<u>Econ 3180 – Midterm 2014 Answer Key</u>

	Exam Version					
Question	1	2	3	4	5	6
1.	C	D	A	B	B	D
2.	A	B	B	C	D	A
3.	D	A	B	C	D	C
4.	B	C	A	A	A	B
5.	A	B	C	C	A	C
6.	B	B	D	C	C	A
7. a)	5.2	3.2	5.2	3.2	4.2	4.2
7. b)	$\hat{y} = 58.88$ $\hat{u} = 0.12$	$\hat{y} = 52.08$ $\hat{u} = 6.92$	$\hat{y} = 63.88$ $\hat{u} = -4.88$	$\hat{y} = 57.08$ $\hat{u} = 1.92$	$\hat{y} = 60.48$ $\hat{u} = -1.48$	$\hat{y} = 56.48$ $\hat{u} = 2.52$
9. a)	10.2	8.2	7.2	7.9	8.9	10.9
9. b)	t = -2.13	t = -2.36	t = -2.26	t = -2.39	t = -2.05	t = -2.37
9. c)	$\hat{\beta}_0 = 10.2$ $\hat{\beta}_1 = 3.2$	$\hat{\beta}_0 = 8.2$ $\hat{\beta}_1 = 5.2$	$\hat{\beta}_0 = 7.2$ $\hat{\beta}_1 = 5.2$	$\hat{\beta}_0 = 7.9$ $\hat{\beta}_1 = 5.5$	$\hat{\beta}_0 = 8.9$ $\hat{\beta}_1 = 4.5$	$\hat{\beta}_0 = 10.9$ $\hat{\beta}_1 = 4.5$

7. c) [Explained in class.]

8.) One way to evaluate whether an estimator is "good" or not, is to measure it by the statistical properties of:

- Unbiasedness
- Consistency
- Efficiency

Unbiasedness is when the expected value of the estimator is equal to the unknown population parameter that we are trying to estimate. (It makes sense to consider an estimators *expectation* or *mean* since an estimator is random.) In other words, an unbiased estimator gives the right answer on average.

Similarly, (strong) consistency is when an estimator always gives the right answer, as the sample size becomes very large.

Efficiency is when an estimator has the smallest variance out of other similar estimators (other estimators that are also unbiased and consistent).

$\hat{\sigma}_Y^2$ is not "good" in the sense that it is *biased* (it is, however, consistent). The expected value of $\hat{\sigma}_Y^2$ is not equal to σ_Y^2. In fact, examining the bias of $\hat{\sigma}_Y^2$ leads us to the bias-corrected estimator, s_Y^2, which is the estimator commonly found in textbooks, and found on your formula sheet.

9. b) In words, this hypothesis is testing whether there is a difference in the average earnings between men and women. That is, it is testing whether there is a *wage-gender* gap.

10.) The R^2 will be the same. Recall that OLS is measuring correlation, not causation. When two variables are correlated, we get the same effect on Y due to a change in X, as we do with a change in Y on X. Which variable goes on the left hand side is a matter of economic theory.

An analytical way to see that R^2 will be the same is to use the hint, $R^2 = r_{XY}^2$, where r_{XY}^2 is the squared sample correlation between X and Y. The formula for sample correlation is found on your formula sheet:

$$r_{xy} = \frac{s_{xy}}{s_x s_y}$$

Notice that it doesn't matter whether we are measuring the correlation between X and Y, or the correlation between Y and X; we get the same number. That is:

$$r_{xy} = \frac{s_{xy}}{s_x s_y} = \frac{s_{yx}}{s_y s_x} = r_{yx}$$