Problem Set 1

OSM Lab-Econ
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Problem 1 The steady-state values are:

Savings:	[0.01931255, 0.05841117]
Capital and Labor:	[0.07772372, 2.2]
Wage and Interest rate:	[0.20172474, 2.43304586]
Consumption:	[0.1824122, 0.20961442, 0.24087319]

Problem 2 The steady-state values when $\beta = 0.55$ are:

Savings:	[0.02817696, 0.07686557]
Capital and Labor:	[0.10504253, 2.2]
Wage and Interest rate:	[0.22415231, 1.88636]
Consumption:	[0.19597535, 0.22861559, 0.26669216]

When all households are more patient, $\bar{b}_2, \bar{b}_3$ both increase since consumption in future periods are more valuable for the households than before, resulting in their saving more today to further smooth consumption across periods.

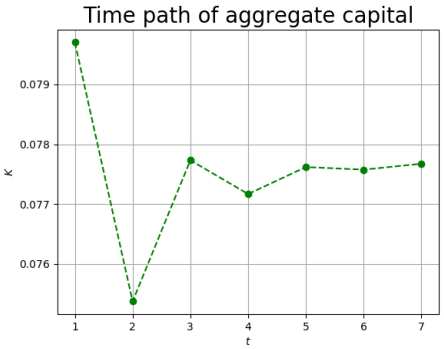
$\bar{K}$ increases because by market clearing, it is equal to the sum of $\bar{b}_2$ and $\bar{b}_3$; $\bar{L}$ remains unchanged because it is an exogenous variable.

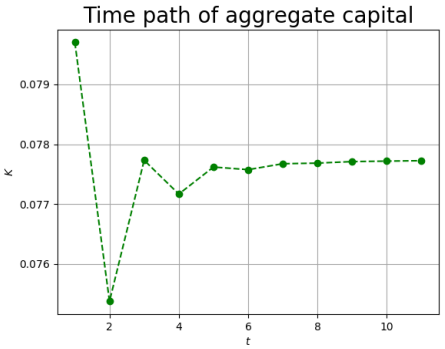
$\bar{w}$ increases and $\bar{r}$ decreases because $\frac{K}{L}$ increases. From firms' first order conditions, we know wage increases when capital-labor ratio increases, and interest rate decreases when capital labor ratio decrease (firms always optimize their capital-labor ratio according to prices).

$\bar{c}_1, \bar{c}_2, \bar{c}_3$ all increase because income effect dominates intertemporal substitution effect– the increase in wage is much larger than the increase in households' savings for both periods.

Problem 3 Please see the python scipt for details of the time path. I choose T=30, and $b_{2,1}, b_{3,1}$ as required.

Problem 4 It only takes 3 periods for the aggregate capital stock to be within 0.0001 of the steady-state value, assuming $\beta = 0.442$. So $T = 3$ if we label the first period 1. I also found the second t(=7) such that the capital stock is within 0.0001 of the steady-state value.


Time path of aggregate capital
0.079
0.078
0.077
0.076
K
1
2
3
4
5
6
7
t


Time path of aggregate capital
0.079
0.078
0.077
0.076
K
2
4
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