File: Ch05, Chapter 5, The Multiple Regression Model

Multiple Choice

1. When an error term is added to an economic model and assumptions about the distribution of the error term are made, the resulting model is _____.
a.) fallacious, you should not make assumptions about error terms.
b.) an econometric model that can be estimated and used for inference.
c.) misspecified due to missing information.
d.) heteroskedastic since error terms are no longer random.

2.) How should β_k in the general multiple regression model be interpreted?
a.) The number of units of change in the expected value of y for a 1 unit increase in x_k when all remaining variables are unchanged
b.) the magnitude by which x_k varies in the model
c.) the amount of variation in y explained by x_k in the model
d.) the number of variables used in the model.

3.) Which of the following is not an assumption of the multiple regression model?
a.) The values of each x_{ik} are not random and are not exact linear functions of the other explanatory variables.
b.) $var(y_i.) = var(e_i) = \sigma^2$
c.) The least squares estimators are BLUE.
d.) $cov(y_i, y_j) = cov(e_i, e_j) = 0; \quad (i \neq j)$

4.) What is the unbiased estimator of σ^2 in the multiple regression model?
a.) $\frac{\sum \hat{e}_i^2}{N}$
b.) $\frac{\sum e_i^2}{K}$
c.) $\frac{\sum \hat{e}_i^2}{N-K}$
d.) $\frac{\sum e_i}{N-K}$

5.) Why does the denominator of $\hat{\sigma}^2$ need to be the same as the degrees of freedom in the model?
a.) so we will know how the estimate is distributed if H_o is true
b.) so we can extrapolate the results to other values of x
c.) so that the root MSE will be a positive number
d.) so the estimator will be unbiased

6.) In the multiple regression model which of the following does NOT lead to larger variances of the least squares estimators b_2 and var(b_2)?
a.) larger error variances, σ^2
b.) larger correlation between x_2 and x_3
c.) smaller values of $\Sigma(x_{i2} - \bar{x}_2)^2$
d.) larger correlation between x_2 and y

7.) The matrix below represents the variance-covariance matrix estimated from the multiple regression model:

$$\begin{bmatrix} A & B & C \\ D & E & F \\ G & H & I \end{bmatrix}$$

Which 2 elements of the matrix should always be equal?
a.) A & I
b.) B & H
c.) C & G
d.) D & F

8.) The matrix below represents the variance-covariance matrix estimated from the multiple regression model:

$$\begin{bmatrix} A & B & C \\ D & E & F \\ G & H & I \end{bmatrix}$$

Which element of the matrix cannot be negative?
a.) A
b.) B
c.) C
d.) D

9.) You have estimated a multiple regression model with 6 explanatory variables and an intercept from a sample with 46 observations. What is t_c if you want to perform a right-tailed hypothesis test at the .01 level of significance?

a.) 2.426
b.) 2.708
c.) 2.423
d.) 2.704

10.) You estimate a model with 5 explanatory variables and an intercept from a data set with 247 observations. To test hypotheses on this model you should use a t distribution with how many degrees of freedom?
a.) 242
b.) 120
c.) ∞
d.) 241

11. A model estimated using a dataset with 125 observations generates the following results.

Variable	β	Std. Error	t	P>|t|
x_2	-0.01264	0.005519	-2.28937	0.022
x_3	0.595792	0.014482	41.13934	0.000
x_4	1.124589	0.877192	1.282032	0.200
x_5	0.323742	0.060709	5.332661	0.000
Constant	8.86016	1.766116	5.016749	0.000

What are the endpoints for the 95% confidence interval for β_3?

a.)(-0.6842, 1.8758)
b.)(-1.3842, 2.5758)
c.)(0.5672, 0.6245)
d.)(-40.5435 , 41.7251)

12.) A model estimated using a dataset with 65 observations generates the following results.

Variable	β	Std. Error	t	P>|t|
x_2	-0.01264	0.005519	-2.28937	0.022
x_3	0.595792	0.014482	41.13934	0.000
x_4	1.124589	0.877192	1.282032	0.200
x_5	0.323742	0.060709	5.332661	0.000
Constant	8.86016	1.766116	5.016749	0.000

What are the endpoints for the 99% confidence interval for β_5?

a.) (0.1623, 0.4852)
b.) (-5.0089 , 5.6564)
c.) (0.2630 , 0.3845)
d.) (0.1786 , 0.4688)

14.) A model estimated using a dataset with 65 observations generates the following results.

Variable	β	Std. Error	t	P>|t|
x_2	-0.01264	0.005519	-2.28937	0.022
x_3	0.595792	0.014482	41.13934	0.000
x_4	1.124589	0.877192	1.282032	0.200
x_5	0.323742	0.060709	5.332661	0.000
Constant	8.86016	1.766116	5.016749	0.000

If you want to test the hypothesis that $\beta_3 = 0.45$, what is the test statistic from this sample?
a.) 41.139
b.)10.067
c.)31.072
d.)0.000

15. A model estimated using a dataset with 125 observations generates the following results.

Variable	β	Std. Error	t	P>|t|
x_2	-0.01264	0.005519	-2.28937	0.022
x_3	0.595792	0.014482	41.13934	0.000
x_4	1.124589	0.877192	1.282032	0.200
x_5	0.323742	0.060709	5.332661	0.000
Constant	8.86016	1.766116	5.016749	0.000

If you want to test the hypothesis $\beta_5 = .47$. What p-value does this test statistic generate if you are performing a two-tailed test?
a.) 0.000
b.) $\simeq$0.02
c.) $\simeq$0.01
d.) 0.05

15.) A model estimated using a dataset with 125 observations generates the following results.

Variable	β	Std. Error	t	P>|t|
x_2	-0.01264	0.005519	-2.28937	0.022
x_3	0.595792	0.014482	41.13934	0.000
x_4	1.124589	0.877192	1.282032	0.200
x_5	0.323742	0.060709	5.332661	0.000
Constant	8.86016	1.766116	5.016749	0.000

What test statistic would you use to test the hypothesis $\beta_5 \geq .25$?
a.) 1.2147
b.) 5.3327
c.) 1.2948
d.) 0.0607

16.) How can you estimate non-linear function forms using least squares?
a.) estimate the linear approximation over small ranges at a time
b.) transform, such as squaring or cubing, some explanatory variables.
c.) use a very large sample so you do not have to assume the error terms are normally distributed
d.) It cannot be done. You need to use another estimation technique.

17.) If you have the following economic model

$$y = \beta_1 + \beta_2 x - \beta_3 x^2$$

What is dy/dx?
a.) β_2
b.) $\beta_3+\beta_2$
c.) $\beta_2 - 2\beta_3 x$
d.) $\beta_1 + 2\beta_2$

17. You have the following economic model

$$\mathbf{y = \beta_1 + \beta_2 x + \beta_3 x^2}$$

If β_2 is positive and β_3 is negative what is the general shape of F(x)?
a.) U-shape
b.) Inverted U
c.) Sigmoid
d.) rectangular hyperbola

18. What is an interaction term?
a.) an additional variable that is the product of 2 other explanatory variables
b.) a variable indicating 2 observations are related
c.) a variable indicating an observation may be in the dataset multiple times
d.) the expected value formed by multiplying a variable by its estimated coefficient.

19.) A model estimated using a dataset with 125 observations generates the following results.

	SS	df	MS
Regression	919587.543	4	229896.9
Error	2590390.62	121	534.2113

Variable	β	Std. Error	t	P>|t|
x_2	-0.0126355	0.005519	-2.28937	0.022
x_3	0.5957923	0.014482	41.13934	0.000
x_4	1.124589	0.877192	1.282032	0.200
x_5	0.3237421	0.060709	5.332661	0.000
constant	8.86016	1.766116	5.016749	0.000

What is the R^2 for this sample?
a.) .2620
b.) .3550
c.) .0888
d.) .2172