DGE–CRED Practice Session 2: Implementation of a Model in Dynare

Andrej Drygalla, Katja Heinisch and Christoph Schult* | August 2020
Halle Institute for Economic Research

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Outline

1. Task 1: Derive the equations
2. Task 2: Find the steady state
3. Task 3: Declare the model variables and parameters
4. Task 4: Declare the model equations
5. Task 5: Implement the steady state routine
6. Task 6: Simulation

Task 1: Derive the equations for the Neoclassical Growth Model

- Households maximize lifetime utility subject to their budget constraint

$$\max_{\{c_t, k_{t+1}\}_{t=1}^{\infty}} = \sum_{t=1}^{\infty} \beta^{t-1} \frac{c_t^{1-\sigma}}{1-\sigma}$$

$$\text{s.t.} \quad c_t + k_{t+1} = A_t\, k_t^{\alpha} + (1-\delta)\, k_t$$

Task 2: Find the steady state of the model for $A = 1$

$$\lambda_t = c_t^{-\sigma} \tag{1}$$

$$\lambda_t = \beta\, \lambda_{t+1}(\alpha\, A_{t+1}\, k_{t+1}^{\alpha-1} + 1 - \delta) \tag{2}$$

$$c_t + k_{t+1} = A_t\, k_t^{\alpha} + (1-\delta)\, k_t \tag{3}$$

Task 3: Declare the model variables and parameters in Dynare and assign values to the parameters

- variables: c, k, A, λ
- parameters: β, δ, α, σ

Task 4: Declare the model equations in Dynare.

$$\lambda_t = c_t^{-\sigma} \tag{8}$$

$$\lambda_t = \beta\,\lambda_{t+1}(\alpha\,A_{t+1}\,k_{t+1}^{\alpha-1} + 1 - \delta) \tag{9}$$

$$c_t + k_{t+1} = A_t\,k_t^{\alpha} + (1-\delta)\,k_t \tag{10}$$

Task 5: Implement the steady state routine in a steady state file.

- You need to create a steady state file called `ModFileName_steady_state.m`.
- Use the template `SteadyStateTemplate.m` file.

Task 6: Simulate a permanent increase in productivity by 10%

1. Define the initial and terminal steady state.
2. Plot the trajectories of the endogenous variables.