

ECONOMETRICS I, SPRING 2024

Homework 4. Due Wednesday February 14.

1. Consider the model

$$y_t = \beta_0 + \beta_1 x_t^1 + \beta_2 x_t^2 + u_t.$$

Rewrite the model so that the restriction $\beta_2 = \beta_3$ becomes a single zero restriction that you can test using a t -test. (This should be easy, but it is often useful in practice.)

2. Almost the same question (and easier, because I already talked about it in class, but super relevant for practice): A sample consists of males and females. We have a dummy D^m for males and a dummy D^f for females. Consider the regression equation

$$y_i = \beta + \beta_m D_i^m + \beta_f D_i^f + u_i.$$

a) Show explicitly that there is perfect multi-collinearity in this model.

So you now drop the constant to get rid of the collinearity and want to estimate

$$y_i = \beta_m D_i^m + \beta_f D_i^f + u_i.$$

b) Explain how you can rewrite the model such that $\beta_f = \beta_m$ becomes a single zero restriction that you can test using a t -test.

3. Computer question (continuation of homework 1, 2, and 3). In Matlab, regress real per capita U.S. data consumption growth on income growth and the interest rate using the posted dataset. (This is the what you did in homework 1.)

a) Calculate the t -test for each of the parameters and display the P-values.

b) Test if the coefficient to income growth is identical to the coefficient for the interest rate. (The tests don't make much economic sense, but this exercise is about the tools.) Explain how you could use a t -test (how) or an F -test. Verify in Matlab that the P-values are identical for the two alternative tests.

c) Test if the coefficients to income growth and the coefficient to the interest rate are both zero. (I suggest you use a table of critical values for the F and test at the 5% level. This is because you will need to use a table for exams.)

d) Test if (simultaneously) the coefficients to income growth is equal to the constant and if the coefficient to the the interest rate are equal to the constant. (This is two linear constraints.)