OSM Bootcamp Econ - DSGE

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1 Part 1

Exercise 1

Using Guess and Verify: $C_t = \phi Y_t$ and $K_{t+1} = (1-\phi)Y_t$ such that $C_t + K_{t+1} = Y_t = e^{z_t}K_t^\alpha$. Then, we get the Euler:

$$\frac{1}{C_t} = \beta\mathbb{E}_t\{\frac{\alpha e^{z_{t+1}}K_t^{\alpha-1}}{C_{t+1}}\} = \beta\mathbb{E}_t\{\frac{\alpha e^{z_{t+1}}K_t^{\alpha-1}}{\phi Y_{t+1}}\} = \beta\mathbb{E}_t\{\frac{\alpha e^{z_{t+1}}K_t^{\alpha-1}}{\phi e^{z_{t+1}}K_{t+1}^\alpha}\} = \beta\mathbb{E}_t\{\frac{\alpha}{\phi K_{t+1}}\}$$

$$\implies \frac{1}{\phi e^{z_t}K_t^\alpha} = \beta\mathbb{E}_t\{\frac{\alpha}{\phi K_{t+1}}\} \implies \frac{1}{e^{z_t}K_t^\alpha} = \beta\frac{\alpha}{K_{t+1}}$$
$$\implies K_{t+1} = \beta\alpha e^{z_t}K_t^\alpha$$

Which also implies that $A = \beta\alpha$.

Exercise 2

$$\frac{-a}{1-l_t} + \frac{w_t)(1-\tau)}{c_t} = 0$$
$$\frac{1}{c_t} = \beta\mathbb{E}\{\frac{(r_{t+1}-\delta)(1-\tau)+1}{c_t^\gamma}\}$$

Exercise 3

The conditions are:

$$\frac{-a}{1-l_t} + \frac{w_t)(1-\tau)}{c_t} = 0$$
$$\frac{1}{c_t} = \beta\mathbb{E}\{\frac{(r_{t+1}-\delta)(1-\tau)+1}{c_{t+1}}\}$$

Exercise 4

The conditions are:

$$\frac{-a}{(1-l_t)^\xi} + \frac{w_t)(1-\tau)}{c_t} = 0$$
$$\frac{1}{c_t^\gamma} = \beta\mathbb{E}\{\frac{(r_{t+1}-\delta)(1-\tau)+1}{c_{t+1}^\gamma}\}$$

Exercise 5

The conditions are:

$$\frac{1}{c_t^\gamma} = \beta \mathbb{E}\{\frac{(r_{t+1} - \delta)(1-\tau) + 1}{c_{t+1}^\gamma}\}$$

In the steady state we get:

$$\frac{1}{c_{ss}} = \beta \frac{(r_{ss} - \delta)(1-\tau) + 1}{c_{ss}^\gamma}$$

Exercise 6

$Y_{ss} = 0.6855$ and $I_{ss} = 0.2257$

2 Part 2

See included .ipynb files.