Problem Set #9

ECON 815, Prof. Jason DeBacker
Due Friday, December 13, 5:00 p.m.

This problem set will have you working *collaboratively* to extend the basic overlapping generations models we worked with in class. I want you to make the following extensions to the model:

1. Add endogenous labor supply

2. Allow for S-period lived agents (where S and integer that represents is the maximum number of model periods a household lives)

3. Add realistic demographics to the model, which includes mortality risk and demographic transitions based on mortality, fertility, and immigration rates

You all will work together on these modifications. You will collaborate on GitHub. Questions can be posted as Issues in the Problem Set 9 repository. Code additions will made through pull requests to the master branch of the Problem Set 9 repo: https://github.com/jdebacker/ProblemSet9.

DELIVERABLES

You will have the following deliverables:

1. Working code. The OG model with the above additions should solve. This code should be contained in the following `*.py` files and , all be placed in the `./ProblemSet9/scripts` directory:

   - `execute.py` – sets parameters, solves the model
   - `households.py` – contains functions related to the households' problems
   - `firm.py` – contains functions related to the firm's problem
   - `aggregates.py` – contains functions related to the aggregate variables used in the market clearing conditions
   - `SS.py` – contains functions to solve the steady-state of the model
   - `TPI.py` – contains functions to solve for the transition path of the model

   I will know the code runs when I fetch this branch and do `python execute.py`. Please print the errors in the SS and transition path equilibrium conditions (just print the max absolute value of this error over all periods in the transition path) as well as the maximum absolute value of the errors in the FOCs from the steady-state and transition path. In addition, compute the error in the resource constraint and have the printed to the screen as well – for both the steady-state and the transition path (max abs value).

2. A a tex file and a pdf compiled from TeX that includes (a) a plot of interest rates and wage rates over the transition path, (b) plots of the aggregate capital stock and labor supply over the transition path, (c) a plot of the lifecycle profiles of savings consumption, and labor supply from the steady-state. Please give a brief description of each of these figures. Please name the pdf "ProblemSet9.pdf" and place it in the `./ProblemSet9/` directory.

Your grade will reflect a common component based on the above deliverables as well as an individual component based on what I observe regarding your contributions on GitHub (which includes additions of source code, discussion of issues, and comments to PRs).

Helpful tips

1. See notes on setting up and keeping your local and remote repos in sync discussed in this issue: https://github.com/jdebacker/CompEcon_Fall19/issues/37

2. Start early!

3. Agree on variable and parameter naming conventions and stay consistent

4. Be consistent with with what is in each dimension of NumPy arrays and the order items are passed through tuples

5. Document your code so others can understand it

6. Consider testing your code to make sure each piece works as expected before trying to put them together

   - I've put an example test script in the `/ProblemSet9/scripts/tests`
   - You can run a specific test modeule by typing `python -m pytest tests/test_name.py` (or `python -m pytest` to run all tests) from the `./ProblemSet9/scripts` directory in your terminal window (Mac/Unix/Linux) or your Anaconda Command Prompt (Windows)

7. Google is your friend – as am I and your classmates – search the internet for solutions and post any unanswered questions as GitHub issues.