Economics 471: Introductory Econometrics
Department of Economics, Finance and Legal Studies
University of Alabama
Fall 2015

Midterm II

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

1. Consider the multiple linear regression model

$$y_i = \alpha + \beta_1 x_{1i} + \beta_2 x_{2i} + \beta_3 x_{3i} + u_i.$$

Suppose that x_{2i}, $i = 1, 2, \ldots, n$ is multiplied by the same constant c. What is the effect of this on (no proof necessary, just explain):

   (a) each of the parameter estimates (α, β_1, β_2 and β_3)

   (b) the standard errors of each of the parameter estimates

   (c) the t-statistics of each of the parameter estimates?

Now suppose that instead of x_{2i}, y_i, $i = 1, 2, \ldots, n$ is multiplied by the same constant c. What is the effect of this on (no proof necessary, just explain):

   (d) each of the parameter estimates (α, β_1, β_2 and β_3)

   (e) the standard errors of each of the parameter estimates

   (f) the t-statistics of each of the parameter estimates?

2. Consider the following six wage models using data extracted from the March, 2015 Current Population Survey of the U.S. Census Bureau.

Model 1	$W_i = \alpha + u_i$
Model 2	$W_i = \alpha + \beta_1 FE_i + u_i$
Model 3	$W_i = \alpha + \beta_2 NW_i + u_i$
Model 4	$W_i = \alpha + \beta_3 UN_i + u_i$
Model 5	$W_i = \alpha + \beta_1 FE_i + \beta_2 NW_i + u_i$
Model 6	$W_i = \alpha + \beta_1 FE_i + \beta_2 NW_i + \beta_3 UN_i + u_i$

where W = wage, FE = female indicator variable, NW = nonwhite indicator, UN = union indicator, and $i = 1, \ldots, n = 1289$. The summary of regressions are provided below. Some results for Model 1 and Model 2 are removed and replaced with upper case letters **A**, **B**, **C**, and **D**.

Model	R^2	$\widehat{\sigma}$	SSR	F
1	**A**	7.90	80304	**B**
2	0.050	**C**	76288	**D**
3	0.016	7.84	78990	21.4
4	0.011	7.86	79452	13.8
5	0.064	7.65	75162	44.0
6	0.073	7.61	74448	33.7

(a) Test $H_0 : \beta_2 = \beta_3 = 0$ for Model 6. Interpret the test result.

(b) Test $H_0 : \beta_2 = 0$ in Model 5. Interpret the test result.

(c) What are the values of **A** and **B** for Model 1.

(d) Compute the value of **C** and **D** for Model 2.

3. Suppose I am thinking about figuring out how much my rent will be given my income. I have gathered data on Tuscaloosa apartment rents (\$/Year) and the incomes of the people who live in those apartments (\$/Year), as well as the square footage of the apartment and whether it has an unobstructed view (Dummy Variable). Suppose the equation for this model is

$$Rent = \alpha + \beta Income + \gamma Income^2 + \theta SquareFoot + \delta View + u$$

(a) Interpret the impact of $Income$ on yearly $Rent$?

(b) Interpret the coefficient on $View$.

(c) What is the $\bar{R}^2$ (adjusted R^2)?

(d) Conduct a test for the validity of the regression at the 5% level. Be sure to write the null and alternative hypotheses correctly.

Regressor\Dependent	$Rent$
Intercept	5455.48
	(602.77)
$Income$	0.0635
	(0.0143)
$Income^2$	-0.0002
	(0.0084)
$SquareFoot$	0.0234
	(0.0074)
$View$	1000.26
	(206.93)
Observations	108
R^2	0.1555