SOLUTIONS TO EXERCISE 4

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OCTOBER 20, 2013

8.19

For the income elasticity, the test statistic is: $t = (0.4515 - 1)/2.2065 = 0.0247$. This t value is highly significant, refuting the hypothesis that the true elasticity is 1. For the price elasticity, the test statistic is:$t = (-0.3772 - (-1))/9.808 = 0.0635$. This t value is also significant, leading to the conclusion that the true price elasticity is different from 1.

8.20

The null hypothesis is that $\beta_2 = -\beta_3$, that is, $\beta_2 + \beta_3 = 0$. Using the t statistic given in (8.6.5), we obtain:

$$t = \frac{0.4515 + (-0.3772)}{\sqrt{0.0247^2 + 0.0635^2 - 2\,(-0.0014)}} = 0.859$$

This t value is not significant, say at the 5% level. So, there is no reason to reject the null hypothesis.

9.1

a. If the intercept is present in the model, we should introduce 11 dummies (12 months - 1), otherwise we should introduce 12 dummies.

b. If the intercept is present in the model, we should introduce 5 dummies (6 - 1), otherwise we should introduce 6 dummies.

9.5

a. Male Professor: $E(Y_i) = (\alpha_1 + \alpha_2) + \beta X_i$, Female Professor: $E\,(Y_i) = \alpha_1 + \beta X_i$. Holding X constant, the male salary is different by α_2.

b. Male Professor: $E(Y_i) = (\alpha_1 + 2\alpha_2) + \beta X_i$, Female Professor: $E\,(Y_i) = (\alpha_1 + \alpha_2) + \beta X_i$. Holding X constant, the male salary is different by α_2. Male Professor: $E(Y_i) = (\alpha_1 - \alpha_2) + \beta X_i$, Female Professor: $E\,(Y_i) = (\alpha_1 + \alpha_2) + \beta X_i$. Holding X constant, the male salary is different by $2\alpha_2$.

c. Male Professor: $E(Y_i) = (\alpha_1 - \alpha_2) + \beta X_i$, Female Professor: $E\,(Y_i) = (\alpha_1 + \alpha_2) + \beta X_i$. Holding X constant, the male salary is different by $2\alpha_2$.
Since the scale of the dummy variable is arbitrary, there is no particular advantage of one method over the other. For a given data, the answer is invariant to the choice of the dummy scheme.

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9.12

a. The coefficient of the income variable in the log form is a semielasticity, that is, it represents the absolute change in life expectancy for a percent change in income.

b. This coefficient shows that the average life expectancy is likely to increase by .0939 years if per capita income increases by 1ceteris paribus.(See Chapter 6 on the lin-log model).

c. This regressor is introduced to capture the effect of increasing levels of per capita income above the threshold value of $1097 on life expectancy. This regressor provides the number of additional years that one may expect to live as ones income goes above the threshold value. The estimated coefficient value, however, is not statistically significant, as the p value of the estimated coefficient is about 0.1618.

d. The regression equation for countries below the per capita income level of $ 1097 is

$$-2.40 + 9.39 \ln X_i$$

For countries with per capita income over $ 1097, the regression equation is

$$-2.40 + 9.39 \ln X_i - 3.36(\ln X_i - 7) = 21.12 + 6.03 \ln X_i$$

e. It seems that there is no statistically discernible difference in life expectancy between poor and rich countries, if we assume that countries with per capita income greater than $ 1097 are richer countries.