

Master internship proposal: modelling abatement and abatement costs in IAM

Antonin Pottier
Chaire Energie et prospérité

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Context

Integrated Assessment Models (IAM) study the relations between climate and the economy. IAMs have been extensively used for climate policy analysis for several purposes: to compute the social cost of carbon, that is the intertemporal welfare cost of a ton of carbon emitted in the atmosphere, to assess feasibility of emissions reductions pathways and their associated costs, etc. Notably, the US Government Interagency Working Group (IWG) used them to assess the Social Cost of Carbon to be put in federal regulations.

Compact IAM, such as DICE (Nordhaus, 2008) or Response (Pottier et al., 2015), rely on reduced forms to model economic relationships. One concerns the representation of abatement, i.e. the percentage reduction of GHG emissions compared to a baseline scenario. Abatement is traditionally modelled as a flow, i.e. a decision variable that can be chosen without constraints at each period.

This was to a certain extent well suited to slow increasing abatement pathways. However, this formulation does not take into account that abatement is an investment that has long lasting effects. It also does not represent inertia in its variation. Recent works have kept the same modelling in a stochastic world, where, as a result, modelled abatement can exhibit rapid variations that have no counterparts in reality. This highlights the need to find a new representation of abatement to accommodate for this new context. The internship will contribute to overcome this difficulty.

Research outline

The internship aims at studying the alternative representation of abatement and its effects on abatement and emissions pathways. More precisely, it will seek to introduce a new representation of abatement that will move it closer to a stock than a flow. A special focus will be put on the calibration of the functional form introduced, to relate more closely theoretical modelling with empirical works.

Work during the internship will mainly consist in three related components:

- a review of literature on the different proposals to model abatement and its costs in a reduced form manner.
- evaluation of these proposals, especially with regards to computation burden and calibration needs.

- designing a representation of abatement and its costs with a special attention to the modelling of inertia. This modelling will be tested in compact Integrated Assessment Models already built. The effect on abatement pathways will be studied.

If time allows, further developments regarding the modelling of technical progress on abatement costs will be discussed jointly with Antonin Pottier and Aurélie Méjean (CIRED).

Skills

Ongoing M2 in economics or related field, programming in Python / Gams will be an asset.

Contact

The internship will be funded by the Chaire Énergie et Prosperité (<http://www.chair-energy-prosperity.org/>).

If you are interested by the internship, please send your CV and a cover letter to [antonin.pottier\(at\)univ-paris1.fr](mailto:antonin.pottier@univ-paris1.fr)

References

NORDHAUS, William D. (2008) — *A Question of Balance*, London: Yale University Press.

POTTIER, Antonin, Etienne ESPAGNE, Baptiste PERRISSIN-FABERT, and Patrice DUMAS (2015) — The comparative impact of Integrated Assessment Models' structures on optimal mitigation policies, *Environmental Modeling and Assessment* **20**(5), pp. 453–473.