1. **Exercise 1**

$$\frac{1}{e^{z_t}K_t^{\alpha} - Ae^{z_t}K_t^{\alpha}} = \beta E_t \left\{ \frac{\alpha e^{z_{t+1}} K_{t+1}^{\alpha-1}}{e^{z_{t+1}}K_{t+1}^{\alpha} - Ae^{z_{t+1}}K_{t+1}^{\alpha}} \right\}$$

$$\frac{1}{e^{z_t}K_t^{\alpha} - Ae^{z_t}K_t^{\alpha}} = \frac{\beta\alpha}{K_{t+1}(1-A)}$$

$$\frac{1}{e^{z_t}K_t^{\alpha}(1-A)} = \frac{\beta\alpha}{K_{t+1}(1-A)}$$

$$K_{t+1} = Ae^{z_t}K_t^{\alpha}, \text{ where } A = \beta\alpha \ .$$

2. **Exercise 2**

$$c_t = (1-\tau)\left[w_t\ell_t + (r_t - \delta)\, k_t\right] + k_t + T_t - k_{t+1}$$

$$1/c_t = \beta E_t \left\{1/c_{t+1}\left[(r_{t+1} - \delta)(1-\tau) + 1\right]\right\}$$

$$-\frac{a}{1-\ell_t} = \frac{1}{c_t} w_t (1-\tau)$$

$$r_t = \alpha e^{z_t} K_t^{\alpha-1} L_t^{1-\alpha}$$

$$w_t = (1-\alpha) e^{z_t} K_t^{\alpha} L_t^{-\alpha}$$

$$\tau\left[w_t\ell_t + (r_t - \delta)\, k_t\right] = T_t$$

$$z_t = (1-\rho_z)\,\overline{z} + \rho_z z_{t-1} + \epsilon_t^z; \quad \epsilon_t^z \sim \text{ i.i.d. } \left(0, \sigma_z^2\right)$$

3. **Exercise 3**

$$c_t = (1-\tau)\left[w_t\ell_t + (r_t - \delta)\, k_t\right] + k_t + T_t - k_{t+1}$$

$$c_t^{-\gamma} = \beta E_t \left\{1/c_{t+1}\left[(r_{t+1} - \delta)(1-\tau) + 1\right]\right\}$$

$$-\frac{a}{1-\ell_t} = c_t^{-\gamma} w_t (1-\tau)$$

$$r_t = \alpha e^{z_t} K_t^{\alpha-1} L_t^{1-\alpha}$$

$$w_t = (1-\alpha) e^{z_t} K_t^{\alpha} L_t^{-\alpha}$$

$$\tau\left[w_t\ell_t + (r_t - \delta)\, k_t\right] = T_t$$

$$z_t = (1-\rho_z)\,\overline{z} + \rho_z z_{t-1} + \epsilon_t^z; \quad \epsilon_t^z \sim \text{ i.i.d. } \left(0, \sigma_z^2\right)$$

4. **Exercise 4**

$$
\begin{aligned}
c_t &= (1-\tau)\left[w_t\ell_t + (r_t-\delta)\,k_t\right] + k_t + T_t - k_{t+1} \\
c_t^{-\gamma} &= \beta E_t\left\{1/c_{t+1}\left[(r_{t+1}-\delta)\,(1-\tau)+1\right]\right\} \\
-a(1-\ell_t)^{-\xi} &= c_t^{-\gamma} w_t (1-\tau) \\
r_t &= \frac{e^{z_t}}{\eta}(\alpha K_t^{\eta} + (1-\alpha)L_t^{\eta})^{\frac{1}{\eta}-1}\alpha\eta K_t^{\eta-1} \\
w_t &= \frac{e^{z_t}}{\eta}(\alpha K_t^{\eta} + (1-\alpha)L_t^{\eta})^{\frac{1}{\eta}-1}(1-\alpha)\eta L_t^{\eta-1} \\
\tau\left[w_t\ell_t + (r_t-\delta)\,k_t\right] &= T_t \\
z_t = (1-\rho_z)\,\overline{z} + \rho_z z_{t-1} + \epsilon_t^z; &\quad \epsilon_t^z \sim \text{ i.i.d. } \left(0,\sigma_z^2\right)
\end{aligned}
$$

5. **Exercise 5**

6. **Exercise 6**

$$
\begin{aligned}
c_t &= (1-\tau)\left[w_t\ell_t + (r_t-\delta)\,k_t\right] + k_t + T_t - k_{t+1} \\
c_t^{-\gamma} &= \beta E_t\left\{c_{t+1}^{-\gamma}\left[(r_{t+1}-\delta)\,(1-\tau)+1\right]\right\} \\
-a(1-\ell_t)^{-\xi} &= c_t^{-\gamma} w_t (1-\tau) \\
r_t &= \alpha K_t^{\alpha-1}(L_t e^{z_t})^{1-\alpha} \\
w_t &= K_t^{\alpha} e^{z_t}(1-\alpha)(L_t e^{z_t})^{-\alpha} \\
\tau\left[w_t\ell_t + (r_t-\delta)\,k_t\right] &= T_t \\
z_t = (1-\rho_z)\,\overline{z} + \rho_z z_{t-1} + \epsilon_t^z; &\quad \epsilon_t^z \sim \text{ i.i.d. } \left(0,\sigma_z^2\right)
\end{aligned}
$$