DGE–CRED Practice Session 3: Macro Processor

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Outline

1. Task 1: Replace the Lagrange multiplier
2. Task 2: Add climate variables
3. Task 3: Add damage function
4. Task 4: Include climate related damages
5. Task 5: Modify the steady state
6. Task 6: Simulate

Task 1: Replace the Lagrange multiplier using local variables (#)

- Use the mod file from the previous practical session.
- Modify the `var` and `model` block accordingly.
- Is it necessary to change the steady state file?

Task 2: Use the Macro language to add an arbitrary number of climate variables

- Call the exogenous variables `CV_1` ... `CV_N`.
- Define an integer specifying the number of variables `ClimateVariables`.

Task 3: Use the Macro language to add climate related damages

- Define an array of climate coefficients called `ClimateCoefficient`.
- Add a damage function variable to the model variables called `D`, if there exists at least one climate variable.
- Add damage function coefficients as parameters called `theta_n_p`, if there exists at least one climate variable.
- Assign values to the damage function coefficients stored in `ClimateCoefficient`, if there exists at least one climate variable.

Task 4: Modify the model block to include climate related damages using the Macro language

$$D_t = exp(-\sum_{n=1}^{N} \theta_n CV_n), \tag{1}$$

$$c_t + k_{t+1} = A_t \left(1 - D_t\right) k_t^{\alpha} + \left(1 - \delta\right) k_{t-1}, \tag{2}$$

$$\lambda_t = \beta \, \lambda_{t+1} \left(\alpha A_{t+1} \left(1 - D_{t+1}\right) k_{t+1}^{\alpha} + \left(1 - \delta\right)\right. \tag{3}$$

$$\tag{4}$$

Task 5: Modify the steady state file to calculate a new long-run equilibrium

- You need to define damages `D` as a function of `CV_n`.
- Use the command `eval(['CV_' num2str(icocv)])` to define the damages.
- Further use a temporary expression to sum up all single components of the damage functions.

```
temp = 0;
if inbCV_p > 0
    for icocv = 1:inbCV_p
        temp = temp + ...;
    end
end
```

Task 6: Simulate the effect of an increase in temperature by one degree Celsius after 100 periods

- The first climate variable represents temperature.
- A one degree increase in temperature leads to a 10% reduction in total factor productivity. Specify the coefficient accordingly.
- Assume that temperature follows a step function and increases by 0.1 degree at the end of every decade. In order to specify the evolution of temperature one can use the block `shocks` described in the manual of dynare.