

## ASSIGNMENT 2

**Overview:** The purpose of this assignment is to conduct an empirical analysis to check the robustness properties of the Hansen Singleton paper of 1982 by extending the data set they used to account for more recent years.

**Due date and assessment:** Please email me a pdf file of your answers in the form of a well written report, and also submit a hard copy of the report only at the beginning of class Monday November 26 with your code attached as an appendix. Hand written work will not be graded. The answer to each question counts equally to the perfect score. Poor grammar, unclear expression, and lack of precision, will be graded as if I have very limited expertise in this area.

**The model:** Consider the model of consumption and portfolio choices we analyzed in Lecture 5, 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.

**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.

**Question 4:** Test whether  $(\alpha_1, \beta_1) = (\alpha_2, \beta_2) = (\alpha_3, \beta_3)$  and interpret your results.