Economics 471: Econometrics

Department of Economics, Finance and Legal Studies

University of Alabama

Fall 2014

Midterm II

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

1. Consider a Cobb-Douglas production function of the form $y = \alpha x_1^{\beta_1} x_2^{\beta_2}$, where y is output, x_1 is the first input, x_2 is the second input and α, β_1 and β_2 are the parameters of the model.

   (a) How would you set up a linear regression for the production function?

   (b) Suppose you are interested in whether the production function exhibits constant returns to scale with respect to the inputs. State the null hypothesis and give the test statistic.

   (c) Suppose you fail to reject the null of constant returns to scale. Explain how you can impose this assumption on the parameters of the model. How would you estimate this model? Be specific.

   (d) Suppose we want to test the validity of the regression. State the null hypothesis and give the test statistic.

   (e) Under the null hypothesis imposed in part (d), derive the estimator of the intercept.

   (f) Under the null hypothesis imposed in part (d), derive the variance of the estimator of the intercept.

2. Consider the residuals obtained via an OLS regression of y on x and z, i.e. $y_i = \heartsuit + \diamondsuit x_i + \maltese z_i + \eta_i$, where η_i is the error term for observation i, $i = 1, 2, \ldots n$. Show the following:

   (a) $\sum_{i=1}^{n} \widehat{\eta}_i = 0$

   (b) $\sum_{i=1}^{n} \widehat{\eta}_i z_i = 0$, under the assumption that $\diamondsuit = 0$

3. Two different empirical models are given on the following page to explain the standardized outcome on a final exam (stndfnl) in terms of percentage of classes attended (ATNDRTE), prior college grade point average (PRIGPS), and ACT score (ACT).

   (a) Give the partial affect of attendance rate in each table.

   (b) Give the partial affect of prior college grade point average in each table.

   (c) Give the partial effect of ACT score in each table.

   (d) Test the null of the validity of the regression in each table.

   (e) Test the null that the interaction and higher order terms are jointly zero.

Dependent Variable: STNDFNL
Method: Least Squares
Date: 04/25/08 Time: 10:51
Sample: 1 680
Included observations: 680
STNDFNL = C(1) + C(2)*ATNDRTE + C(3)*PRIGPA + C(4)*ACT

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-3.343655	0.299098	-11.17911	0.0000
C(2)	0.005334	0.002369	2.251706	0.0247
C(3)	0.402373	0.078280	5.140156	0.0000
C(4)	0.084257	0.011182	7.535002	0.0000

R-squared	0.201308	Mean dependent var	0.029659
Adjusted R-squared	0.197764	S.D. dependent var	0.989461
S.E. of regression	0.886237	Akaike info criterion	2.602200
Sum squared resid	530.9411	Schwarz criterion	2.628801
Log likelihood	-880.7480	Durbin-Watson stat	2.274954

Figure 1:

Dependent Variable: STNDFNL
Method: Least Squares
Date: 04/25/08 Time: 10:41
Sample: 1 680
Included observations: 680
STNDFNL = C(1) + C(2)*ATNDRTE + C(3)*PRIGPA + C(4)*ACT +
C(5)*(PRIGPA^2)+C(6)*(ACT^2)+C(7)*(PRIGPA*ATNDRTE)

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	2.050293	1.360319	1.507215	0.1322
C(2)	-0.006713	0.010232	-0.656067	0.5120
C(3)	-1.628540	0.481002	-3.385720	0.0008
C(4)	-0.128039	0.098492	-1.299998	0.1940
C(5)	0.295905	0.101049	2.928314	0.0035
C(6)	0.004533	0.002176	2.082939	0.0376
C(7)	0.005586	0.004317	1.293817	0.1962

R-squared	0.228654	Mean dependent var	0.029659
Adjusted R-squared	0.221777	S.D. dependent var	0.989461
S.E. of regression	0.872872	Akaike info criterion	2.576185
Sum squared resid	512.7624	Schwarz criterion	2.622736
Log likelihood	-868.9030	Durbin-Watson stat	2.278908

Figure 2: