

## Measure of association and simple linear regression

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### 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  $\epsilon$  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
- 0
  - 1
  - either 1 or -1, depending upon whether the relationship is positive or negative
  - 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
- 0.20
  - 1.67
  - 0.60
  - 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
- is 40%
  - is 16%.
  - is 4%
  - 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
- is also 0.9
  - is either 0.81 or -0.81
  - can be either negative or positive
  - must be 0.81

ANS: D

PTS: 1

TOP: Regression Analysis

28. If the coefficient of correlation is a positive value, then
- the intercept must also be positive
  - the coefficient of determination can be either negative or positive, depending on the value of the slope
  - the regression equation could have either a positive or a negative slope
  - 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
- 1
  - 1
  - 11
  - 11

ANS: B                      PTS: 1                      TOP: Regression Analysis

30. Refer to Exhibit 14-3. The sample correlation coefficient equals
- 0.4364
  - 0.4364
  - 0.1905
  - 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
- 18
  - 24
  - 0.707
  - 1.5

ANS: D                      PTS: 1                      TOP: Regression Analysis

32. Refer to Exhibit 14-6. The total sum of squares (SST) equals
- 36
  - 18
  - 9
  - 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).

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

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  $\epsilon$ ?

- 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
- 1
  - 2
  - 3
  - 4

ANS: A

PTS: 1

TOP: Regression Analysis

43. Refer to Exhibit 14-1. The coefficient of correlation is
- 0.7906
  - 0.7906
  - 0.625
  - 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
- 1
  - 0
  - 1
  - 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
- less than .01
  - between .01 and .025
  - between .025 and .05
  - 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
- 1.753
  - 2.131
  - 1.746
  - 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
- 1
  - 1.0
  - 11
  - 0.0

ANS: C

PTS: 1

TOP: Regression Analysis

60. Refer to Exhibit 14-10. The coefficient of correlation is
- 0.1905
  - 0.1905
  - 0.4364
  - 0.4364

ANS: D

PTS: 1

TOP: Regression Analysis

61. Refer to Exhibit 14-10. The point estimate of  $Y$  when  $X = 3$  is
- 11
  - 14
  - 8
  - 0

ANS: C

PTS: 1

TOP: Regression Analysis