Problem Set 9

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1 Thanks

First, I want to say thank you to Jason. Thank you for giving us a wonderful semester!
Through the course, I learn how to deal data with python. My favorite part is the machine learning part, for which I find really useful for my future study. The hardest parts for me are the econometric and DP formulas. As a first-year student, I have not taken the econometric classes, so I get into troubles with all the OLS and Lagrangian formulas. But by learning the definition through the context, I gain great knowledge in the basic ideas, as well as how to use and code them in python.
Lastly, I want to say thanks to my brilliant classmates, who offered hands whenever I got into "Error-THIS WON'T BE WORKING!". And special thanks to Jaewoo Lee, Xinya Yu and Ruby Han for helping me with PS9, although in the end I cannot get it working.
Wish you all have a great winter break!

2 Introduction of the Model

In this solution, we take the S-period-lived agent model from previous study, and add an endogenous labor decision in every period for every household. That is, now the household must choose in every period how much to work ns,t and how much to save bs+1,t+1.
In adding the labor decision to the household optimization problem, we must add a utility of leisure or a disutility of labor to the period utility function. We will introduce a new functional form for the disutility of labor following. This approach fits an ellipse to the standard constant Frisch elasticity disutility of labor specification. The elliptical disutility of labor functional form provides Inada conditions at both the upper and lower bounds of labor supply, which greatly simplifies the computation.

2.1 Necessary Functions

Necessary functions are divided into 3 parts, they are, functions for Households, Firms and Disability of Labor. And we will use this equations to achieve the equilibrium solution for our problem.

3 Results and Pictures

I am really sorry that my code did not work out. In this section, there should be three pictures showing the results. Here, I took the pictures from the Chapter 4 to interpret my results. I wish I could get similar pictures as the book does.

3.1 Consumption and Savings

The orange line in the first picture shows the steady-state distribution of the savings for a labor who works 80 years(in my model, it was 50 years). We can see an inverse-U pattern in the saving curve. Which means before first 55 years, the savings increase with the ages, but decrease after 55 years.
The blue line in the first picture shows the steady-state distribution of the consumption for a labor who works 80 years. We can see that the consumption has a positive linear relationship with age. Which means that when the labor gets older, he or she tends to consume more units.

Figure 4.3: Steady-state distribution of consumption $\bar{c}_s$ and savings $\bar{b}_s$

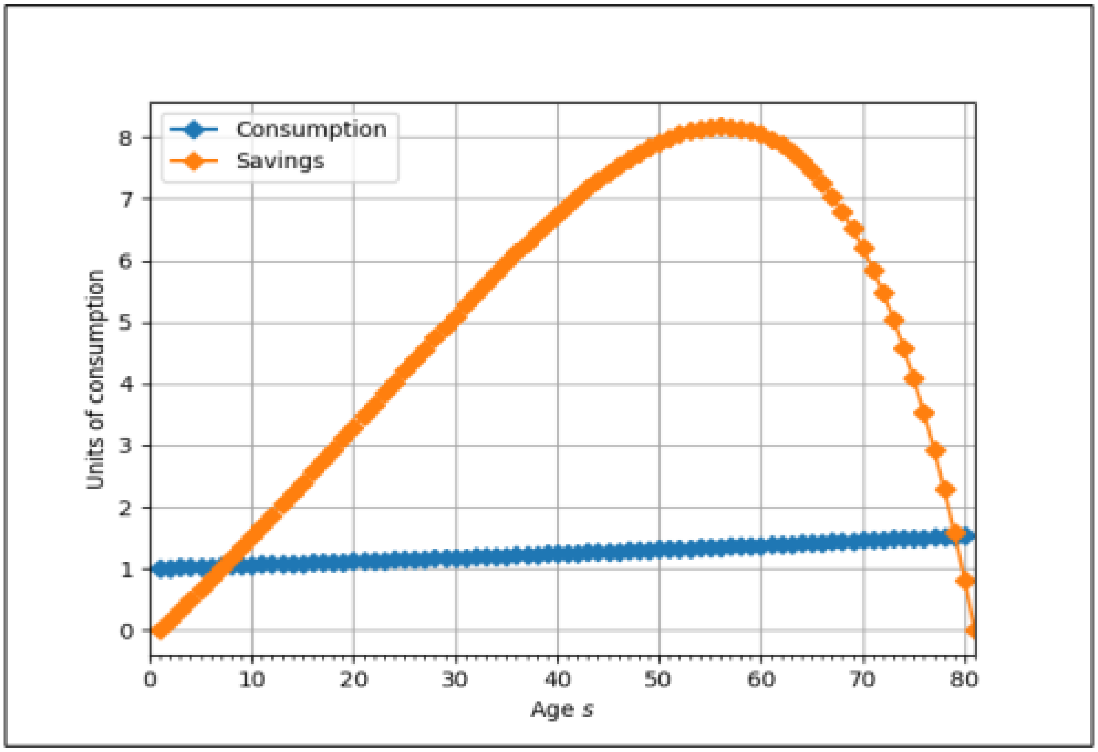

Figure 1: Consumption and Savings

3.2 Labor Supply

The second picture shows the steady-state distribution of labor supply for a labor who works 80 years. The figure shows that the labor supply has a negative relationship with age. When one gets older, he or she tends to provide less labor. And the curve shows a slightly increasing negative second order derivative. Which means the decline of labor will be speed up.

Figure 4.4: Steady-state distribution of labor supply $\bar{n}_s$

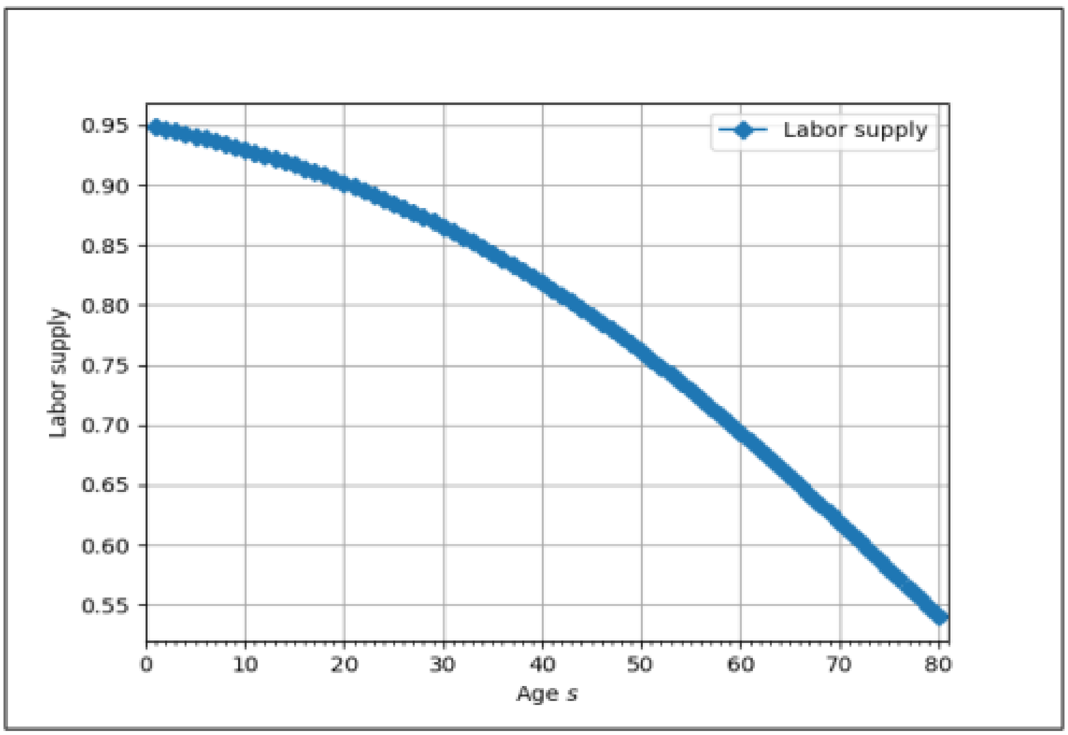

Figure 2: Labor Supply