Macroeconomics I: Report

Barend Spanjers, Elisa de Weerd, Bas Machielsen

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Question 1

The code for question 1 is available at https://github.com/basm92/macroeconomics_i/blob/master/assignment_1/question1_main.ipynb. This is both downloadable and can then be run via Jupyter notebooks, but Github also renders the output of the code and creation of the figure. No additional Python libraries are required other than the standard libraries that come with e.g. the Conda implementation of Python.

1. Include the plot and carefully discuss the economic intuition for the differences between the time paths for $\sigma = 1$ and $\sigma = 5$.

We see in Figure 1 that the optimal capital chosen increases monotonically with time t. When $\sigma = 1$, we see that the optimal capital chosen steeply increases with time t, until it reaches the steady state of 22.96 at about $t = 75$. When $\sigma = 5$, the optimal capital chosen also monotonically increases with time t, but at a lower rate, until it reaches the steady state 22.96 at about time $t = 145$. Both Policy Paths are concave.

In Figure 1 one clearly observes two main differences between the Policy Paths from K_0 for $\sigma = 1$ and $\sigma = 5$. First, the steady state for the path with $\sigma = 5$ is lower than the steady state with $\sigma = 1$. However, note that given σ, the theoretical steady state of the model is 22.96. Because of our grid, we see that in the figure the steady states in the model with $\sigma = 1$ and $\sigma = 5$ differ a bit numerically. Second, the Policy Path with $\sigma = 1$ converges faster to its steady state than with $\sigma = 5$.

Note that the derivative $\frac{\partial u(c)}{\partial c} = c^{-\sigma}$ for $\sigma \neq 1$ and $\frac{\partial u(c)}{\partial c} = c^{-1}$ for $\sigma = 1$. That is, utility is increasing in consumption, but, for higher σ, the utility will increase slower than for lower σ. If σ is higher, we care more about additional consumption. Thus, we expect that with $\sigma = 5$ compared to $\sigma = 1$, people prefer additional consumption over investment in future capital, and thus it takes people longer to get to the steady state. This is also what we see in Figure 1: with a higher σ, the optimal capital chosen increases more slowly to the steady state.

σ can be seen as the elasticity of substitution parameter. That is, for higher σ, one needs more of the good (in this case consumption) to achieve a certain level of utility compared to a lower σ.

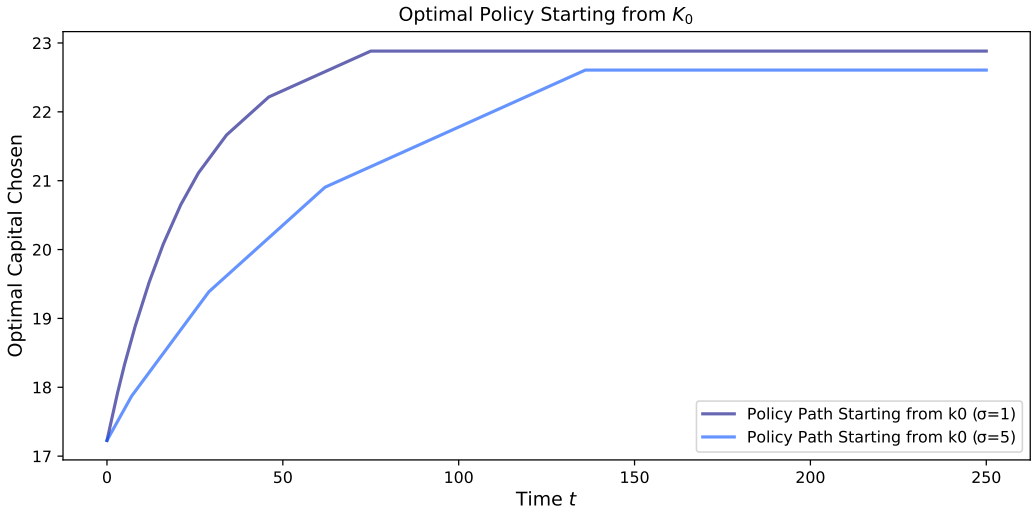

Figure 1: Plot for Question 1