$$U'(C_t) = C_t^{(-\phi_c)}$$

$$U'(C_{t+1}) = C_{t+1}^{(-\phi_c)}$$

$$U''(C_t) = (-\phi_c)\ C_t^{(-\phi_c)-1}$$

$$U''(C_{t+1}) = (-\phi_c)\ C_{t+1}^{(-\phi_c)-1}$$

$$g(\mu) = \mu_t^{\theta_2}\,\theta_1$$

$$g'(\mu) = \theta_2\,\theta_1\,\mu_t^{\theta_2-1}$$

$$h(Y) = Y_t^{1-\gamma}$$

$$h'(Y) = (1-\gamma)\ Y_t^{(-\gamma)}$$

$$d(X_t) = d_2\,X_{t-1}^2 + X_{t-1}\,d_1 + d_0$$

$$d(X_{t+1}) = d_0 + d_2\,X_t^2 + d_1\,X_t$$

$$d'(X_T) = d_1 + X_{t-1}\,2\,d_2$$

$$Z_\tau = \frac{Z_t\ \frac{\theta_2}{\theta_2-1}}{\tau_t}$$

$$Z_Y = \frac{Z_t\ \frac{\theta_2\,(1-\gamma)-1}{\theta_2-1}}{Y_t}$$

$$E_\tau = \frac{\frac{(-1)}{\theta_2-1}\,\mu_t\,Y_t^{1-\gamma}}{\tau_t}$$

$$E_y = (1-\gamma)\ Y_t^{(-\gamma)} - Y_t^{(-\gamma)}\,\mu_t\ \left(1 + \frac{(-\gamma)}{\theta_2-1} - \gamma\right)$$

$$R_\tau = (1-\gamma)\ \alpha + K_{t-1}^{(-1)}\,Y_t^{1-\gamma}\ (1-\gamma)\ (-\alpha) + K_{t-1}^{(-1)}\,Y_t^{1-\gamma}\,\mu_t\ \left(1 + \frac{1}{\theta_2-1}\right) - \mu_t^{\theta_2}\,K_{t-1}^{(-1)}\,Y_t\,\frac{\theta_2\,\alpha\,\theta_1}{\theta_2-1}\,\tau_t^{(-1)}$$

$$R_Y = \alpha\,K_{t-1}^{(-1)} - K_{t-1}^{(-1)}\,Y_t^{(-\gamma)}\,\tau_t\,\alpha\ (1-\gamma)^2 + K_{t-1}^{(-1)}\,Y_t^{(-\gamma)}\,\mu_t\,\tau_t\ (1-\gamma)\ \alpha\ \left(1-\gamma-\frac{\gamma}{\theta_2-1}\right) - \mu_t^{\theta_2}\,K_{t-1}^{(-1)}\,\alpha\,\theta_1\ \left(1-\frac{\theta_2\,\gamma}{\theta_2-1}\right)$$

$$R_K(\tau_t, y_t, k_{t-1}) = Y_t\ (-\alpha)\ K_{t-1}^{(-2)} + K_{t-1}^{(-2)}\ Y_t^{1-\gamma}\ \tau_t\ (1-\gamma)\ \alpha - K_{t-1}^{(-2)}\ Y_t^{1-\gamma}\ \mu_t\ \tau_t\ (1-\gamma)\ \alpha + \mu_t^{\theta_2}\ K_{t-1}^{(-2)}\ Y_t\ \alpha\ \theta_1$$

$$R_K(\tau_{t+1}, y_{t+1}, k_t) = (-\alpha)\ Y_{t+1}\ K_t^{(-2)} + K_t^{(-2)}\ (1-\gamma)\ \alpha\ \tau_{t+1}\ Y_{t+1}^{1-\gamma} - K_t^{(-2)}\ Y_{t+1}^{1-\gamma}\ (1-\gamma)\ \alpha\ \tau_{t+1}\ \mu_{t+1} + K_t^{(-2)}\ \alpha\ \theta_1\ Y_{t+1}\ \mu_{t+1}^{\theta_2}$$

$$\log(A_t) = \rho\ \log(A_{t-1}) + \epsilon_t \tag{1}$$

$$R_t = \frac{Y_t\ \alpha\ K_{t-1}^{\alpha-1}}{K_{t-1}^{\alpha}}\ \left(1 - \tau_t\ (1-\mu_t)\ h'(Y) - g(\mu)\right) \tag{2}$$

$$\tau_t\ h(Y) = Y_t\ g'(\mu) \tag{3}$$

$$U'(C_t) = \beta\ U'(C_{t+1})\ (R_{t+1} + 1 - \delta) \tag{4}$$

$$C_t = Y_t - K_t + K_{t-1}\ (1-\delta) - Z_t \tag{5}$$

$$X_t = X_{t-1}\ \eta + (1+\nu)\ E_t \tag{6}$$

$$Y_t = K_{t-1}^{\alpha}\ A_t\ (1 - d(X_t)) \tag{7}$$

$$E_t = (1-\mu_t)\ h(Y) \tag{8}$$

$$Z_t = Y_t\ g(\mu) \tag{9}$$

$$U'(C_t)\ Z_\tau = Z_\tau\ \lambda_t\ U''(C_t) + \lambda_{t-1}\ \left(U''(C_t)\ (-Z_\tau)\ (1 + R_t - \delta) + U'(C_t)\ R_\tau\right) + \zeta_t\ (-E_\tau) \tag{10}$$

$$\beta\ \eta\ \zeta_{t+1} = \zeta_t + (d_1 + X_{t-1}\ 2\ d_2)\ K_{t-1}^{\alpha}\ A_t\ \omega_t \tag{11}$$

$$\zeta_t\ E_y = \omega_t + U'(C_t)\ (1 - Z_Y) + (1 - Z_Y)\ \lambda_t\ \left(-U''(C_t)\right) + \lambda_{t-1}\ \left((1 + R_t - \delta)\ U''(C_t)\ (1 - Z_Y) + U'(C_t)\ R_Y\right) \tag{12}$$

$$\begin{aligned} U'(C_t) = {} & \beta\ U'(C_{t+1})\ (1-\delta) + \lambda_{t+1}\ \beta\ (1-\delta)\ \left(-U''(C_{t+1})\right) + \lambda_t\ \left(U''(C_t) + (1-\delta)\ \beta\ U''(C_{t+1})\ (1 + R_{t+1} - \delta) + \beta\ U'(C_{t+1})\ R_K(\tau_{t+1}, y_{t+1}, k_t)\right) \\ & + \lambda_{t-1}\ (1 + R_t - \delta)\ \left(-U''(C_t)\right) - \alpha\ \beta\ \omega_{t+1}\ (1 - d(X_{t+1}))\ A_{t+1}\ K_t^{\alpha-1} \end{aligned} \tag{13}$$