

ECON 8106
Prof. Larry Jones
Problem Set 1

Form group of 4-5. For groups with number of members $n > 5$, marks will be discounted by $\frac{5}{n}$. Also please include a cover page for your solutions, stating members' name and page number for each of the questions below.

The due date for this assignment is Tuesday, November 6.

Data Work

1. What are the time series properties of the following in the last 50 or so years for the United States (what are they on average, how much do they fluctuate, are there noticeable trends in them, etc). Your report should contain graphs as well as your own description of the data
 - (a) Consumption as a fraction of GNP
 - (b) Investment as a fraction of GNP
 - (c) Government spending as a fraction of GNP
 - (d) Payments to labor as a share of GNP
 - (e) Payments to capital as a share of GNP
 - (f) The capital output ratio
 - (g) The growth rate of output per capita
 - (h) The growth rate of consumption per capita
 - (i) The rate of return on capital

2. Detrend the following series for the United States and another country of your choice using HP-filter (learn what it is!). Report the trends and residuals as well as their statistical properties. Compare the two countries
 - (a) Output per capita
 - (b) Consumption per capita
 - (c) Investment per capita
 - (d) Hours worked per capita

Math Warm-up: read SLP chapter 3 and answer the following:

1. Exercise 3.3. c,d,e,f and Exercise 3.4 e,f
2. Exercise 3.7
3. Exercise 3.8

4. Exercise 3.9

Carefully read SLP chapter 4.1,4.2, answer the following:

1. Exercise 4.3
2. Exercise 4.5
3. Following the logic of 4.1, come up with an example from the real world. Write down both the sequential problem and its dynamic programming counterpart. State theorems establishing the equivalence (define clearly what you mean by equivalence) between the two. Clearly identify the assumptions needed. prove them. (You may consult examples in Chapter 5)

Read Sargent and Ljungqvist, chapter 3, answer the following:

1. Consider the following dynamic program problem:

$$\begin{aligned} v(a) &= \max_c \{u(c) + \beta v(a')\} \\ \text{s.t. } c + a' &= (1+r)a \end{aligned}$$

- (a) assume $u(c) = \frac{c^{1-\sigma}}{1-\sigma}$. Obtain an analytical expression for $v(a)$. (hint: make a guess for the value function and assume a linear decision rule)
- (b) assume $u(c) = -\exp(-c)$. Obtain $v(a)$

2. Exercise 3.1