

Project Assignment

Topic 4

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 4 - Discounting

Description

The DICE model uses classic economic discounting to distinguish between utility in the present and in the future using a social discount rate. This is in line with basic economic reasoning. However, this discounting has strong impacts on long-term problems, such as climate change. Use the three tasks below to elaborate on how changes/adjustments in the size and type of discounting has an impact in DICE and interpret its effects on the modeled future.

Tasks

1. The DICE default assumes a low social discount rate of ca. 1.5% and classic discounting. Imagine the world population is more patient and applies only a 0.5% rate. How does this affect optimal climate policy and growth?
2. Besides the social discount rate (illustrating patience in consumption), the elasticity of the marginal consumption utility (`elast_mrg_cons_utility`) is a key component that defines how the world population values utility (through consumption). Use multiple scenarios to illustrate how a 40% positive and or negative change to both of these parameters affects the model outcomes. Look at how an interaction of the two parameters affects your model results compared to the first task.
3. As most economic models, DICE also uses classic economic discounting to define the valuation of utility in the future. Hyperbolic discounting tries to represent a more realistic method for human valuation. You are free to choose a specification of hyperbolic discounting for your discount factor. Adjust your model and compare the outcome to previous model runs. (Hint: One possibility is to transform the default discount factor to a linear combination of $r + (1 - r)$, both weighted by an exponential multiplier to the power of the time index and two different weights $-\gamma$ and $-\delta$. In this case use the parameters `hyperbdisc_TF:str`, `hpyerdisc_gamma:float` and `hyperdisc_delta:float`).