Shooting Algorithm

Step 0 *Steady State Computation and Initialization* Solve[1]

$$H\left(k_t, k_{t+1}, k_{t+2}; z_t, z_{t+1}\right) = 0 \tag{1}$$

for the terminal steady-state $\bar{k}'$ that is associated with the permanent policy vector $\bar{z}'$, i.e. find the solution of

$$f'(\bar{k}') = (\rho + \delta)\left(\frac{1 - \tau_i'}{1 - \tau_k'}\right)$$

where $z = \left(g, \tau_c, \tau_n, \tau_k, \tau_i, \tau_h\right)$. Choose the initial level of capital equal to the original steady state, $k_0 = \bar{k}$, when $\bar{z} = z_0$. Select large time index $S >> T$, where T is the time when the government policies are set at their stationary values, $z_T = \bar{z}'$, and the stopping parameter ε.Guess an initial consumption level c_0.

Step 1 Use the initial consumption level c_0 and compute k_1 by the use of

$$k_1 = f(k_0) + (1 - \delta)k_0 - c_0 - g_0.$$

Let $t = 1$.

Step 2 *Simulation* Use the Euler equation

$$u'(c_t) = \beta u'(c_{t+1}) \frac{1 + \tau_{ct}}{1 + \tau_{c,t+1}} R_{t+1} \tag{2}$$

to solve for $u'(c_{t+1})$ where

$$R_{t+1} = \frac{1 - \tau_{i,t+1}}{1 - \tau_{i,t}}(1 - \delta) + \frac{1 - \tau_{k,t+1}}{1 - \tau_{i,t}} f'(k_{t+1}). \tag{3}$$

Then invert u' and compute c_{t+1}. Use

$$k_{t+2} = f(k_{t+1}) + (1 - \delta)k_{t+1} - c_{t+1} - g_{t+1} \tag{4}$$

to compute k_{t+2}.

[1] Using (4) for c_t and c_{t+1} and together with (3) for R_{t+1} putting them into (2) you get the second-order difference equation in k_{t+1} (1).

Step 3 Increase time $t = t + 1$ and go to Step 2 until you compute candidate values for $\{k_t, c_t, R_t\}_{t=1}^{S}$, i.e. until $t > S$.

Step 4 *Stopping Rule* If $\frac{|k_S - \bar{k}'|}{\bar{k}} \leq \varepsilon$ then go to Step 5. If $\frac{|k_S - \bar{k}'|}{\bar{k}} > \varepsilon$ then if $k_S > \bar{k}'$, raise c_0 and go to Step 1, or if $k_S < \bar{k}'$, lower c_0 and go to Step 1.

Step 5 *Computation of Other Variables* Using $\{k_t\}_{t=1}^{S}$ calculate other variables like $\left\{\frac{r_t}{q_t}, \frac{w_t}{q_t}, \frac{s_t}{q_t}\right\}_{t=1}^{S}$.

Step 6 End