

Measure of association and simple linear regression

MULTIPLE CHOICE

1. A numerical measure of linear association between two variables is the
- variance
 - covariance
 - standard deviation
 - coefficient of variation

ANS: B

PTS: 1

TOP: Descriptive Statistics

2. A numerical measure of linear association between two variables is the
- variance
 - coefficient of variation
 - correlation coefficient
 - standard deviation

ANS: C

PTS: 1

TOP: Descriptive Statistics

3. The coefficient of correlation
- is the same as the coefficient of determination
 - can be larger than 1
 - cannot be larger than 1
 - cannot be negative

ANS: C

PTS: 1

TOP: Descriptive Statistics

4. In a regression analysis, the error term ϵ is a random variable with a mean or expected value of
- zero
 - one
 - any positive value
 - any value

ANS: A

PTS: 1

TOP: Regression Analysis

5. The mathematical equation relating the independent variable to the expected value of the dependent variable; that is, $E(y) = \beta_0 + \beta_1 x$, is known as
- regression equation
 - correlation equation
 - estimated regression equation
 - regression model

ANS: A

PTS: 1

TOP: Regression Analysis

6. A regression analysis between sales (Y in \$1000) and advertising (X in dollars) resulted in the following equation

$$\hat{Y} = 30,000 + 4 X$$

The above equation implies that an

- a. increase of \$4 in advertising is associated with an increase of \$4,000 in sales
- b. increase of \$1 in advertising is associated with an increase of \$4 in sales
- c. increase of \$1 in advertising is associated with an increase of \$34,000 in sales
- d. increase of \$1 in advertising is associated with an increase of \$4,000 in sales

ANS: D

PTS: 1

TOP: Regression Analysis

7. In a simple regression analysis (where Y is a dependent and X an independent variable), if the Y intercept is positive, then
- a. there is a positive correlation between X and Y
 - b. if X is increased, Y must also increase
 - c. if Y is increased, X must also increase
 - d. None of these alternatives is correct.

ANS: D

PTS: 1

TOP: Regression Analysis

8. The equation that describes how the dependent variable (y) is related to the independent variable (x) is called
- a. the correlation model
 - b. the regression model
 - c. correlation analysis
 - d. None of these alternatives is correct.

ANS: B

PTS: 1

TOP: Regression Analysis

9. In a regression analysis, the variable that is being predicted
- a. must have the same units as the variable doing the predicting
 - b. is the independent variable
 - c. is the dependent variable
 - d. usually is denoted by x

ANS: C

PTS: 1

TOP: Regression Analysis

10. A regression analysis between sales (in \$1000) and price (in dollars) resulted in the following equation

$$\hat{Y} = 60 - 8X$$

The above equation implies that an

- a. increase of \$1 in price is associated with a decrease of \$8 in sales
- b. increase of \$8 in price is associated with an decrease of \$52,000 in sales
- c. increase of \$1 in price is associated with a decrease of \$52 in sales
- d. increase of \$1 in price is associated with a decrease of \$8000 in sales

ANS: D

PTS: 1

TOP: Regression Analysis

11. A regression analysis between demand (Y in 1000 units) and price (X in dollars) resulted in the following equation

$$\hat{Y} = 9 - 3X$$

The above equation implies that if the price is increased by \$1, the demand is expected to

- a. increase by 6 units
- b. decrease by 3 units
- c. decrease by 6,000 units
- d. decrease by 3,000 units

ANS: D

PTS: 1

TOP: Regression Analysis

12. A least squares regression line

- a. may be used to predict a value of y if the corresponding x value is given
- b. implies a cause-effect relationship between x and y
- c. can only be determined if a good linear relationship exists between x and y
- d. None of these alternatives is correct.

ANS: A

PTS: 1

TOP: Regression Analysis

13. The coefficient of determination

- a. cannot be negative
- b. is the square root of the coefficient of correlation
- c. is the same as the coefficient of correlation
- d. can be negative or positive

ANS: A

PTS: 1

TOP: Regression Analysis

14. The value of the coefficient of correlation (R)

- a. can be equal to the value of the coefficient of determination (R^2)
- b. can never be equal to the value of the coefficient of determination (R^2)
- c. is always smaller than the value of the coefficient of determination
- d. is always larger than the value of the coefficient of determination

ANS: A

PTS: 1

TOP: Regression Analysis

15. In a regression analysis, the coefficient of determination is 0.4225. The coefficient of correlation in this situation is

- a. 0.65
- b. 0.1785
- c. any positive value
- d. any value

ANS: A

PTS: 1

TOP: Regression Analysis

16. Correlation analysis is used to determine

- a. the equation of the regression line
- b. the strength of the relationship between the dependent and the independent variables
- c. a specific value of the dependent variable for a given value of the independent variable
- d. None of these alternatives is correct.

ANS: B

PTS: 1

TOP: Regression Analysis

17. In a regression and correlation analysis if $r^2 = 1$, then

- a. $SSE = SST$
- b. $SSE = 1$
- c. $SSR = SSE$
- d. **$SSR = SST$**

ANS: D

PTS: 1

TOP: Regression Analysis

18. In a regression analysis if $SSE = 200$ and $SSR = 300$, then the coefficient of determination is

- a. 0.6667
- b. **0.6000**
- c. 0.4000
- d. 1.5000

ANS: B

PTS: 1

TOP: Regression Analysis

19. If the coefficient of correlation is a positive value, then the regression equation

- a. **must have a positive slope**
- b. must have a negative slope
- c. could have either a positive or a negative slope
- d. must have a positive y intercept

ANS: A

PTS: 1

TOP: Regression Analysis

20. In regression and correlation analysis, if SSE and SST are known, then with this information the

- a. **coefficient of determination can be computed**
- b. slope of the line can be computed
- c. Y intercept can be computed
- d. x intercept can be computed

ANS: A

PTS: 1

TOP: Regression Analysis

21. SSE can never be

- a. **larger than SST**
- b. smaller than SST
- c. equal to 1
- d. equal to zero

ANS: A

PTS: 1

TOP: Regression Analysis

22. If the coefficient of correlation is a negative value, then the coefficient of determination

- a. must also be negative
- b. must be zero
- c. can be either negative or positive
- d. **must be positive**

ANS: D

PTS: 1

TOP: Regression Analysis

23. If two variables, x and y , have a strong linear relationship, then

- a. **there may or may not be any causal relationship between x and y**
- b. x causes y to happen
- c. y causes x to happen
- d. None of these alternatives is correct.

ANS: A

PTS: 1

TOP: Regression Analysis

24. If all the points of a scatter diagram lie on the least squares regression line, then the coefficient of determination for these variables based on these data is
- a. 0
 - b. 1
 - c. either 1 or -1, depending upon whether the relationship is positive or negative
 - d. could be any value between -1 and 1

ANS: B

PTS: 1

TOP: Regression Analysis

25. In a regression analysis if $SST = 500$ and $SSE = 300$, then the coefficient of determination is
- a. 0.20
 - b. 1.67
 - c. 0.60
 - d. 0.40

ANS: D

PTS: 1

TOP: Regression Analysis

26. If the coefficient of correlation is 0.4, the percentage of variation in the dependent variable explained by the variation in the independent variable
- a. is 40%
 - b. is 16%.
 - c. is 4%
 - d. can be any positive value

ANS: B

PTS: 1

TOP: Regression Analysis

27. If the coefficient of correlation is 0.90, then the coefficient of determination
- a. is also 0.9
 - b. is either 0.81 or -0.81
 - c. can be either negative or positive
 - d. must be 0.81

ANS: D

PTS: 1

TOP: Regression Analysis

28. If the coefficient of correlation is a positive value, then
- a. the intercept must also be positive
 - b. the coefficient of determination can be either negative or positive, depending on the value of the slope
 - c. the regression equation could have either a positive or a negative slope
 - d. the slope of the line must be positive

ANS: D

PTS: 1

TOP: Regression Analysis

Exhibit 14-3

You are given the following information about y and x.

y Dependent Variable	x Independent Variable
12	4
3	6
7	2
6	4

29. Refer to Exhibit 14-3. The least squares estimate of b_1 equals

- a. 1
- b. -1
- c. -11
- d. 11

ANS: B

PTS: 1

TOP: Regression Analysis

30. Refer to Exhibit 14-3. The sample correlation coefficient equals

- a. -0.4364
- b. 0.4364
- c. -0.1905
- d. 0.1905

ANS: A

PTS: 1

TOP: Regression Analysis

Exhibit 14-6

For the following data the value of $SSE = 0.4130$.

y Dependent Variable	x Independent Variable
15	4
17	6
23	2
17	4

31. Refer to Exhibit 14-6. The slope of the regression equation is

- a. 18
- b. 24
- c. 0.707
- d. -1.5

ANS: D

PTS: 1

TOP: Regression Analysis

32. Refer to Exhibit 14-6. The total sum of squares (SST) equals

- a. 36
- b. 18
- c. 9
- d. 1296

ANS: A

PTS: 1

TOP: Regression Analysis

Exhibit 14-7

You are given the following information about y and x.

y Dependent Variable	x Independent Variable
5	4
7	6
9	2
11	4

33. Refer to Exhibit 14-7. The least squares estimate of b_1 (slope) equals
- 10
 - 10
 - 0.5
 - 0.5

ANS: D

PTS: 1

TOP: Regression Analysis

34. Refer to Exhibit 14-7. The sample correlation coefficient equals
- 0.3162
 - 0.3162
 - 0.10
 - 0.10

ANS: B

PTS: 1

TOP: Regression Analysis

Exhibit 14-9

A regression and correlation analysis resulted in the following information regarding a dependent variable (y) and an independent variable (x).

$$\begin{aligned} \Sigma X &= 90 & \Sigma (Y - \bar{Y})(X - \bar{X}) &= 466 \\ \Sigma Y &= 170 & \Sigma (X - \bar{X})^2 &= 234 \\ n &= 10 & \Sigma (Y - \bar{Y})^2 &= 1434 \\ \text{SSE} &= 505.98 \end{aligned}$$

35. Refer to Exhibit 14-9. The least squares estimate of b_1 equals
- 0.923
 - 1.991
 - 1.991
 - 0.923

ANS: B

PTS: 1

TOP: Regression Analysis

36. Refer to Exhibit 14-9. The sum of squares due to regression (SSR) is
- 1434
 - 505.98
 - 50.598
 - 928.02

ANS: D

PTS: 1

TOP: Regression Analysis

37. Refer to Exhibit 14-9. The coefficient of determination equals

- a. 0.6472
- b. -0.6472
- c. 0
- d. 1

ANS: A

PTS: 1

TOP: Regression Analysis

38. In regression analysis, which of the following is **not** a required assumption about the error term ε ?

- a. The expected value of the error term is one.
- b. The variance of the error term is the same for all values of X.
- c. The values of the error term are independent.
- d. The error term is normally distributed.

ANS: A

PTS: 1

TOP: Regression Analysis

39. In regression analysis, the unbiased estimate of the variance is

- a. coefficient of correlation
- b. coefficient of determination
- c. mean square error
- d. slope of the regression equation

ANS: C

PTS: 1

TOP: Regression Analysis

40. If only MSE is known, you can compute the

- a. r square
- b. coefficient of determination
- c. standard error
- d. all of these alternatives are correct

ANS: C

PTS: 1

TOP: Regression Analysis

41. In simple linear regression analysis, which of the following is **not** true?

- a. The F test and the t test yield the same conclusion.
- b. The F test and the t test may or may not yield the same conclusion.
- c. The relationship between X and Y is represented by means of a straight line.
- d. The value of $F = t^2$.

ANS: B

PTS: 1

TOP: Regression Analysis

Exhibit 14-1

The following information regarding a dependent variable (Y) and an independent variable (X) is provided.

Y	X
4	2
3	1
4	4
6	3
8	5

$$SSE = 6$$

$$SST = 16$$

42. Refer to Exhibit 14-1. The least squares estimate of the slope is

a. 1
b. 2
c. 3
d. 4

ANS: A

PTS: 1

TOP: Regression Analysis

43. Refer to Exhibit 14-1. The coefficient of correlation is

a. 0.7906
b. -0.7906
c. 0.625
d. 0.375

ANS: A

PTS: 1

TOP: Regression Analysis

Exhibit 14-5

The following information regarding a dependent variable (Y) and an independent variable (X) is provided.

Y	X
1	1
2	2
3	3
4	4
5	5

44. Refer to Exhibit 14-5. The least squares estimate of the Y intercept is

a. 1
b. 0
c. -1
d. 3

ANS: B

PTS: 1

TOP: Regression Analysis

45. Refer to Exhibit 14-5. The coefficient of correlation is

- a. 0
- b. -1
- c. 0.5
- d. 1

ANS: D

PTS: 1

TOP: Regression Analysis

46. Refer to Exhibit 14-5. The MSE is

- a. 0
- b. -1
- c. 1
- d. 0.5

ANS: A

PTS: 1

TOP: Regression Analysis

Exhibit 14-8

The following information regarding a dependent variable Y and an independent variable X is provided

$$\Sigma X = 90$$

$$\Sigma (Y - \bar{Y})(X - \bar{X}) = -156$$

$$\Sigma Y = 340$$

$$\Sigma (X - \bar{X})^2 = 234$$

$$n = 4$$

$$\Sigma (Y - \bar{Y})^2 = 1974$$

$$SSR = 104$$

47. Refer to Exhibit 14-8. The sum of squares due to error (SSE) is

- a. -156
- b. 234
- c. 1870
- d. 1974

ANS: C

PTS: 1

TOP: Regression Analysis

48. Refer to Exhibit 14-8. The slope of the regression equation is

- a. -0.667
- b. 0.667
- c. 100
- d. -100

ANS: A

PTS: 1

TOP: Regression Analysis

49. Refer to Exhibit 14-8. The coefficient of correlation is

- a. -0.2295
- b. 0.2295
- c. 0.0527
- d. -0.0572

ANS: A

PTS: 1

TOP: Regression Analysis

50. The interval estimate of the mean value of y for a given value of x is
- prediction interval estimate
 - confidence interval estimate
 - average regression
 - x versus y correlation interval

ANS: B

PTS: 1

TOP: Regression Analysis

51. Regression analysis was applied between demand for a product (Y) and the price of the product (X), and the following estimated regression equation was obtained.

$$\hat{Y} = 120 - 10 X$$

Based on the above estimated regression equation, if price is increased by 2 units, then demand is expected to

- increase by 120 units
- increase by 100 units
- increase by 20 units
- decrease by 20 units

ANS: D

PTS: 1

TOP: Regression Analysis

52. Regression analysis was applied between sales (in \$1000) and advertising (in \$100) and the following regression function was obtained.

$$\hat{Y} = 500 + 4 X$$

Based on the above estimated regression line if advertising is \$10,000, then the point estimate for sales (in dollars) is

- \$900
- \$900,000
- \$40,500
- \$505,000

ANS: B

PTS: 1

TOP: Regression Analysis

53. Regression analysis was applied between sales (Y in \$1,000) and advertising (X in \$100), and the following estimated regression equation was obtained.

$$\hat{Y} = 80 + 6.2 X$$

Based on the above estimated regression line, if advertising is \$10,000, then the point estimate for sales (in dollars) is

- \$62,080
- \$142,000
- \$700
- \$700,000

ANS: D

PTS: 1

TOP: Regression Analysis

Exhibit 14-2

You are given the following information about y and x.

y Dependent Variable	x Independent Variable
5	1
4	2
3	3
2	4
1	5

54. Refer to Exhibit 14-2. The least squares estimate of b_0 (intercept) equals
- 1
 - 1
 - 6
 - 5

ANS: C PTS: 1 TOP: Regression Analysis

55. Refer to Exhibit 14-2. The sample correlation coefficient equals
- 0
 - +1
 - 1
 - 0.5

ANS: C PTS: 1 TOP: Regression Analysis

Exhibit 14-4

Regression analysis was applied between sales data (Y in \$1,000s) and advertising data (x in \$100s) and the following information was obtained.

$$\hat{Y} = 12 + 1.8x$$

$$n = 17$$

$$SSR = 225$$

$$SSE = 75$$

$$S_{b1} = 0.2683$$

56. Refer to Exhibit 14-4. Based on the above estimated regression equation, if advertising is \$3,000, then the point estimate for sales (in dollars) is
- \$66,000
 - \$5,412
 - \$66
 - \$17,400

ANS: A PTS: 1 TOP: Regression Analysis

57. Refer to Exhibit 14-4. To perform an F test, the p -value is

- a. less than .01
- b. between .01 and .025
- c. between .025 and .05
- d. between .05 and 0.1

ANS: D

PTS: 1

TOP: Regression Analysis

58. Refer to Exhibit 14-4. The critical t value for testing the significance of the slope at 95% confidence is

- a. 1.753
- b. 2.131
- c. 1.746
- d. 2.120

ANS: B

PTS: 1

TOP: Regression Analysis

Exhibit 14-10

The following information regarding a dependent variable Y and an independent variable X is provided.

$$\Sigma X = 16$$

$$\Sigma (X - \bar{X})(Y - \bar{Y}) = -8$$

$$\Sigma Y = 28$$

$$\Sigma (X - \bar{X})^2 = 8$$

$$n = 4$$

$$SST = 42$$

$$SSE = 34$$

59. Refer to Exhibit 14-10. The Y intercept is

- a. -1
- b. 1.0
- c. 11
- d. 0.0

ANS: C

PTS: 1

TOP: Regression Analysis

60. Refer to Exhibit 14-10. The coefficient of correlation is

- a. 0.1905
- b. -0.1905
- c. 0.4364
- d. -0.4364

ANS: D

PTS: 1

TOP: Regression Analysis

61. Refer to Exhibit 14-10. The point estimate of Y when $X = 3$ is

- a. 11
- b. 14
- c. 8
- d. 0

ANS: C

PTS: 1

TOP: Regression Analysis