Econ 3180 – Midterm, Feb. 26th, 2014

You may use a calculator. Answer all questions in the answer book provided. The exam is 45 minutes long and consists of 100 marks.

A formula sheet, and a table of probabilities from the standard Normal distribution, are provided at the back of the exam booklet.

NAME:	
STUDENT #:	

Exam version 6.

You must write your exam version number in your answer booklet.

Hand in this booklet at the end of the exam.

Part A – Multiple Choice – 5 marks each

1.) The sampling distribution is
a) a subset of the population.
b) Normal because of the Central Limit Theorem.
c) identically and independently distributed.
d) the probability distribution of an estimator.

2.) If two random variables are independent, then
a) their covariance must be zero.
b) they must be correlated.
c) one variable could still cause the other.
d) OLS is not possible.

3.) The OLS estimator is derived by
a) minimizing the R^2.
b) making sure that the standard error of the regression equals the standard error of the slope estimator.
c) minimizing the sum of squared residuals.
d) minimizing the sum of absolute residuals.

4.) Critical values are
a) the probability of calculating a test statistic more extreme than the one just calculated.
b) the maximum and minimum values for the test statistic, that won't be rejected in a hypothesis test.
c) the maximum and minimum values for the null hypothesis, that won't be rejected in a hypothesis test.
d) the probability of scoring a critical hit (usually 5%).

5.) The R^2 from an OLS regression is 0.66. The sample variance of Y is 100. What is the sample variance of $\hat{Y}$?
a) 33
b) 50
c) 66
d) 100

6.) The slope estimator, $\hat{\beta}_1$, has a smaller standard error, other things equal, if
a) there is more variation in the explanatory variable, X.
b) there is a large variance of the error term, u.
c) the sample size is smaller.
d) the intercept, β_0, is small.

Part B – Short Answer

7.) The following equation was estimated by OLS: $\hat{Y}_i = 42.2 + 4.2X_i$.

a) What is the estimated marginal effect of X on Y?

[**8 marks**]

b) When $X = 3.4$, $Y = 59.0$. What is the OLS predicted value, and OLS residual, when $X = 3.4$?

[**10 marks**]

c) Is it possible for the R^2 (from the above regression) to be equal to 0 or to 1? Explain.

[**10 marks**]

8.) Consider the following estimator for the variance of a random variable, Y:

$$\hat{\sigma}_Y^2 = \frac{1}{n}\sum_{i=1}^{n}(Y_i - \bar{Y})^2.$$

Is this a "good" estimator? How can you determine whether an estimator is "good" or not? Explain.

[**15 marks**]

Part C – Long Answer

9.) An economist estimates the following equation by OLS:

$$\widehat{wage}_i = 15.4 - 4.5 \times D_i,$$
$$(2.6) \quad (1.9)$$

where *wage* is the hourly wage rate and D is a dummy variable which equals 0 if the worker is male, and equals 1 if the worker is female.

a) What is the (sample) mean wage for females?

[**5 marks**]

b) Conduct a formal hypothesis test of $\beta_1 = 0$, at the 5% and 1% significance levels. Show all steps. In words, what is this null hypothesis testing?

[**15 marks**]

c) Suppose the dummy variable is defined in the opposite way. What is the new estimated equation?

[**5 marks**]

Difficult Question

10.) How does the R^2 from the regression of Y on X relate to the R^2 from a regression of X on Y? (Hint: $R^2 = r_{XY}^2$ in the regression of Y on X).

[**2 marks**]

END.