

## Advanced Mathematical Economics, Visiting Student Project

Submission: date to be confirmed, by email to [andrew.clausen@ed.ac.uk](mailto:andrew.clausen@ed.ac.uk).

Do as much as you like of the following items:

- Write down a social planner's problem for global warming in which the social planner determines how much carbon dioxide gas is emitted. *Hint: Start simple. I recommend starting with the cake-eating problem with two time-periods.*
- Extend your model to accommodate investment in low-carbon technology.
- Is there a socially optimal plan? *Hint: use extreme value theorem.*
- Is the social cost of carbon dioxide convex? *Hint: look at Example 2.4.*
- Write down a Bellman equation in order to focus on the choices in one year only. *Hint: look at Example 2.4.*
- Use the envelope theorem to calculate the marginal social cost of carbon dioxide. *Hint: look at the sample solutions to the Micro1 Practice Question 11 parts (iii) and (iv).*
- Hopefully, the world will never end. Reformulate your model to accommodate an infinite number of years. Write down a recursive Bellman equation, and answer the same questions from above in this model. *Hint: look at the cake-eating problem in Appendix G.*
- Feel free to explore any other variations of the model, and apply any techniques that might be helpful for understanding what the social planner ought to recommend. You might get some ideas by looking at the Micro1 Practice Questions and solutions. For example, can your model address the following question: should society make a sudden/urgent change now, or should it gradually prepare for the future?

You will be assessed according to the learning outcomes (see the Assessment section of the website). Since this is an advanced course, earning a **pass** only requires demonstrating competency in one learning outcome only. To earn a **distinction**, you need to display all three major learning outcomes.

You are welcome to discuss your project with me during my office hours. I recommend that you do not discuss the specific ideas of your project with anyone else. (If you do, you must acknowledge such help in your writing.) However, you are very welcome to discuss generic ideas with others. For example, you are welcome to ask anyone for help in understanding any part of the lecture notes, the recommended textbooks, or the sample solutions to the Micro1 questions.

You are welcome to type up your work, but I do not recommend this. I suggest you write your assignment on paper, scan it in (or take photos), and email it to me. The writing needs to be legible, but you are welcome to cross things out, direct my attention with arrows, etc.

Good luck!