Resource Economics (Spring Term 2025)

Project Assignment
Topic 1

Frank Krysiak(frank.krysiak@unibas.ch)
Raul Hochuli (raul.hochuli@unibas.ch)

Administrative Remarks

- **Task Structure**
  - There are five main topics to be covered, one topic per group.
  - Each topic is split into three tasks of increasing difficulty.
  - Grade will depend on how many tasks you solve and the quality of your report.
    - Solved 1st task, passing; 2nd task, good; and 3rd task, excellent grade
- **Report Structure**
  - Introduction (Why is the topic / model feature relevant?)
  - Description of procedure (Which model settings or additional extensions are chosen for certain scenario runs and why? Assume you write for an informed reader and focus on your changes/extensions.)
  - Result interpretation (Which insights can you derive from your model scenario outputs and what is there relevance?)
- **Prerequisites**
  - There will be a final "DICE default" model version uploaded to ADAM that you can use for your modeling scenarios (ipynb).
- **Hand in**
  - Your written report (PDF, max 10 pages text).
    - Self-disclaimer, who worked on what part of the project (1 Grade per group)
    - No further formality requirements (font, spacing etc.) but keep it reason-

able for a good reading experience (also with regards to the number of graphs in your text).

- Your model code (one or multiple files, .ipynb or .py)
  * 1 Code "version" per scenario (e.g. 1 function with specified settings, 1 separate code file)
  * All your scenarios should run through with no changes (exception: path adjustment to import exogenous variables CSV)
  * If not, separate the scenario so as to not disturb your other simulations
- One naming convention for all files (e.g. "GroupX_Lastname1Lastname2.pdf")
- **Deadline: 29thJune 2025**, by email to raul.hochuli@unibas.ch

Topic 1 - Carbon Capture and Storage

Description

The ability to revert carbon emissions through technological innovation in the future is currently a hot topic in the environmental protection debate and has serious implications for modeling different future pathways. Use the three tasks below to elaborate on how this feature could be implemented in DICE and interpret its effects on the modeled future.

Tasks

1. The DICE default model assumes carbon capture and storage (CCS) is feasible at 20% of total emissions after 30 periods (150 years). But what if CCS will not be developed ever? Adjust your model, so that no CCS is possible at any point in time. How do climate mitigation and growth react?

2. When discussing the importance of CCS, the timing of the first future application and the volume of captured carbon are key determinants affecting the model outcomes. Use a number of scenarios to show how the interaction of these two parameters affects the optimal economic and environmental future in comparison to the results of the first task.

3. CCS technology is currently still in development and far from being economically feasible. DICE assumes a smooth increase in the abatement cost coefficient, regardless if we abate carbon emissions by using existing "greener" technologies or applying CCS. Adjust your model to reflect the assumption that using CCS is much more expensive than just regular abatement (`ECtr` ≤ 1), hence abatement cost increase at a steeper rate for `ECtr` > 1. Use an additional parameter `add_ECtr_CSS_cost:float` to add a linear cost increase to the total and marginal abatement cost for all the emissions that are abated through CCS.