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Analytics and Empirics of Emission Trading

Abstract

In the acadamic discussion emission trading schemes (ETS) have emerged as a political instrument to both comply to emission targets and achieve this in a cost efficient way for all participants. However, until today most of the theoretical analysis in this area has been done in a qualitative rather than a quantitive way. In our research we aim to analyze already established ETS in terms of price volatility and jumpy behaviour and, based on this, point out alternative designs. We investigate how linking of different ETS effects the market price and consider various hybrid schemes. Our analysis is based on stochastic equilibrium models and employs techniques in financial mathematics used for option pricing.

Project

ETS have become one of the leading political instruments to achieve emission targets in an efficient way. However, permit prices are still highly volatile and show jumpy behaviour. In our research we aim to make suggestions on how to improve already existing ETS in order to make markets more predictable and less susceptible to regulatory changes. This would also lead to an increase in liquidity as new investors are drawn to the market.
In our research we focus on two different aspects. On the one hand we analyze what impact the linking of emission trading schemes would have on permit price behaviour. In this context we examine the relationship of trading schemes set up in different geographical zones and study price interactions and sensitivities. The other stream of our research investigates various hybrid schemes. We study the interaction of cap and trade schemes with other policy measures, like taxes or subsidies, or setting a price floor/ceiling. Furthermore we analyze the effects that changes in the regulatory framework (i.e allocation rules, banking and borrowing restrictions) might have on those hybrid schemes.
Our main aim is to establish new stochastic models which will enable us to perform a quantitative analysis of the price behaviour in established schemes and compare it to those of the afore-mentioned alternative schemes. Doing this we employ market equlibrium approaches and use methods from option pricing theory, to value seperate design features in permit prices. Furthermore we will perform an empirical analysis on EU-ETS data sets of the last years. This approach will provide us a deep insight into the complex characteristics which are specific for permit price processes.
The results of our research will significantly contribute to the understanding of hybrid schemes and the effects of linking already existing ETS. Policy makers as well as energy-generating firms will profit from the outcome of our research. The former will be able to assess the costs of different hybrid instruments and judge

their effectiveness. Furthermore our results allow to quantify the political risk associated with the various scheme designs. As our model design also allows to study the effects on risk management and investement decisions, energy-generating firms can base their choice of power-generation technologies on our results as well, which in turn directly effects the achievement of emission targets.