EC 38020: Quantitative Macroeconomic Methods I

Problem Set 4

Antoine Gustin *

September 29, 2022

Exercise 1

See the `exercise_1.m` script for the baseline simulation of the life-cycle model. The `functions` sub-folder contains the `tauchenHussey` function as well as the `solveLifeCycleHH` function, which solves the household's value and consumption function over the life cycle, i.e. by age.

Life cycle

Figure 1 plots the average consumption, income and asset holdings over the life cycle. I do not take death into account in order to keep these estimates accurate for later years. The model reproduces the hump-shaped consumption pattern observed in the data, mainly thanks to the average income itself following a similar pattern. Households tend to consume in their middle years, and then reduce their consumption to accumulate assets in preparation for retirement. The drop in average assets before age $j = 40$ is due to "rich" households, who start with high initial assets, and slowly consume that wealth over their life cycle. Households that are initially poor, in contrast, slowly save for retirement over time, driving up average assets in later years.

Figure 2 represents the proportion of households alive over retirement. I omit earlier years, since households cannot die prior to retirement by assumption.

Figures 3 and 4 plot the average growth and the cross-sectional variance in the log of consumption and income, respectively. I omit the retirement period, where income is constant and consumption is decreasing, and do not take death into account. We see that the variance of income is almost constant over the life cycle. Consumption, in contrast, is highly dispersed for young households, and less dispersed in later years. This pattern arises because initial assets are scattered across households, but these differences are mitigated by optimal consumption and saving behavior over time.

Insurance

I obtain $\phi \approx 0.6$ for the baseline configuration of the economy. Figure 5 plots ϕ for different values of the persistence in permanent income, ρ. Unexpectedly, ϕ varies very little with ρ, and is increasing on the whole range. Given that ϕ represents the degree of insurance — a ϕ close to one means consumption growth is uncorrelated to permanent income shocks — I thus obtain a relationship opposite to that of Kaplan and Violante (2010).

*Stockholm School of Economics, e-mail: `antoine.gustin@phdstudent.hhs.se`

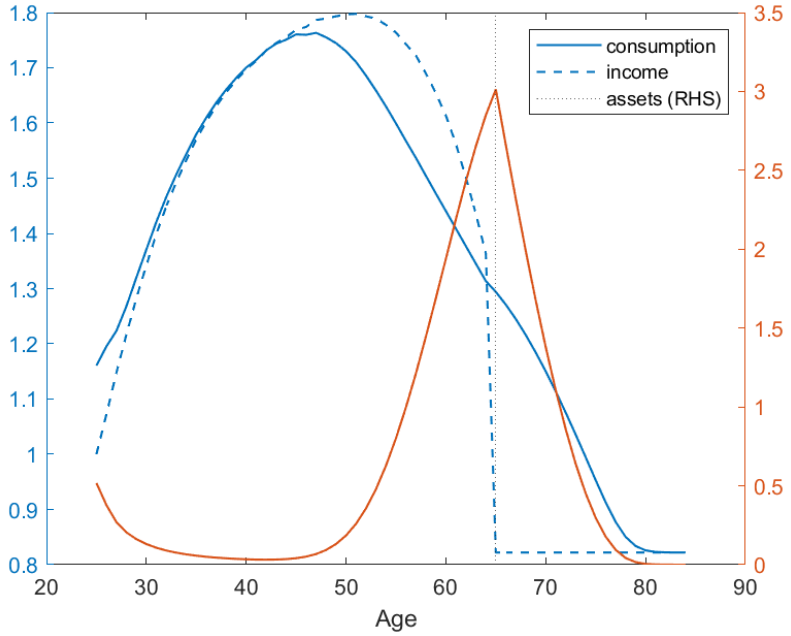

Figure 1: Average consumption, income (LHS) and assets (RHS) over the life cycle

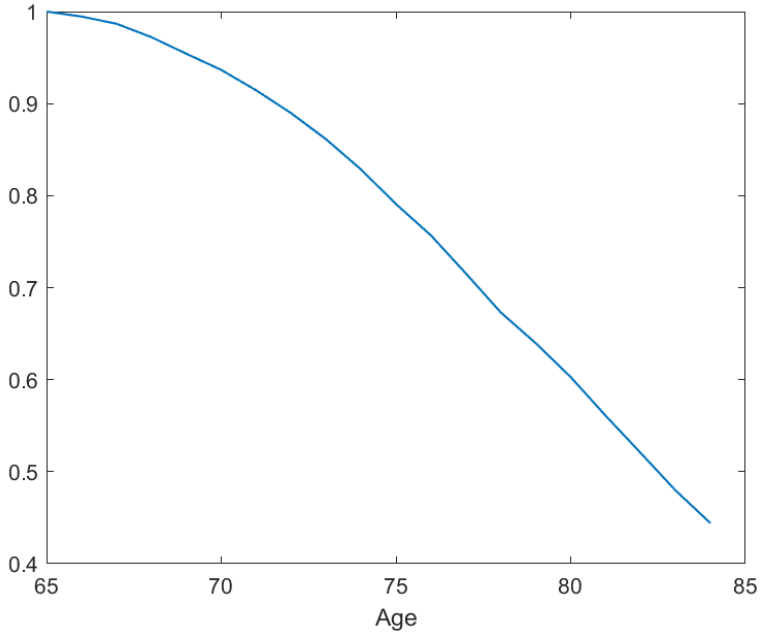

Figure 2: Proportion of surviving households by age

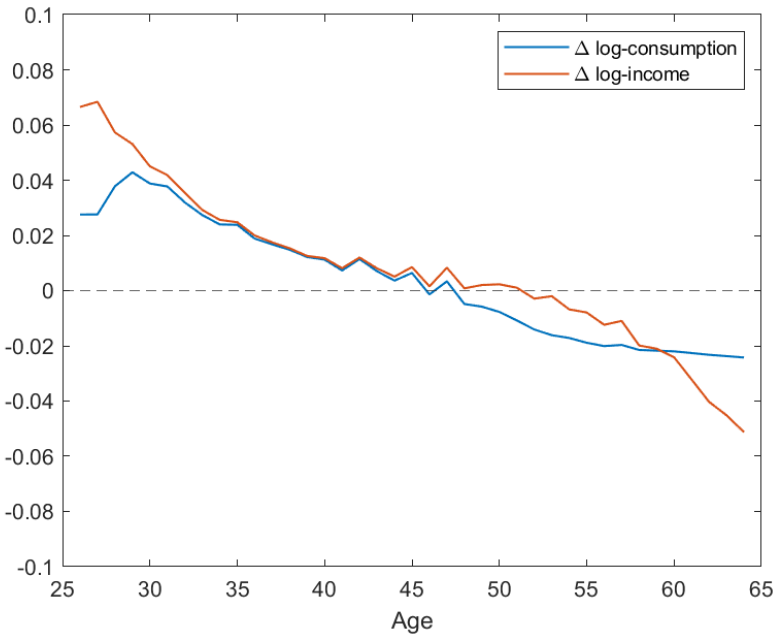

Figure 3: Growth of consumption and income (logs) over the life cycle

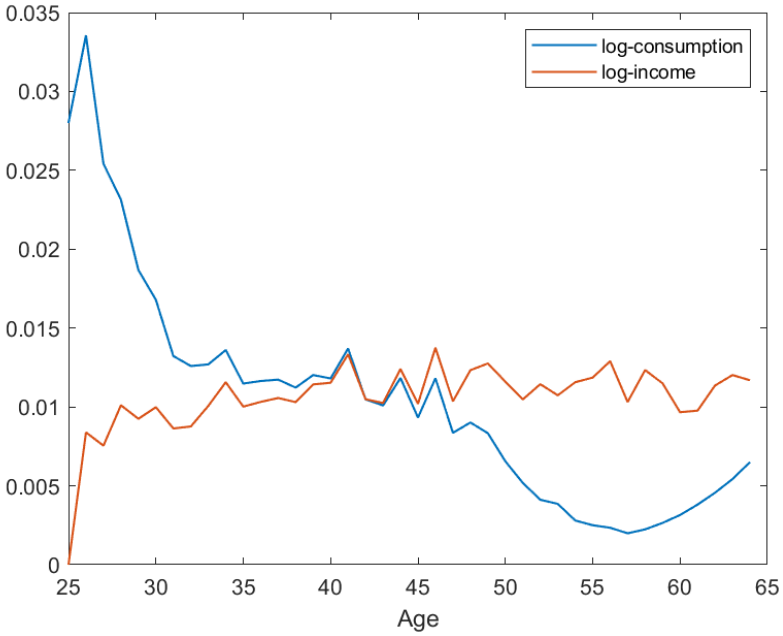

Figure 4: Variance of consumption and income (logs) over the life cycle

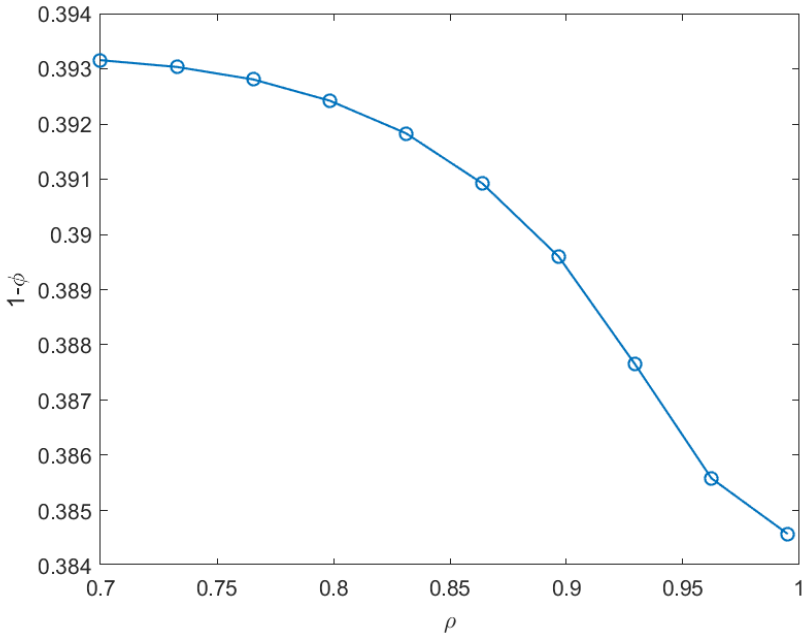

Figure 5: $1 - \phi$ as a function of ρ