Economics 471: Introductory Econometrics

Department of Economics, Finance and Legal Studies
University of Alabama

Fall 2017

Final Exam

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

1. Consider the following nonlinear model

$$y_i = \alpha x_i^{\beta} e^{u_i},$$

for $i = 1, 2, \ldots, n$, where e is the exponential function. Answer the following:

   (a) Using natural logs (ln) on both sides of the equation, write this equation in a linear form.

   (b) In the equation obtained from part (a), what is the intercept? What is the slope? What is the error?

   (c) Using the equation from part (a), derive the intercept estimator?

   (d) Using the equation from part (a), derive the slope estimator?

   (e) What is the interpretation of the slope 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 a base group and consider the model:

$$y_i = \alpha + \beta x_i + \gamma D_{1i} + \delta D_{2i} + \lambda D_{3i} + u_i,$$

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

(a) Define the intercept for each group.

(b) Define the base group.

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

(d) Suppose γ, δ, and λ are all positive and that $\gamma > \delta > \lambda$. 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 γ, λ, and ϕ, where ϕ is defined with respect to the dummy for single men.

3. Consider the simple linear regression model $y_i = \alpha + \beta x_i + u_i$. Consider two cases: (1) the variance of the error is homoskedastic $V(u_i|x_i) = \sigma^2$ and (2) the variance of the error is heteroskedastic $V(u_i|x_i) = \sigma_i^2$.

   (a) Derive the OLS estimator of β in cases (1) and (2).

   (b) What can be said about the OLS estimator of β when case (1) holds? When case (2) holds?

   (c) Derive the variance of $\widehat{\beta}$ in case (1).

   (d) Derive the variance of $\widehat{\beta}$ in case (2).

   (e) What is the consequence of using the variance estimator of case (1) under case (2)? What is the consequence of using the variance estimator of case (2) under case (1)?

4. A model 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) is given in the EViews output on the following page. Use the output to answer the following questions:

   (a) Interpret the coefficients c(1), c(2), c(3) and c(4) in the first table.

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

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

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

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

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

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