWER: b

16. The error term in a regression equation is said to exhibit homoskedasticity if _____.

- a. it has zero conditional mean
- b. it has the same variance for all values of the explanatory variable
- c. it has the same value for all values of the explanatory variable
- d. if the error term has a value of one given any value of the explanatory variable

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ANSWER: b

17. In the regression of y on x , the error term exhibits heteroskedasticity if _____.

- a. it has a constant variance
- b. $\text{Var}(y|x)$ is a function of x
- c. x is a function of y
- d. y is a function of x

ANSWER: b

18. What is the estimated value of the slope parameter when the regression equation, $y = \alpha_0 + \beta_1 x_1 + u$ passes through the origin?

- a. $\sum_{i=1}^n y_i$
- b. $\sum_{i=1}^n (y_i - \bar{y})$
- c. $\frac{\sum_{i=1}^n x_i y_i}{\sum_{i=1}^n x_i^2}$
- d. $\sum_{i=1}^n (y_i - \bar{y})^2$

ANSWER: c

19. A natural measure of the association between two random variables is the correlation coefficient.

- a. True
- b. False

ANSWER: True

20. Simple regression is an analysis of correlation between two variables.

- a. True
- b. False

ANSWER: True

21. The sample covariance between the regressors and the Ordinary Least Square (OLS) residuals is always positive.

- a. True
- b. False

ANSWER: False

22. R^2 is the ratio of the explained variation compared to the total variation.

- a. True
- b. False

ANSWER: True

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23. There are $n-1$ degrees of freedom in Ordinary Least Square residuals.

- a. True
- b. False

ANSWER: False

24. The variance of the slope estimator increases as the error variance decreases.

- a. True
- b. False

ANSWER: False

25. In general, the constant that produces the smallest sum of squared deviations is always the sample average.

- a. True
- b. False

ANSWER: True

26. Consider a simple linear regression model, $y = \beta_0 + \beta_1 x + u$. What does the zero conditional mean assumption imply?

- a. The expected value of the error term, u , is zero, regardless of what the value of the explanatory variable, x , is.
- b. The estimated average value of β_1 is zero.
- c. The expected value of the explained variable, y , is zero, regardless of what the value of the explanatory variable, x , is.
- d. The estimated average value of β_0 is zero.

ANSWER: a

27. Which of the following will cause Ordinary Least Square (OLS) estimates of a simple regression model, $y = \beta_0 + \beta_1 x + u$ to be biased?

- a. Every individual in the population has the same probability of being observed in the sample.
- b. The observed values of x span a wide range.
- c. The constant, β_0 is greater than the coefficient, β_1 .
- d. The constant, β_0 is greater than the coefficient, β_1 .

ANSWER: d

28. Which of the following is an example of a dummy variable?

- a. A person's hourly wage
- b. The number of years of education someone has
- c. The number of years of work experience someone has
- d. Whether or not someone has a college degree

ANSWER: d

29. Consider a simple linear regression model, $wage = \beta_0 + \beta_1 male + u$, where $male$ is a binary variable (1 if a person is male, and 0 otherwise). Now suppose that we know being a male means there is a lower probability of attaining higher education, another factor that is also expected to affect wage. Which of the key assumptions made to establish unbiasedness of OLS estimates do not hold?

- a. Linear in parameters

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- b. Random sampling
- c. Sample variation in the explanatory variable
- d. Zero conditional mean

ANSWER: d

30. In a simple linear regression model, $wage = \beta_0 + \beta_1 male + u$, where male is a binary variable (1 if a person is male, and 0 otherwise), is the difference in the average wage between males and non-males.

- a. True
- b. False

ANSWER: True