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The market (in-)stability reserve for EU carbon emission trading: Why it might fail and how to improve it

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ABSTRACT

The EU parliament has accepted a proposal of the EU commission on the backloading of EU emission allowances (EUA), where the auctioning of EUAs is postponed to future time periods. The EU commission has also proposed a market stability reserve (MSR), which is a quantity-based stabilisation policy that is aimed at controlling the volume of EUAs in circulation.

Using an agent-based electricity market simulation with endogenous investment and a CO_2 market (including banking), we analyse the backloading reform and the proposed MSR. We find backloading to only have a short-term impact of CO_2 prices; regardless, there is a significant risk of high CO_2 prices and volatility in the EU ETS.

Our simulations indicate that the triggers of the proposed MSR appear to be set too low for the hedging need of power producers, effectively leading to a stricter cap in its initial 10–15 years of operation. While the current proposal may be improved by choosing different triggers, a reserve that is based on volume triggers is likely to increase price volatility, contrary to its purpose. Additional problems are the two-year delay in the response time and the abruptness of the response function, combined with the difficulty of estimating future hedging behaviour.

1. Introduction

In recent years, the Europe Union's emission trading system (EU ETS) has experienced very low prices and a high level of price volatility. This has triggered a political discussion about stabilising the EU ETS and improving incentives for investing in CO_2 abatement. As a result of this discussion, the EU parliament accepted a proposal of the European Commission for “backloading” EU emission allowances (EUA), which means that a certain volume of EUAs is not auctioned until later (European Commission, 2012a).

A second stabilisation measure, proposed in Europe's climate strategy for 2020 to 2030, concerns a “market stability reserve” (MSR) (European Commission, 2012b). The MSR is a quantity-based policy instrument, based on the volume of EUAs in circulation. Both policy measures together mark a significant change of the EU ETS policy framework.

This paper investigates whether these two policies are able to stabilise prices (at a higher but still politically acceptable level) and to lower EUA price volatility. The long-term development of the power sector is characterised by strong path dependencies and non-linear relations. In addition, the actors are characterised by bounded rationality, especially with respect to investment decisions. The MSR itself also has a non-linear response function and works with a time delay. Therefore, we use the agent-based model EMLab-Generation (Richstein et al., 2014) to investigate the dynamic effects on investment of these policy changes. We extend this model to include backloading and the MSR.

In the next section, banking and hedging in the EU ETS are discussed because they play a key role in EUA price development. Next, the two policies are described and analysed (see Section 2). The model is introduced in Section 3, the results are presented in Section 4 and the conclusions are presented in Section 5.

2. Banking and the EU ETS reforms

In order to discuss the MSR and backloading, a short discourse into what motivates actors in the EU ETS to hold European Emission Allowances (EUAs) is necessary, since the MSR directly acts on the quantity of EUAs held. Afterwards we introduce the proposals of the European commission to stabilise EUA prices, and finally

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discuss the theoretic implications of the MSR and the backloading proposal.

2.1. The banking behaviour of power generators

We define banking as the holding of EUAs that exceed the amount needed for compliance in the current year. Two principal motivations are associated with banking EUAs: speculation based on future expectations of EUA prices and hedging future sales of products (most often power) that have greenhouse gas emissions as a side product or input cost (Schopp and Neuhoff, 2013).

Speculative banking in cap-and-trade schemes has a long history of treatment in academic literature, and is often simply referred to only as banking. On the one hand, this is because hedging was often ignored, thus making a distinction unnecessary, but also because it was often treated as a decision under abatement cost certainty, meaning that it was seen not as speculation but as a means of optimal planning. In general, a permit trading scheme will be efficient in achieving a cumulative emission target only if unlimited banking and borrowing is allowed and the social discount rate is used to make banking decisions (Rubin, 1996). This is also called inter-temporal efficiency because abatement takes place at those points in time that lead to a cost efficient achievement of the overall abatement target. For example, it may be efficient to postpone abatement, if considerable technological advancements that will lower future abatement costs are expected.[1] Leiby and Rubin (2001) discuss unlimited banking and borrowing[2] in permit trading for stock and flow pollutants under certainty (greenhouse gases are a stock pollutant due to their long-term effect). They find that if investors have a higher discount rate than a social planner,[3] companies will borrow more and bank less than is socially optimal. In other words, companies will postpone abatement further into the future than is socially optimal. To counter this effect, they suggest multiplying the volume of banked allowances with an interest rate to incentivise banking and promote socially optimal behaviour. Since Leiby and Rubin (2001) treat the problem as continuous and certain, they are possibly still under-estimating the effect of postponed abatement. Long-run infrastructures, that determine a large part of emissions, are discrete objects that have long-run effects and create path dependencies (see Section 3.1 for more details). Furthermore, heterogeneous actors make decisions under uncertainty. This could lead to further inefficiencies not captured by Leiby and Rubin (2001).

Newell et al. (2005) discuss the effect abatement cost shocks have on prices, meaning unanticipated changes in the costs of abatement to reach a given target, for example due to lower demand in a recession. Under unlimited banking and borrowing non-persistent shocks lead to quantity shocks, not price shocks, due to perfect inter-temporal arbitrage. For example in case of a negative shock, due to a recession, firms will foresee that abatement will still need to occur at the same costs level with a delay. Thus the CO_2 price stays at a similar level, but firms start to bank credits (or borrow less, depending on the original scenario). Thus, according to economic theory the current banking surplus is actually too small and not too big (at least under the assumption that the cap is set at the politically optimal level), since higher (inter-temporally efficient) current carbon prices would lead to an even bigger surplus. Newell et al. (2005) also discuss various options to stabilise prices under persistent abatement cost shocks by adjusting quantities based on fixed rules or discretionary action by the regulator.

Currently, hedging in the EU ETS is mainly driven by future power sales. This accounted for a majority of currently banked EUAs at the end of 2013 (Neuhoff et al., 2012; Tschach et al., 2014). Power companies sell their power on future markets to reduce volume and price risks (Doege et al., 2009). When doing so, they also cover the open positions for their production input, among them fuels and EUAs. According to Eurelectric (2009), power producers in Europe hedge between 10 and 20% of their output three years in advance, 30–50% two years in advance and 60–80% one year in advance on a cumulative basis. However, as acknowledged by the European Commission (2014) hedging behaviour may change over time: it depends on forward sales or contracts of companies, which in turn might vary with the risks and volatility faced in the markets in which the companies participate, the demand for forward sales, and whether they can pass on their EUA costs to their customers (which is why companies at risk of carbon leakage may be provided with free EUAs).

Neuhoff et al. (2012), based on a series of interviews with stakeholders, stipulate that there is a difference between the interest rates of speculative banking and hedging. The distinction between hedgers and speculators is an accepted insight in financial theory (Bailey, 2005). Furthermore, Schopp and Neuhoff (2013) point out that power producers might incorporate expectations about prices into their hedging strategies. They may, for example, increase the forward sales of carbon intensive production (e.g., coal) when they expect a tighter emission market (Schopp and Neuhoff, 2013). This could also be described as an attempt to lock in clean dark spreads,[4] that appear favourable to power producers. By changing their forward sales, they can hold more EUAs, while still having no open position (that is, they do not hold emission allowances for which they have not already sold the corresponding electricity. Deviating from this rule would be speculative banking and outside of the risk management criteria of many electricity companies). Thus, according to Schopp and Neuhoff (2013), up to the hedging horizon of 3–4 years and within the risk management criteria of power companies, banking takes place at a low discount rate (estimated to be between 0 and 10%). Banking volumes exceeding this hedging flexibility are discounted more heavily (rates exceeding 10–15%). This possibly explains the low prices in the EU ETS, since hedging flexibility, as determined by the risk management procedures of power producers, may well be exhausted.

2.2. Improving the ETS: backloading and the MSR

The so-called “backloading” is a rescheduling of part of the auctioning volumes of EUAs. As defined by the European Commission (2012a) and European Commission (2014b), for the years 2014, 2015, and 2016, 400, 300 and 200 million fewer EUAs respectively were intended to be auctioned than originally scheduled. These EUAs are auctioned at a later point in time, hence the term “backloading”: In 2019, an additional 300 million EUAs will be auctioned and in 2020 the auctioning schedule will be increased by 600 million EUAs.

The MSR is a quantity-based addition to the EU ETS active from the year 2021 on (European Commission, 2014a): The amount of EUAs that are auctioned is reduced if the upper threshold of 833 million EUAs in circulation is exceeded. In this case, with a two-year

[1] Assuming that there is no negative effect on technological advancement due to the postponement of installing abatement technologies.

[2] To the knowledge of the authors no existing carbon trading scheme allows borrowing. Possible reason are outlined by Fankhauser and Hepburn (2010), among them adverse selection.

[3] A social planner is a purely theoretical agent of welfare economics that optimises welfare results for all involved parties.

[4] The gross margin of coal power plants after obtaining fuels and emission allowances.