Econ 444 Elementary Econometrics
Fall 2007
SUMMARY of CHAPTER 5
and
HOMEWORK EXERCISE: 5

Due at the beginning of class on Wednesday, November 7

1 KEY TERMS AND CONCEPTS

Confidence intervals, Confidence level, The t test, Critical value, Type I error, Type II error, Level of significance, Two-tailed test, One-tailed test, Joint hypothesis testing, F test

2 FORMULAS AND RESULTS

$$t = \frac{\hat{\beta}_k - \beta_k}{SE(\hat{\beta}_k)} \tag{1}$$

is distributed as the t-distribution with $(N-K)$ degrees of freedom for k=1,2,...,K.

To form a confidence interval, we first choose the confidence level, say 0.95, and find the t_C value such that

$$P[\hat{\beta}_k - t_C SE(\hat{\beta}_k) \leq \beta_k \leq \hat{\beta}_k + t_C SE(\hat{\beta}_k)] = 0.95. \tag{2}$$

For a two-tailed test, compute the t test statistic from Equation (1), get t_C (the *critical value*) from Table B-1, and reject H_0 if $|t| > t_C$ and accept H_0 if $|t| \leq t_C$.

For a multiple regression with K independent variables,

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

follows the F distribution with K and $N-K-1$ degrees of freedom under the null hypothesis:

$$H_0 : \beta_1 = ... = \beta_K = 0. \tag{4}$$

3 HOMEWORK EXERCISE: 5

1. Imagine that you have a time series data set for demand for coffee (Y) and the price of coffee (X), and that you run a regression:

$$Y_t = \beta_0 + \beta_1 X_t + \epsilon_t \tag{5}$$

Suppose that the data are annual from 1981 to 2006, that Excel computer output for regression (1) is

	Coefficients	Standard Error
Intercept	4.217	2.357
X Variable	-0.92	0.36

with R square of 0.875.

(1.a) Report the regression results, using our class format.

(1.b) Interpret the point estimates of the regression coefficients in Regression (5).

(1.c) Establish a 95% confidence interval for β_1.

(1.d) Test the hypothesis $H_0 : \beta_1 = 0$ at the 5% significance level in Regression (5), using a two-tailed test. Explain.

(1.e) Discuss which alternative hypothesis makes more sense; $H_A : \beta_1 > 0$ or $H_A : \beta_1 < 0$ for Regression (5). Then test the hypothesis $H_0 : \beta_1 = 0$ at the 1% significance level. Explain.

2. Imagine that you have a time series data set for demand for coffee *(Y)*, the price of coffee (X_1), and the price for tea (X_2), and that you run two regressions:

$$Y_t = \beta_0 + \beta_1 X_t + \epsilon_t \tag{6}$$

$$Y_t = \beta_0 + \beta_1 X_{1t} + \beta_2 X_{2t} + \epsilon_t \tag{7}$$

Suppose that the data are annual from 1981 to 2006, and the results for Regression (6) were as in the previous question. The results for Regression (7) were

$$\hat{Y}_i = 4.317 \quad \underset{(0.34)}{-0.95} \quad X_{1i} \quad \underset{(0.23)}{+\ 0.25}\ \mathrm{X}_{2i}$$

$$R^2 = 0.86$$

(2.a) Interpret the point estimates of partial regression coefficients for Regression (7).

(2.b) Establish a 95% confidence interval for $\hat{\beta}_2$.

(2.c) Test the hypothesis $H_0 : \beta_2 = 0$ at the 5% significance level in regression (2), using a two-tailed test. Explain.

(2.d) Discuss which alternative hypothesis makes more sense; $H_A : \beta_2 > 0$ or $H_A : \beta_2 < 0$ for Regression (7). Then test the hypothesis $H_0 : \beta_2 = 0$ at the 1% significance level, using a one-tailed test. Explain.

(2.e) Test the hypothesis $H_0 : \beta_1 = \beta_2 = 0$ in regression (7) at the 1% significance level. Explain.

(2.f) Compute the adjusted R^2 for regression (6) and regression (7). Based on the adjusted R^2, which regression do you prefer?