

Dynamic General Equilibrium Model for Climate Resilient Economic Development

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- 1 DGE-CRED Model: Scenario Creation and Simulation
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- 1 DGE-CRED Model: Scenario Creation and Simulation
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1.1 Introduction

- The DGE-CRED model allows its user to analyze and compare different scenarios
 - ▶ The model can be used without a detailed knowledge about programming
 - ▶ The user has to edit an excel sheet in order to: (i) set the paths of the exogenous variables, (ii) specify the initial and terminal values, (iii) assign parameter values, etc.
- The following slides encompass a guideline on how to create and simulate a new scenario
 - ▶ For a comprehensive explanation on how to set the structural parameters for the simulation, see the presentation “DGE_CRED_Training”

1.2 Setting up a new Scenario (1)

- At first, the user has to choose the:
 - ▶ number of sectors **k**
 - ▶ number of regions **r**
- The settings for the simulation of **k** sectors and **r** regions must be provided in “ModelSimulationandCalibration**k**Sectorsand**r**Regions.xlsx”
- To create a new scenario, a new sheet has to be added to this workbook
 - ▶ The name of the sheet becomes the name of the scenario
 - ▶ Avoid using symbols or spaces when naming the scenario
 - ▶ Examples of valid scenario names: RCP_45_Average, Baseline

1.2 Setting up a new Scenario (2)

- The trajectories of the exogenous variables examined in this new scenario must be added to the excel sheet
 - ▶ As the initial value is provided in the sheet “start”, values starting from period $t = 2$ must be provided
 - ▶ Note that absolute changes compared to the initial value must be provided
 - ▶ If no specific trajectory for an exogenous variable is provided in this sheet, the variable will remain at its initial value
 - ▶ Include a timeline in the first column of the sheet
 - ▶ Recommendation: Include a trajectory for population (exo_PoP)

1.2 Setting up a new Sceario (3)

- Example: Set up a new scenario called “RCP_45_Average” in a 3 sector and 3 regions setting. Include the trajectories of population (exo_PoP), temperature (exo_T_r), precipitation (exo_PREC_r) and sea level (exo_SL).

	A	B	C	D	E	F	G	H	I	J	K	L
1	Time	exo_PoP	exo_T_1	exo_T_2	exo_T_3	exo_PREC_1	exo_PREC_2	exo_PREC_3	exo_SL			
2	2	0,00936	0,060234983	0,04920008	0,054883757	1,416784716	2,887567184	1,658416575	0,005204737			
3	3	0,01881	0,119345254	0,09847229	0,10907469	2,800273623	5,652479667	3,27724083	0,010423423			
4	4	0,02841	0,176677603	0,14781417	0,161966736	4,125699744	8,207679464	4,827508431	0,015656059			
5	5	0,03666	0,231800643	0,197056584	0,213446285	5,375093598	10,49278112	6,28809279	0,020902644			
6	6	0,04487	0,284509159	0,246182411	0,263600615	6,535620414	12,46813408	7,644048804	0,026163179			
7	7	0,05306	0,335119085	0,295323237	0,31215606	7,598592635	14,11108617	8,884895949	0,031437664			
8	8	0,06127	0,383941754	0,344219902	0,359078176	8,557794828	15,41364652	10,00339151	0,036726097			
9	9	0,06953	0,431373796	0,393046716	0,40457402	9,409499936	16,38159477	10,99484829	0,042028481			
10	10	0,07616	0,477388833	0,441818061	0,448426603	10,15101026	17,03552692	11,85645383	0,047344813			
11	11	0,08269	0,521742714	0,490217142	0,490881456	10,78200387	17,41252669	12,58752772	0,052675096			
12	12	0,08911	0,563822216	0,53809736	0,532238741	11,30357037	17,56956119	13,18942403	0,058019328			
13	13	0,09542	0,603287418	0,585154546	0,571936803	11,71891535	17,58967703	13,66615512	0,063377509			
14	14	0,10165	0,640439964	0,631015205	0,609830449	12,0342544	17,58967703	14,02472325	0,06874964			
15	15	0,10604	0,675063789	0,675435997	0,645848333	12,25559962	17,58967703	14,27537137	0,07413572			
16	16	0,11073	0,706953682	0,718180457	0,679767513	12,39615357	17,58967703	14,43154291	0,07953575			
17	17	0,11565	0,736291879	0,759224153	0,711896767	12,46911401	17,58967703	14,51026247	0,084949729			
18	18	0,1207	0,763087633	0,798762145	0,742533658	12,49284677	17,58967703	14,53419871	0,090377658			
19	19	0,12579	0,787794758	0,836858401	0,771583325	12,49284677	17,58967703	14,53419871	0,095819536			
20	20	0,12875	0,811124837	0,873921139	0,798776013	12,49284677	17,58967703	14,53419871	0,101275364			
21	21	0,13211	0,833643966	0,910434091	0,824968539	12,49284677	17,58967703	14,53419871	0,106745141			
22	22	0,13578	0,855288724	0,946437321	0,85029547	12,49284677	17,58967703	14,53419871	0,112228868			
23	23	0,13969	0,876754777	0,982777455	0,875543102	12,49284677	17,58967703	14,53419871	0,117776544			

1.3 DGE_CRED_Model.mod

- After creating a new scenario in “ModelSimulationandCalibrationkSectorsandrRegions.xlsx”, open the Dynare file “DGE_CRED_Model.mod”
- Define the number of sectors **k** and regions **r**
- Example:

```
% =====  
% === Define number of sectors and regions ===  
% =====  
@# define Sectors = 3  
@# define Regions = 3
```


1.4 RunSimulations.m

- The next step is to open the MATLAB file “RunSimulations.m” and to specify the scenario names in “casScenarioNames”
- Example:

```
% =====  
% === Script to do multiple Simulations ===  
% =====  
% add dynare path to the search path of matlab  
addpath('C:\dynare\4.6.1\matlab')  
% specify scenario names  
casScenarioNames = {'Baseline','RCP_45_Average'};  
% execute dynare to run the model  
dynare DGE_CRED_Model noclearall
```

- Now, everything is set up for the simulation of the new scenario
 - ▶ Press “Run” to conduct the simulation

1.5 ResultsScenarioskSectorsandrRegions.xlsx (1)

- The results of the simulation are stored in
“ResultsScenarioskSectorsandrRegions.xlsx”
- There will be a result sheet for every scenario containing the trajectories of all model variables

1.5 ResultsScenarioskSectorsandrRegions.xlsx (2)

■ Example:

[illegible]

Outline

2 Appendix

- Determine the Trajectories of the Climate Variables
- Generate a Climate Change Scenario Sheet Automatically

2.1 Determine the Trajectories of the Climate Variables (1)

- The set of MATLAB files starting with the abbreviation CCS (Climate Change Scenarios) can be used to generate trajectories for temperature (T), precipitation (PREC) and sea level (SL)
- The excel workbook “Input_Climate_Change_Scenarios.xlsx” has to be edited by the user
 - ▶ The regions have to be specified in the sheet “define regions”
 - ▶ The target values for the climate variables must be provided in the respective sheets

2.1 Determine the Trajectories of the Climate Variables (2)

- Next, the user has to choose among different options/procedures in the MATLAB file “CCS_Run.m”
 - ▶ Now, everything is set up and the code can be executed
- The set of CCS files generates a discrete trajectory (annual basis) for all climate variables and scenarios specified in “Input_Climate_Change_Scenarios.xlsx”

2.2 Generate a Climate Change Scenario Sheet Automatically (1)

- A scenario sheet can be generated and directly written into “ModelSimulationandCalibrationkSectorsandrRegions.xlsx” by using the MATLAB code
“CCS_write_to_ModelSimulationandCalibrationkSectorsandrRegions.m”
 - ▶ Advantage: New scenarios for the climate variables do not have to be assembled manually
- This code can be use:
 - ▶ After the the MATLAB code “CCS_Run.m” has been executed
 - ▶ While these results are still in the MATLAB memory

2.2 Generate a Climate Change Scenario Sheet Automatically (2)

- The number of sectors **k** as well as the desired combination of the climate variables has to be chosen by the user
- Example:

```
% Choose the number of sectors:  
number_of_sectors = 3;  
  
% Design your scenario:  
simulation_scenario_RCP = {'4.5'};  
simulation_scenario_T = {'yes'};  
simulation_scenario_type = {'Average'};  
simulation_scenario_PREC = {'yes'};  
simulation_scenario_PREC_type = {'Average'};  
simulation_scenario_SL = {'yes'};  
simulation_scenario_SL_type = {'Average'};
```

- A descriptive name for the scenario will be assigned automatically