ECONOMETRICS I, SPRING 2017.

Homework 8. Due Wednesday April 12.

1. (10% of Macro II midterm 1, 2015)
a) Let

$$x_t \ = \alpha_0 \ + \ 5 * u_t \ + \ u_{t-1} \ ,$$

where u_t is white noise.
Find the autocovariances for x_t in terms of σ_u^2 (the variance of u_t).

b) Given the stationary AR(1) process

$$x_t \ = \ 3 \ + \ .5 * x_{t-1} \ + \ u_t$$

where $Eu_t^2 = 3$. Find the variance of x_t, and the first 3 autocovariances and autocorrelations.

2. (25% of Macro II, midterm 2, 2014) Consider the AR model

$$y_t \ = \ 10 \ + \ 0.2y_{t-1} \ + \ u_t \ ,$$

where u_t is iid white noise with variance 3.

a) Is this model stable? (Explain our answer, if you state "yes" or "no" with no more elaboration, you get 0 points even if your answer is correct.)
b) Assume y_0 is a fixed constant, $y_0 = 5$. Calculate the variance of y_t for all t.
c) What is $E_0 y_1$? What is $E_0 y_2$?
$a(L)$ is the lag polynomial $1 + .5 * L$ and $b(L) = 1 + .3 * L$, define $c(L) = a(L) * b(L)$.

d) Find $c(L)$.
e) Define the model $c(L)z_t = u_t$, where u_t is white noise. Is this model stable? (Explain your answer.)

3. For the AR(1) process:

$$e_t \ = \ \ ae_{t-1} \ + \ u_t \ ,$$

for $t = 1, 2, 3$ and $a = .6$.
a) Find the variance matrix $\Omega = var(e)$.
b) Find $\Omega^{-1/2}$ using the Prais-Winsten tranformation.
c) Verify by matrix multiplication that $\Omega^{-1/2} \, \Omega \, \Omega^{-1/2'} = I$.

4. Computer question (continuation of previous homeworks). 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 residuals e. Regress e_t on e_{t-1}? Is there evidence of autocorrelation (Use t-tests.)
b) Assume you concluded that there is autocorrelation in the residuals (so don't condition on part a). Perform 2-stage GLS using the Prais-Winsten transformation.
c) Do the approximate feasible GLS estimation using the Cochrane-Orcutt transformation. Are you results sensitive to whether you do Prais-Winsten or Cochrane-Orcutt?