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) = $\beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_p x_p$ is
   a. a simple linear regression model
   b. a multiple nonlinear regression model
   c. an estimated multiple regression equation
   d. 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, …, x_p and the error term ε is
   a. a simple nonlinear regression model
   b. a multiple regression model
   c. an estimated multiple regression equation
   d. a multiple regression equation

   ANS: B PTS: 1 TOP: Multiple Regression

3. A multiple regression model has
   a. only one independent variable
   b. more than one dependent variable
   c. more than one independent variable
   d. 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. a simple linear regression model
   b. a multiple regression model
   c. an independent model
   d. 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
   a. increase by 11 units
   b. decrease by 11 units
   c. increase by 6 units
   d. decrease by 6 units

   ANS: C PTS: 1 TOP: Multiple Regression

Exhibit 15-4

a. $Y=\beta_0+\beta_1X_1+\beta_2X_2+\varepsilon$
b. $E(Y)=\beta_0+\beta_1X_1+\beta_2X_2+\varepsilon$
c. $\hat{Y}=b_0+b_1X_1+b_2X_2$
d. $E(Y)=\beta_0+\beta_1X_1+\beta_2X_2$

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
    a. 0.81
    b. 0.11
    c. 0.35
    d. 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
    a. 0.80
    b. 0.90
    c. 0.25
    d. 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
    a. zero
    b. -1
    c. 1
    d. 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
    a. zero
    b. dependent on each other
    c. independent of each other
    d. 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
    a. 47 and 3
    b. 3 and 47
    c. 2 and 43
    d. 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
    a. regression
    b. correlation
    c. multicollinearity
    d. 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
    a. 121 degrees of freedom
    b. 135 degrees of freedom
    c. 130 degrees of freedom
    d. 4 degrees of freedom

    ANS: C PTS: 1 TOP: Multiple Regression

18. The ratio of MSE/MSR yields
    a. SST
    b. the F statistic
    c. SSR
    d. 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
    a. 14 and 255
    b. 255 and 14
    c. 13 and 240
    d. 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
    a. 8 and 121
    b. 7 and 120
    c. 8 and 112
    d. 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
    a. 4 and 36
    b. 3 and 35
    c. 4 and 31
    d. 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
    a. 200
    b. 10
    c. 1,000
    d. 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
    a. increased by $1 (holding advertising constant), sales are expected to increase by $3
    b. decreased by $1 (holding advertising constant), sales are expected to decrease by $3
    c. increased by $1 (holding advertising constant), sales are expected to increase by $4,000
    d. 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
    a. 2.33
    b. 0.70
    c. 17.5
    d. 1.75

    ANS: C PTS: 1 TOP: Multiple Regression

25. Refer to Exhibit 15-2. The multiple coefficient of correlation for this problem is
    a. 0.70
    b. 0.8367
    c. 0.49
    d. 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
    a. 43.75
    b. 0.875
    c. 50.19
    d. 7.00

    ANS: A PTS: 1 TOP: Multiple Regression

27. Refer to Exhibit 15-3. The conclusion is that the
    a. model is not significant
    b. model is significant
    c. slope of X_1 is significant
    d. 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. a one unit change in X_1 will lead to a 25.625 unit change in Y
    b. a one unit change in X_1 will lead to a 25.625 unit increase in Y when all other variables are held constant
    c. 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
    d. 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
    a. 2.06
    b. 2.069
    c. 2.074
    d. 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
    a. $Y=\beta_0+\beta_1 X_1+\beta_2 X_2+\varepsilon$
    b. $E(Y)=\beta_0+\beta_1 X_1+\beta_2 X_2$
    c. $\hat{Y}=12.924-3.682X_1+45.216X_2$
    d. $\hat{Y}=4.425+2.63X_1+12.56X_2$

    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
    a. -1.4
    b. 1.4
    c. 3.6
    d. 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
    a. rejected
    b. not rejected
    c. revised
    d. 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
    a. 37.33
    b. 485.3
    c. 4,853
    d. 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
    a. 3.41
    b. 3.63
    c. 3.81
    d. 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
    a. 0.3636
    b. 0.7333
    c. 0.275
    d. 0.5

    ANS: B PTS: 1 TOP: Multiple Regression

36. Refer to Exhibit 15-7. The test statistic from the information provided is
    a. 2.110
    b. 3.480
    c. 4.710
    d. 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
    a. males is $3 more than females
    b. females is $3 more than males
    c. males is $3,000 more than females
    d. 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 is the sample size was larger than 30
    d. None of these alternatives is correct.

    ANS: A PTS: 1 TOP: Multiple Regression