Economics 471: Econometrics

Department of Economics, Finance and Legal Studies
University of Alabama
Fall 2017

Midterm II

The exam consists of three questions on four pages. Each question is of equal value.

1. Consider the Gauss-Markov Assumptions given in class.

   (a) State each of the six Gauss-Markov assumptions.

   (b) For each assumption in part (a), give an example where that assumption is violated.

   (c) For each violation in part (b), give the consequence for that violation.

2. Consider the $F-$statistic discussed in class

$$F = \frac{(SSR_R - SSR_U)/q}{SSR_U/(n-k-1)}$$

(a) Define each component on the right hand side of the equation.

(b) What is the distribution of this test statistic (be sure to list the degrees of freedom)? Draw this distribution (be sure to label the axes and note the range).

(c) Using this $F-$statistic, derive the $F-$statistic in terms of the R^2 formulation. Show your work.

(d) Define SST. Does SST need a subscript for R or U? If so, why? If not, why not?

(e) Give a generic example of this test statistic in practice (define the equation(s), sample size, hypothesis, etc.).

3. Consider two estimation strategies for the relationship between student test scores and hours of homework assigned daily: linear ($y = \alpha + \beta x + u$) and quadratic ($y = \alpha + \beta x + \gamma x^2 + \varepsilon$). Note that the test scores can range from 0 to 100. Use the EViews output below to answer the following questions:

   (a) What is the partial effect of a one hour increase in homework per day on test scores for each model?

   (b) What value of homework will give the maximum predicted test score in each model?

   (c) Test the null that the model is linear.

   (d) If the test in part (c) is rejected, what sign will the bias of $\widehat{\beta}$ have in the linear model?

   (e) Using the five model selection criteria discussed in class, pick the model that represents the data best.

Dependent Variable: TESTSCORES
Method: Least Squares
Date: 11/12/08 Time: 16:56
Sample: 1 3733
Included observations: 3733
TESTSCORES = C(1) + C(2)*HOMEWORK

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	49.83785	0.298027	167.2257	0.0000
C(2)	4.011346	0.393603	10.19134	0.0000

R-squared	0.027084	Mean dependent var	52.43538
Adjusted R-squared	0.026823	S.D. dependent var	9.566599
S.E. of regression	9.437423	Akaike info criterion	7.327779
Sum squared resid	332301.3	Schwarz criterion	7.331114
Log likelihood	-13675.30	Durbin-Watson stat	1.704769

Dependent Variable: TESTSCORES
Method: Least Squares
Date: 11/12/08 Time: 16:57
Sample: 1 3733
Included observations: 3733
TESTSCORES = C(1) + C(2)*HOMEWORK + C(3)*(HOMEWORK^2)

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	47.23240	0.412152	114.5994	0.0000
C(2)	9.532628	0.723923	13.16802	0.0000
C(3)	-1.691596	0.186972	-9.047310	0.0000

R-squared	0.047976	Mean dependent var	52.43538
Adjusted R-squared	0.047465	S.D. dependent var	9.566599
S.E. of regression	9.336797	Akaike info criterion	7.306607
Sum squared resid	325165.7	Schwarz criterion	7.311610
Log likelihood	-13634.78	Durbin-Watson stat	1.689612