Econ 444 Elementary Econometrics
Fall 2007

ANSWERS TO HOMEWORK EXERCISE: 5

(1.a) The number of observation is $2006 - 1981 + 1 = 26$. The t-value is $-0.92/0.36 = -2.56$. So

$$
\begin{aligned}
\hat{Y}_i = 4.217 \quad & -0.92 \quad X_i \\
& (0.36) \\
t = \quad & -2.56 \\
N = 26, R^2 = \quad & 0.875
\end{aligned}
$$

(1.b) When the price of coffee is zero, the expected demand is estimated to be 4.217. When the price of coffee increases by one unit, the expected demand is estimated to decrease by 0.92 units.

(1.c) The degrees of freedom are $26 - 2 = 24$. The critical value, $t_C = 2.064$, from Table B-1. So the lower bound for the confidence interval is $-0.92 - 2.064 \cdot 0.36 = -1.66$. The upper bound is $-0.92 + 2.064 \cdot 0.36 = -0.18$. The confidence interval is

$$-1.66 \leq \beta_1 \leq -0.18 \tag{1}$$

(1.d) The critical value, $t_C = 2.064$, from Table B-1. Because $|t| = 2.56$ is greater than the critical value, we reject the null hypothesis.

(1.e) Because the demand is expected to decrease when the price rises, $H_A : \beta_1 < 0$ makes sense. For the 1% level, the critival value, t_C, is 2.492 from Table B-1. Because $|t| = 2.56$ is greater than the critival value, we reject the null hypothesis.

(2.a) Holing the price of tea constant, the expected demand is estimated to decrease by 0.95 units when the price of coffee rises by one unit. Holding the price of coffee constant, the expected demand is estimated to increase by 0.25 units when the price of tea rises by one unit.

(2.b) The degrees of freedom are $26 - 3 = 23$. The critical value, $t_C = 2.069$, from Table B-1. So the lower bound for the confidence interval is $0.25 - 2.069 \cdot 0.23 = -0.23$. The upper bound is $0.25 + 2.069 \cdot 0.23 = 0.73$. The confidence interval is

$$-0.23 \leq \beta_1 \leq -0.73 \tag{2}$$

(2.c) The t-value is 0.25/0.23=1.09 The critical value, $t_C = 2.069$, from Table B-1. Because $|t| = 1.09$ is smaller than the critical value, we accept the null hypothesis.

(2.d) Because coffee and tea are likely to be substitutes, we expect that the demand for coffee to increase when the price of tea rises. Hence $H_A : \beta_2 > 0$ makes sense. For the 1%

level, the critival value, t_C, is 2.500 from Table B-1. Because $|t| = 1.09$ is smaller than the critival value, we accept the null hypothesis.

(2.e) Using Equation (3),

$$F = \frac{R^2/K}{(1-R^2)/(N-K-1)} = \frac{0.86/2}{(1-0.86)/23} = 70.64 \tag{3}$$

(2.f) For Regression (6),

$$\bar{R}^2 = 1 - (1-R^2)\frac{N-1}{N-K-1} = 1 - (1-0.875)\frac{25}{24} = 0.87. \tag{4}$$

For Regression (7),

$$\bar{R}^2 = 1 - (1-R^2)\frac{N-1}{N-K-1} = 1 - (1-0.86)\frac{25}{23} = 0.85. \tag{5}$$

I prefer Regression (6) because it has a higher adjusted R^2.