EC1340 – Fall 2025

Take home final
Due 11:59pm, December 13
Matt Turner

The object of this exam is twofold. First, to demonstrate that you know how to apply what we have learned in the course to a real life problem. Second, to explain clearly what you are doing. For this purpose, it is not enough to write down the answer. You need to explain what you have done and convince a sceptical reader that your answer is sensible.

To answer these questions you will need to make use of various parameters taken from class, and you will need to research some on your own. In each case, be explicit about where you find you data, and for parameters not described in class, provide a citation.

Try not to write more than 5p in a normal font and margins. There is no minimum page limit. If you can answer the question in a few pages that is fine. The exam is worth 100 points in total. Points for each question are given in parentheses.

You may use AI for help on this exam, but do not report AI output as your own.

I will hold extra office hours early in reading week, time TBD, if you have questions about this as you go along.

This exam asks you to use what you have learned in the course to assess the implications of AI for climate change.

1. (25) This question asks you to think about the harm that a data center causes. Suppose that a data center suitable for AI has a lifetime of 20 years.
   (a) Estimate how much carbon emissions are involved in the construction of a typical facility.
   (b) Estimate how much carbon is involved in the operation of a typical facility over its lifetime.
   (c) Using your estimates above, estimate the contribution of the typical facility to climate change in 100 years?
   (d) Using your calculations above, estimate the climate damage that each data center causes.
2. (25) This question asks you to think about the benefits from each data center. Suppose the entire increase in the value of the SP500 index/portfolio this year is due to AI data centers.
   (a) How much must each data center be worth in order for this to be true?
   (b) Suppose that each data center produces V of services in each year of its life. Given your estimate above, what is the value of V.
3. (25) This question asks you to think about the benefits of an AI data center net of the costs of climate change.
   (a) Suppose that the rate of return to capital is 5%. Using your estimates, do the benefits of an AI data center outweight their costs?
   (b) What is the highest interest rate at which the costs of climate change from an AI data center exceed the costs?
4. (25) In the course of your analysis, you will have made a number of simplifying assumptions. List three of them and explain which of them you think is most problematic.