

Multiple regression

MULTIPLE CHOICE

1. The mathematical equation relating the expected value of the dependent variable to the value of the independent variables, which has the form of $E(y) = \beta_0 + \beta_1x_1 + \beta_2x_2 + \dots + \beta_px_p$ is
- a simple linear regression model
 - a multiple nonlinear regression model
 - an estimated multiple regression equation
 - a multiple regression equation

ANS: D

PTS: 1

TOP: Multiple Regression

2. The mathematical equation that explains how the dependent variable y is related to several independent variables x_1, x_2, \dots, x_p and the error term ε is
- a simple nonlinear regression model
 - a multiple regression model
 - an estimated multiple regression equation
 - a multiple regression equation

ANS: B

PTS: 1

TOP: Multiple Regression

3. A multiple regression model has
- only one independent variable
 - more than one dependent variable
 - more than one independent variable
 - at least 2 dependent variables

ANS: C

PTS: 1

TOP: Multiple Regression

4. A regression model in which more than one independent variable is used to predict the dependent variable is called
- a simple linear regression model
 - a multiple regression model
 - an independent model
 - None of these alternatives is correct.

ANS: B

PTS: 1

TOP: Multiple Regression

5. A multiple regression model has the form

$$\hat{Y} = 5 + 6X + 7W$$

As X increases by 1 unit (holding W constant), Y is expected to

- increase by 11 units
- decrease by 11 units
- increase by 6 units
- decrease by 6 units

ANS: C

PTS: 1

TOP: Multiple Regression

Exhibit 15-4

- a. $Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \varepsilon$
- b. $E(Y) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \varepsilon$
- c. $\hat{Y} = b_0 + b_1 X_1 + b_2 X_2$
- d. $E(Y) = \beta_0 + \beta_1 X_1 + \beta_2 X_2$

6. Which equation gives the estimated regression line?
- a. Equation A
 - b. Equation B
 - c. Equation C
 - d. Equation D

ANS: C PTS: 1 TOP: Multiple Regression

7. A measure of goodness of fit for the estimated regression equation is the
- a. multiple coefficient of determination
 - b. mean square due to error
 - c. mean square due to regression
 - d. sample size

ANS: A PTS: 1 TOP: Multiple Regression

8. The adjusted multiple coefficient of determination is adjusted for
- a. the number of dependent variables
 - b. the number of independent variables
 - c. the number of equations
 - d. detrimental situations

ANS: B PTS: 1 TOP: Multiple Regression

9. In a multiple regression analysis involving 15 independent variables and 200 observations, $SST = 800$ and $SSE = 240$. The coefficient of determination is
- a. 0.300
 - b. 0.192
 - c. 0.500
 - d. 0.700

ANS: D PTS: 1 TOP: Multiple Regression

10. The correct relationship between SST, SSR, and SSE is given by
- a. $SSR = SST + SSE$
 - b. $SSR = SST - SSE$
 - c. $SSE = SSR - SST$
 - d. None of these alternatives is correct.

ANS: B PTS: 1 TOP: Multiple Regression

11. In a multiple regression analysis involving 10 independent variables and 81 observations, $SST = 120$ and $SSE = 42$. The coefficient of determination is
- 0.81
 - 0.11
 - 0.35
 - 0.65

ANS: D

PTS: 1

TOP: Multiple Regression

12. In a multiple regression analysis involving 5 independent variables and 30 observations, $SSR = 360$ and $SSE = 40$. The coefficient of determination is
- 0.80
 - 0.90
 - 0.25
 - 0.15

ANS: B

PTS: 1

TOP: Multiple Regression

13. In a multiple regression model, the error term ε is assumed to be a random variable with a mean of
- zero
 - 1
 - 1
 - any value

ANS: A

PTS: 1

TOP: Multiple Regression

14. In a multiple regression model, the values of the error term ε , are assumed to be
- zero
 - dependent on each other
 - independent of each other
 - always negative

ANS: C

PTS: 1

TOP: Multiple Regression

15. In order to test for the significance of a regression model involving 3 independent variables and 47 observations, the numerator and denominator degrees of freedom (respectively) for the critical value of F are
- 47 and 3
 - 3 and 47
 - 2 and 43
 - 3 and 43

ANS: D

PTS: 1

TOP: Multiple Regression

16. A term used to describe the case when the independent variables in a multiple regression model are correlated is
- regression
 - correlation
 - multicollinearity
 - None of the above answers is correct.

ANS: C

PTS: 1

TOP: Multiple Regression

17. A regression model involved 5 independent variables and 136 observations. The critical value of t for testing the significance of each of the independent variable's coefficients will have
- 121 degrees of freedom
 - 135 degrees of freedom
 - 130 degrees of freedom
 - 4 degrees of freedom

ANS: C

PTS: 1

TOP: Multiple Regression

18. The ratio of MSE/MSR yields
- SST
 - the F statistic
 - SSR
 - None of these alternatives is correct.

ANS: D

PTS: 1

TOP: Multiple Regression

19. In order to test for the significance of a regression model involving 14 independent variables and 255 observations, the numerator and denominator degrees of freedom (respectively) for the critical value of F are
- 14 and 255
 - 255 and 14
 - 13 and 240
 - 14 and 240

ANS: D

PTS: 1

TOP: Multiple Regression

20. In order to test for the significance of a regression model involving 8 independent variables and 121 observations, the numerator and denominator degrees of freedom (respectively) for the critical value of F are
- 8 and 121
 - 7 and 120
 - 8 and 112
 - 7 and 112

ANS: C

PTS: 1

TOP: Multiple Regression

21. In order to test for the significance of a regression model involving 4 independent variables and 36 observations, the numerator and denominator degrees of freedom (respectively) for the critical value of F are
- 4 and 36
 - 3 and 35
 - 4 and 31
 - 4 and 32

ANS: C

PTS: 1

TOP: Multiple Regression

Exhibit 15-1

In a regression model involving 44 observations, the following estimated regression equation was obtained.

$$\hat{Y} = 29 + 18X_1 + 43X_2 + 87X_3$$

For this model $SSR = 600$ and $SSE = 400$.

22. Refer to Exhibit 15-1. MSR for this model is
- 200
 - 10
 - 1,000
 - 43

ANS: A PTS: 1 TOP: Multiple Regression

Exhibit 15-2

A regression model between sales (Y in \$1,000), unit price (X_1 in dollars) and television advertisement (X_2 in dollars) resulted in the following function:

$$\hat{Y} = 7 - 3X_1 + 5X_2$$

For this model $SSR = 3500$, $SSE = 1500$, and the sample size is 18.

23. Refer to Exhibit 15-2. The coefficient of the unit price indicates that if the unit price is
- increased by \$1 (holding advertising constant), sales are expected to increase by \$3
 - decreased by \$1 (holding advertising constant), sales are expected to decrease by \$3
 - increased by \$1 (holding advertising constant), sales are expected to increase by \$4,000
 - increased by \$1 (holding advertising constant), sales are expected to decrease by \$3,000

ANS: D PTS: 1 TOP: Multiple Regression

24. Refer to Exhibit 15-2. To test for the significance of the model, the test statistic F is
- 2.33
 - 0.70
 - 17.5
 - 1.75

ANS: C PTS: 1 TOP: Multiple Regression

25. Refer to Exhibit 15-2. The multiple coefficient of correlation for this problem is
- 0.70
 - 0.8367
 - 0.49
 - 0.2289

ANS: B
Exhibit 15-2

PTS: 1 TOP: Multiple Regression

Exhibit 15-3

In a regression model involving 30 observations, the following estimated regression equation was obtained:

$$\hat{Y} = 17 + 4X_1 - 3X_2 + 8X_3 + 8X_4$$

For this model SSR = 700 and SSE = 100.

26. Refer to Exhibit 15-3. The computed F statistic for testing the significance of the above model is
- 43.75
 - 0.875
 - 50.19
 - 7.00

ANS: A PTS: 1 TOP: Multiple Regression

27. Refer to Exhibit 15-3. The conclusion is that the
- model is not significant
 - model is significant
 - slope of X_1 is significant
 - slope of X_2 is significant

ANS: B PTS: 1 TOP: Multiple Regression

Exhibit 15-5

Below you are given a partial Minitab output based on a sample of 25 observations.

	Coefficient	Standard Error
Constant	145.321	48.682
X_1	25.625	9.150
X_2	-5.720	3.575
X_3	0.823	0.183

28. Refer to Exhibit 15-5. The interpretation of the coefficient on X_1 is that
- a one unit change in X_1 will lead to a 25.625 unit change in Y
 - a one unit change in X_1 will lead to a 25.625 unit increase in Y when all other variables are held constant
 - a one unit change in X_1 will lead to a 25.625 unit increase in X_2 when all other variables are held constant
 - It is impossible to interpret the coefficient.

ANS: B PTS: 1 TOP: Multiple Regression

29. Refer to Exhibit 15-5. The t value obtained from the table to test an individual parameter at the 5% level is
- 2.06
 - 2.069
 - 2.074
 - 2.080

ANS: D PTS: 1 TOP: Multiple Regression

Exhibit 15-6

Below you are given a partial computer output based on a sample of 16 observations.

	Coefficient	Standard Error
Constant	12.924	4.425
X ₁	-3.682	2.630
X ₂	45.216	12.560

Analysis of Variance

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square	F
Regression		4,853	2,426.5	
Error			485.3	

30. Refer to Exhibit 15-6. The estimated regression equation is

- $Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \varepsilon$
- $E(Y) = \beta_0 + \beta_1 X_1 + \beta_2 X_2$
- $\hat{Y} = 12.924 - 3.682X_1 + 45.216X_2$
- $\hat{Y} = 4.425 + 2.63X_1 + 12.56X_2$

ANS: C

PTS: 1

TOP: Multiple Regression

31. Refer to Exhibit 15-6. We want to test whether the parameter β_1 is significant. The test statistic equals

- 1.4
- 1.4
- 3.6
- 5

ANS: A

PTS: 1

TOP: Multiple Regression

32. Refer to Exhibit 15-6. Carry out the test of significance for the parameter β_1 at the 1% level. The null hypothesis should be

- rejected
- not rejected
- revised
- None of these alternatives is correct.

ANS: B

PTS: 1

TOP: Multiple Regression

33. Refer to Exhibit 15-6. The sum of squares due to error (SSE) equals

- 37.33
- 485.3
- 4,853
- 6,308.9

ANS: D

PTS: 1

TOP: Multiple Regression

34. Refer to Exhibit 15-6. The F value obtained from the table used to test if there is a relationship among the variables at the 5% level equals
- 3.41
 - 3.63
 - 3.81
 - 19.41

ANS: C

PTS: 1

TOP: Multiple Regression

Exhibit 15-7

A regression model involving 4 independent variables and a sample of 15 periods resulted in the following sum of squares.

$$SSR = 165$$

$$SSE = 60$$

35. Refer to Exhibit 15-7. The coefficient of determination is
- 0.3636
 - 0.7333
 - 0.275
 - 0.5

ANS: B

PTS: 1

TOP: Multiple Regression

36. Refer to Exhibit 15-7. The test statistic from the information provided is
- 2.110
 - 3.480
 - 4.710
 - 6.875

ANS: D

PTS: 1

TOP: Multiple Regression

Exhibit 15-8

The following estimated regression model was developed relating yearly income (Y in \$1,000s) of 30 individuals with their age (X_1) and their gender (X_2) (0 if male and 1 if female).

$$\hat{Y} = 30 + 0.7X_1 + 3X_2$$

Also provided are $SST = 1,200$ and $SSE = 384$.

37. Refer to Exhibit 15-8. From the above function, it can be said that the expected yearly income of
- males is \$3 more than females
 - females is \$3 more than males
 - males is \$3,000 more than females
 - females is \$3,000 more than males

ANS: D

PTS: 1

TOP: Multiple Regression

38. Refer to Exhibit 15-8. The yearly income of a 24-year-old male individual is
- a. \$13.80
 - b. \$13,800
 - c. \$46,800
 - d. \$49,800

ANS: C

PTS: 1

TOP: Multiple Regression

39. Refer to Exhibit 15-8. If we want to test for the significance of the model, the critical value of F at 95% confidence is
- a. 3.33
 - b. 3.35
 - c. 3.34
 - d. 2.96

ANS: B

PTS: 1

TOP: Multiple Regression

40. Refer to Exhibit 15-8. The model
- a. is significant
 - b. is not significant
 - c. would be significant if the sample size was larger than 30
 - d. None of these alternatives is correct.

ANS: A

PTS: 1

TOP: Multiple Regression