Economics 471: Econometrics

Department of Economics, Finance and Legal Studies

University of Alabama

Fall 2013

Midterm II

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

1. Answer the following questions about the Gauss-Markov assumptions:

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

   (b) Which assumption(s) guarantee(s) unbiasedness?

   (c) Which assumption(s) guarantee(s) that OLS is the best linear unbiased estimator?

   (d) Which assumption(s) guarantee(s) that OLS is the minimum variance unbiased estimator?

2. We examine the wage difference among four groups: married men, married women, single men, and single women. Define dummy variables for each for these four groups and call them *married_male, married_female, single_male* and *single_female*, respectively. Choose single men as the base group and consider the model:

$$y_i = \clubsuit + \spadesuit x_i + \blacktriangledown D_{1i} + \bigstar D_{2i} + \blacksquare D_{3i} + u_i,$$

   where $y_i = wage$, $x = educ$, $D_1 = married\_male$, $D_2 = married\_female$, and $D_3 = single\_female$.

   (a) What do ♣, ♠, ▼, ★, and ■ each represent?

   (b) Define the intercept for each group.

   (c) Suppose you also added *single_male* to the above model. What will happen in the estimation?

   (d) Suppose ▼, ★, and ■ are all positive and that ▼ > ★ > ■. What do these say about the differences between groups?

   (e) Suppose we now choose to define married women as the base group. Given the information from part (d), what are the expected signs of ▼, ■, and ♦, where ♦ is defined with respect to the dummy for single men.

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 tables and the critical values table 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 the linear model?

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

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

   (e) Test the validity of the regression in each model.

   (f) Using any three of the 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