

ECON 6130: Problem set 3

Mathieu Taschereau-Dumouchel

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Please upload your problem set on Canvas. You may work in groups, but you must turn in your own answers. Actively working on the assignments is *absolutely essential* for your understanding of the course material.

Problem 1. This problem will help you to familiarize yourself with some of the basic facts about the U.S. economy. You can find all the data needed for this problem in the FRED database at <http://research.stlouisfed.org/fred2/>.

What are the time series properties of the following in the last 50 years or so? What are they on average? How much do they fluctuate? Are there any noticeable trends in them? What was their behavior during the recent recession? (If you cannot find one of the time series look for a substitute)

1. Consumption as a fraction of GDP
2. Investment as a fraction of GDP
3. Government (federal and all levels) spending as a fraction of GDP
4. Payments to labor as a share of GDP
5. Payments to capital as a share of GDP
6. The growth rate of output per capita
7. The growth rate of consumption per capita
8. Civilian unemployment rate
9. Average Duration of Unemployment

Problem 2. During lecture, we started solving a dynamic program using value function iterations. In this problem, you will have to write a numerical code to find the efficient allocation in a slightly more complicated environment.

Consider the same problem as in the slides 20 to 27 of the "Neoclassical growth model" lecture notes, except that $\delta = 0.75$. This change is quite important since it prevents us from using the analytical guess and verify approach of slides 17 to 19 (if you find a way to use it, come talk to me!)

1. Formulate the planner's optimization problem as a dynamic programming problem. What are the state variables? What are the choice variables?

- Using a value function iterations approach (and your favorite computation software, I recommend Julia or Matlab) solve for the value function and the policy function in this economy. Plot these two functions as functions of k . (Hints: Use a grid with at least 100 points for k . You will need to find appropriate bounds for the grid. One way to do this is to simulate the optimal path for k once you have a solution and to make sure that the time series converges somewhere near the center of your grid. Start with wide bounds.)