

Homework 1. Due Wednesday February 1.

1. Consider the regression model

$$y_i = \beta_0 + \beta_1 z_i + \beta_2 w_i + \epsilon_i ; \quad i = 1, \dots, n .$$

Find the first order conditions form minimizing the sum of square residuals wrt. (with respect to) $\beta_0, \beta_1,$ and β_2 .

Collect the first order conditions in vector-matrix notation and verify that the solution for $\beta = (\beta_0, \beta_1, \beta_2)'$ is

$$\hat{\beta} = (X'X)^{-1}X'Y ,$$

where $Y = (y_1, \dots, y_n)'$, and

$$X = \begin{pmatrix} 1 & z_1 & w_1 \\ \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot \\ 1 & z_n & w_n \end{pmatrix}$$

2. Davidson and MacKinnon, question 2.15.

3. Computer question. In Gauss or Matlab, regress real per capita U.S. data consumption growth on income growth and the interest rate using the posted dataset. Xavier has written a Matlab program for you. You are welcome to translate it into Gauss, the data are posted in both Matlab and Gauss. In the posted program, you need to put in the actual regression where "To do" is written.

a) Using vectors and matrices (i.e., do not use the built-in regression commands, except to check you results, if you want) regress consumption growth (constant, income growth, and the interest rate) using the OLS formula. Calculate and print the estimated coefficients (next week, we will add a lot more, using the same data). Include your code with your answers.)

b) Regress income on the other variables (constant and interest rate) and calculate the residuals, which we can call *MInc*.

c) Now regress consumption on constant, interest rate and *MInc*. Also regress consumption on *MInc*. Verify that the coefficients to income/*Minc* are the same in all the regressions.