

Quantitative modeling of emission markets (Juri Hinz, mathj@nus.edu.sg)

During the last decades, market-based environmental instruments have attracted attention of policy makers all over the world. The role of these regulations is to institutionalize the creation of incentives for the use of cleaner technologies by the introduction of appropriate market mechanisms.

In a generic design, a cap-and-trade mechanism works as follows: A central authority sets the quantity of emissions it will allow (the so-called cap) within a pre-determined compliance period and then allocates the corresponding amount of fully tradable pollution rights to businesses. Each source of emissions participating in the scheme must have sufficient permits to cover all its emissions by the end of the compliance period to avoid penalty which applies for each unit of pollutant not covered by permits.

The introduction of marketable pollution rights is considered as an appropriate way to combat environmental problems on a global scale. According to theoretical arguments, a properly designed emission trading system should help reaching pollution reduction at low social costs. However, the practice of real emission markets provides a stress test for the underlying eco-

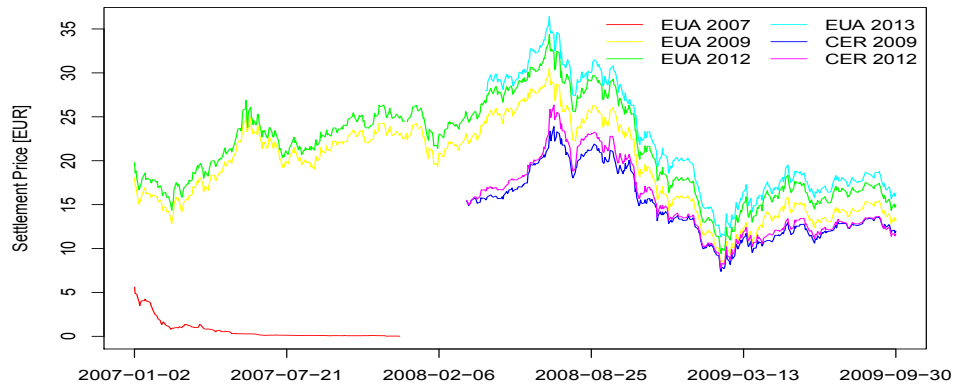


Figure 1: Prices of emission-related financial contracts.

nomic theory and raises a lively discussion about advantages and shortcomings of emission trading.

We highlight some core principles underlying quantitative understanding of emission markets and elaborate on mathematical problems and applications, arising in this context. Furthermore, we illustrate how the mathematical analysis of stochastic models may help understanding the mechanics of allowance price formation to tackle diverse questions in the area of risk management.