

**Exercise 10: Homogeneous Agent Recursive Competitive Equilibrium**  
**Edward C. Prescott**  
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This economy consists of measure one of ex ante identical people. A representative person solves

$$\max E\{\sum_t \beta^t u(c_t)\}$$

subject to

$$\begin{aligned} 0 &\leq n_t \leq 1 \\ c_t + k_{t+1} &\leq w_{kt} k_t + w_{nt} n_t \\ c_t, k_{t+1} &\geq 0 \end{aligned}$$

all  $t$  where  $k_0 > 0$  is given. Elements  $w_k$  and  $w_n$  are rental prices of the factors of production.

There is a neoclassical aggregate production function

$$C_t + K_{t+1} \leq \exp(\phi_t) F(N_t, K_t)$$

where capital letters denote aggregate values or, since the measure of people is one, per capita values. Productivity shocks  $\phi$  are generated by

$$\phi_{t+1} = b \phi_t + \varepsilon_{t+1}$$

where the  $\varepsilon$  are iid and have mean zero. Here  $0 < b < 1$ .

- a. For this model economy specify to what each of the elements in the RCE definition corresponds.
- b. For the deterministic version of the economy, i.e.  $\text{var}(\varepsilon_t) = 0$ , specify a set of equations whose unique solution is the steady state.
- c. Outline how to put this into the linear quadratic RCE framework so that the approximate equilibrium behavior can be determined. (Assume the initial state is near the steady state point, the steady state is locally stable, and that the shocks are not too large).