Homework 4. Due Wednesday February 28.

1. Show, under the standard assumptions of the linear model, that if $CX = I$, where C is an $k \times N$ matrix, the covariance of $CY - \hat{\beta}$ and $\hat{\beta}$ is 0 (where $\hat{\beta}$ is OLS estimator of dimension $k \times 1$ and e is the vector of residuals). (This is the central part of the proof that OLS is BLUE—it got a bit messy when I did that proof on the board.)

2. Prove that if Z is χ^2-distributed with p degrees of freedom and W is χ^2-distributed with q degrees of freedom and independent of Z, the, $Z+W$ is χ^2-distributed with $p+q$ degrees of freedom.

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 (simulataneusly) 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.)