An Analysis of Allowance Banking in the EU ETS

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- The cap and trade principle:
  - A cap on the total amount of greenhouse gases emitted by installations is fixed.
  - The allowances for emissions can be traded.
- Spatial trading:
  - The installations that need to increase their emissions must buy allowances ...
  - ... from those that require fewer allowances.
- Intertemporal trading:
  - Banking: units can save their allowances for future use or sale.
  - Borrowing: units can borrow allowances from their future allocations.

- The EU ETS:
  - Phase I: 2005 - 2007,
  - Phase II: 2008 - 2012,
  - Phase III: 2013 - 2020.
- Banking:
  - Allowances from Phase I not bankable into Phase II,
  - From Phase II no limitations on banking.
- Borrowing:
  - Possible only one year ahead because of the schedule,
  - Not allowed otherwise.

- At the end of Phase II of the EU ETS:
  - 2 billion unused EU allowances (EUAs)...
  - ... out of 10.2 billion EUAs distributed during Phase II.
- Policy debate about the *imbalance* of EUAs:
  - Shortcoming of the EU ETS,
  - Proposals to fix the *imbalance*.
- No consideration of intertemporal trading:
  - Important in the U.S.'s SO_2 trading system...
  - ... as shown by Schennach (2000) and Ellerman and Montero (2007).

Introduction

Objectives

- To adapt the theory of intertemporal trading to a smoothly declining cap.
- To present simulations of plausible banking outcomes for the EU ETS.

- We consider the planner's solution:

$$\min_{\{e_t\}} \left\{ \int_0^\infty e^{-rt} C(u_t - e_t)\ dt \right\}$$
$$\text{s. t. } \dot{B}_t = Y_t - e_t$$
$$B_t \geq 0$$

- where

u_t :	Counterfactual emissions in t	$\dot{B}_t$:	Addition to bank in t
e_t :	Actual emissions in t	B_t :	Accumulated bank in t
Y_t :	Cap in t		

- $C(.)$ is the abatement cost function where $C'(.) > 0$ and $C''(.) > 0$.

- r is the discount rate, $r > 0$.

The Model of Intertemporal Trading

Assumptions

Assumptions of the model:

1. Constant parameters,
2. Perfect foresight,
3. Competitive market for permits.

- Intertemporal cost minimization yields the following equilibrium condition:

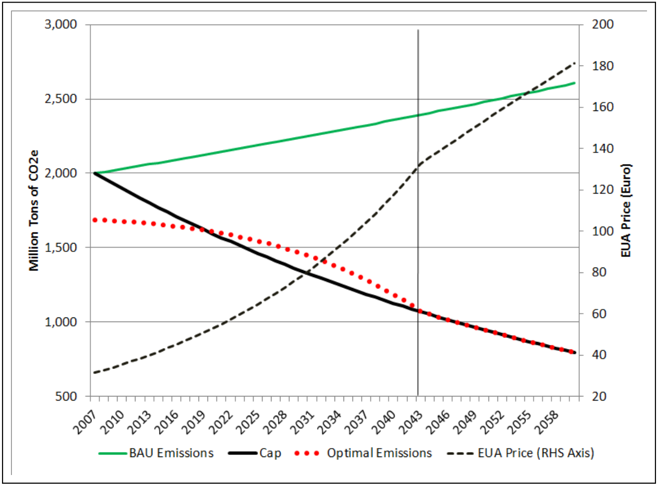
$$C''(u_t - e_t) = rC'(u_t - e_t) - \Phi_t$$

  where Φ_t is the multiplier associated with the constraint on borrowing, $B_t \geq 0$.

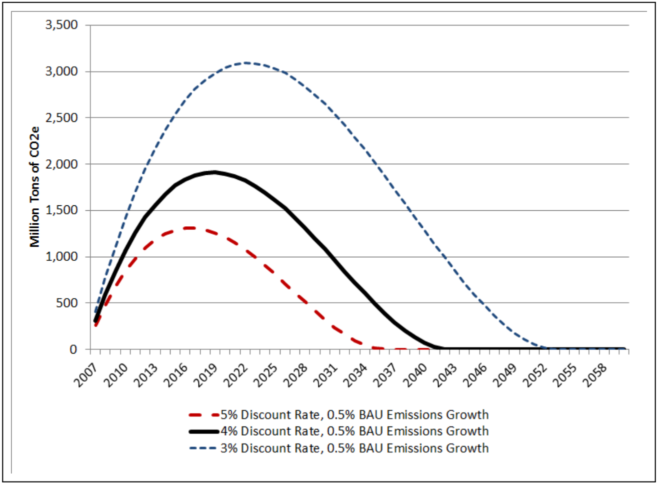
- Evolution of the marginal cost:
  - If $B_t > 0$, $\Phi_t = 0$: the marginal cost increases at the discount rate;.
  - If $\Phi_t > 0$, $B_t = 0$: the marginal cost increases less than discount rate.

Intertemporal Trading in the EU ETS

Simulation Results (1/3)



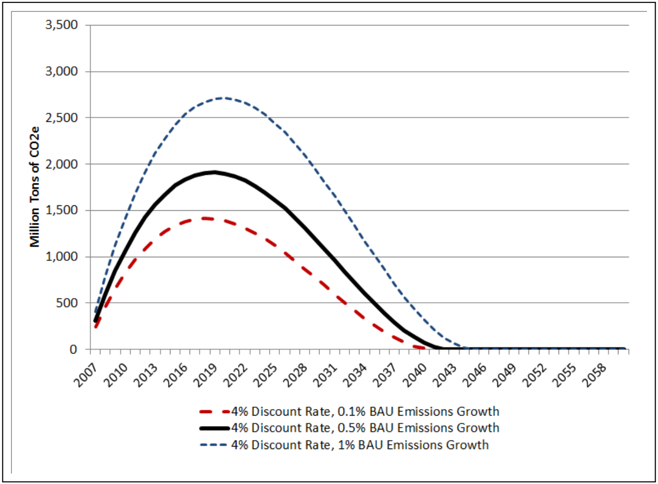
Cap, Emissions, Price Path, Baseline Case



Optimal Cumulative Bank, Varying Discount Rates

Intertemporal Trading in the EU ETS

Simulation Results (3/3)



Optimal Cumulative Bank, Varying BAU Emissions Growth

Conclusion

- It is rational to bank with a smoothly declining cap.
- Efficient banking behavior might at least partly explain the observed imbalance.
- Consideration of banking in the evaluation of the measures proposed by the European Commission.

Open Questions

1. Are there shocks?
2. Are firms risk-neutral?
3. Is the discount rate the same for every firm?
4. What is the time horizon of firms?

End

Thank you for your attention!