ECO 441 Fall 2009

Solutions-2

1) a) The 95% confidence interval for $\hat{\beta}_1$ is $\{-5.82 \pm 1.96 * 2.21\}$, that is $-10.152 \leq \beta_1 \leq -1.4884$.

d) The 99% confidence interval for $\hat{\beta}_0$ is $\{520.4 \pm 2.58 * 20.4\}$, that is $467.7 \leq \beta_0 \leq 573.0$.

2) a) The estimated gender gap equals $\$2.12/hour$.

b) The hypothesis testing for the gender gap is $H_0 = \beta_1 = 0$ vs. $H_0 = \beta_1 \neq 0$ With a $t - statistic$

$$t = \frac{\hat{\beta}_1 - 0}{SE(\hat{\beta}_1)} = \frac{2.12}{0.36} = 5.89$$

We reject the null hypothesis of zero gender gap. That is, the coefficient is statistically significant.

c) The 95% confidence interval for $\hat{\beta}_1$ is $\{2.12 \pm 1.96 * 0.36\}$, that is $1.41 \leq \beta_1 \leq 2.83$.

d) The sample average wage for women is $\hat{\beta}_0 = 12.52/hour$. The sample average wage for men is $\hat{\beta}_0 + \hat{\beta}_1 = 12.52 + 2.12 = 14.64/hour$.

e)

$$\widehat{Wages} = 14.64 - 2.12 * Female,\ R^2 = 0.06,\ SER = 4.2$$

3) The 99% confidence interval is $1.5 * \{3.94 \pm 2.58 * 0.31\}$, that is $4.71 \leq WeightGain \leq 7.11$

4) a) The estimated gain from being in a small class is 13.9 points. This is equal approximately 1/5 of the standard deviation in test scores, a moderate increase.

b) The $t - statistic$ is 5.56. Thus the null hypothesis is rejected at 5% level.

c) The 99% confidence interval is $\{13.9 \pm 2.58 * 2.5\} = 13.9 \pm 6.45$.

5) a) The question asks whether the variability in test scores in large classes is the same as the variability in small classes. It is hard to say. On the one hand, teachers in small classes may be able to spend more time bringing all of the students along, reducing the poor performance of particularly unprepared students. On the other hand, most of the variability in test scores may be beyond the control of the teacher.

b) The formula in 5.3 is valid for homoskedasticity or heteroskedasticity; thus inferences are valid in either case.

6) a) The $t - statistic$ is 2.13. Thus the null hypothesis is rejected at 5% level.

b) The 95% confidence interval is $\{3.2 \pm 1.96 * 1.5\} = 3.2 \pm 2.94$.

c) Yes. If Y and X are independent, then $\beta_1 = 0$; but this null hypothesis was rejected at the 5% level in part (a).

d) β_1 would be rejected at the 5% level in 5% of the samples; 95% of the confidence intervals would contain the value of $\beta_1 = 0$.

7) a) Yes

b) Yes

c) They would be unchanged.

d) (a) is unchanged. (b) is no longer true as the errors are not conditionally homoskedastic.

E5.1) a)

$$AHE = -1.133 + 0.591 Age$$

The regression coefficient is statistically significant since the $t-statistic$ is 5.86 (using heteroskedastic robust standard error) and the corresponding $p-value$ is 0.00.

b) $\{0.591 \pm 1.96 * 0.100\}$, that is $0.393 \leq \beta_1 \leq 0.789$

c)

$$AHE = 0.764 + 0.438 Age$$

The regression coefficient is statistically significant at all levels since the $t-statistic$ is 4.50 (using heteroskedastic robust standard error) and the corresponding $p-value$ is0.00.

d)

$$AHE = -5.833 + 0.874 Age$$

The regression coefficient is statistically significant at all levels since the $t-statistic$ is 5.05 (using heteroskedastic robust standard error) and the corresponding $p-value$ is 0.00.

E5.3) a)

$$Ed = 13.962 - 0.056 * Dist$$

The regression coefficient is statistically significant at 10% and 5% level since the $t-statistic$ is -2.13 (using heteroskedastic robust standard error), however, it is statistically insignificant (not different than zero) at 1% level. The corresponding $p-value$ is 0.034.

b) $\{-0.056 \pm 1.96 * 0.026\}$, that is $-0.107 \leq \beta_1 \leq -0.004$.

c) The regression coefficient for females is not statistically significant at 5% significance level, $-0.125 \leq \beta_1 \leq 0.029$.

d) The regression coefficient for males is not statistically significant at 5% significance level, $-0.132 \leq \beta_1 \leq 0.006$.