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45-812 Econometrics II

Mini 2 2024

### ASSIGNMENT 1 (Hansen and Singleton 1982)

**Overview** The purpose of this assignment is to introduce you to actually estimating a structural econometrics model. The assignment should be undertaken in groups of about three. I do not object to discussion taking place across groups in the early stages of the work either. I do insist that each group should refine its own answers and submit a unique report.

**Due data and assessment** Please submit your answers in the form of a report by **Sunday November 3, 11:59 p.m.** with your code attached as an appendix. Hand written work will not be graded. The code must be clearly written with comments where appropriate so that a reader can easily follow. Poor grammar, unclear expression, and lack of precision, will be graded as if I have very limited expertise in this area. All questions carry equal weights.

**The model:** Consider the following model of consumption and portfolio choices we analyzed in lectures, and recall:

$$1 = E_t \left[ r_{t+1,k} \beta \frac{u'(c_{t+1})}{u'(c_t)} \right] \equiv E_t [r_{t+1,k} MRS_{t+1}]$$

where:

- $E_t [\cdot]$  is an expectations operator that conditions on all the information the consumer has at time  $t$ ;
- $r_{tj}$  denotes the real return on the  $j^{th}$  asset purchased in period  $t - 1$ ;
- $\beta$  is the subjective discount factor;
- $u(\cdot)$  denotes the within-period utility function.

Suppose:

$$u(c_t) = (1 + \alpha) c_t^{1+\alpha} \quad (\text{Assumption 1})$$

**Question 1:** For the whole of the post WW2 era, plot the aggregate quarterly series of:

- nondurables per capita  $c_t$  and the ratio of  $c_{t+1}/c_t$
- nondurables and services per capita  $c_t^*$  and the ratio of  $c_{t+1}^*/c_t^*$
- value weighted aggregate stock returns  $r_{t+1}$
- equally weighted aggregate stock returns  $r_{t+1}^*$

Test whether any of these series have a unit root. (You should read about unit root tests first.) Is there evidence that these series are not stationary and ergodic?

**Question 2:** Replicate (to the extent you can) the two top panels of Table III from Hansen and Singleton (1984), by estimating their model with their subsample (data from 1959:2 through 1978:12), and the instrument sets they used. How do your results (estimates and values of test statistics) compare with theirs? If they are not identical can you explain the discrepancies? (

**Question 3:** Now reestimate the model using the whole sample, where the two parameters  $\alpha$  and  $\beta$ , are allowed to differ in the three time frames, with say  $(\alpha_1, \beta_1)$  parameterizing the model before 1959:2,  $(\alpha_2, \beta_2)$  in Hansen-Singleton frame, and  $(\alpha_3, \beta_3)$  after 1978:12. Test the overidentifying restrictions of the model and compare the estimates for the three time frames. Interpret your results. Test whether  $(\alpha_1, \beta_1) = (\alpha_2, \beta_2) = (\alpha_3, \beta_3)$  and interpret your results.

**Question 4:** Finally, replace Assumption 1 with:

$$u(c_t) = -e^{-\gamma c_t} \quad (\text{Assumption 2})$$

Repeat the exercises entailed in Questions 2 though 4.

**Question 5:** On the basis of the evidence from your work, which is the more palatable parameterization. Briefly explain the reasons for your choice.