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ASYMMETRIC COST PASS-THROUGH OF EMISSION ALLOWANCE PRICES IN THE GERMAN ELECTRICITY WHOLESALE MARKET

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Overview

This paper analyzes the pass-through of CO^2-emission allowance prices in the German wholesale electricity market. The asymmetric development of price increases and price decreases is an observable fact in many markets.[1] Thereby two phenomena can be distinguished: prices rise faster than they decrease ("rockets and feathers") and; cost increases have a stronger effect on prices than cost reductions (asymmetry in markup). In the energy sector Borenstein et al. (1997) showed that US gasoline prices respond asymmetrically to crude oil price changes, thus giving evidence for the second phenomenon. They suggest a model of tacit collusion with imperfect monitoring to explain their finding (as in Tirole, 1988; p.264). Geweke (2004) surveys 18 papers on asymmetric pricing in the gasoline market, demonstrating the importance of this approach.

Asymmetric pricing has not been studied in electricity wholesale markets so far. As wholesale electricity markets in continental Europe feature an oligopolistic structure one could expect the exercise of market power. Such behaviour is, however, difficult to detect because of private marginal cost information and volatile demand. With the introduction of the EU emission trading scheme (EU ETS) CO_2-emmission allowances became a considerable cost factor for electricity generators. In perfect electricity markets a small cost increase should in general lead to the same absolute electricity price change as an equally sized cost decrease. In this paper, this hypothesis of symmetric cost pass-through is tested empirically.

Using a regression model we are able to show that rising allowance prices have a significantly stronger impact on electricity prices than falling allowance prices. This indicates that generators directly pass-through increasing cost but hesitate to hand-over declining cost to their customers.

Methods

A dummy regression is used to test the null-hypothesis of symmetric cost pass-through. Electricity price changes are explained by four variables: constant, time trend, natural gas price change and emission allowance price changes. This basic model, representing the null hypothesis of symmetric cost pass-through is compared with an alternative formulation where positive and negative emission allowance price changes are considered separately. Thus, there would be evidence for asymmetric cost pass-through if the variable for emission allowance price increases is bigger than that for emission allowance price decreases and if the asymmetric model explains electricity price changes significantly better than the symmetric model. We intend to extend the final version of the paper by additionally testing for the "rockets and feathers" phenomenon by implementing an Error Correction Model (ECM) as suggested in Geweke (2004).

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[1] "In two out of three markets, output prices rise faster than they fall" (Peltzman (2000, p480) cited after Tappata (2006, p15).

Preliminary Results

Both models are estimated using nine working days rolling averages of EEX electricity prices, TTF natural gas prices and EEX emission allowance prices for 2005 and 2006. Table 1 summarizes the estimation results. The parameters for emission allowance price increases (base 2.2, peak 3.1) are always higher than those for emission allowance price decreases (base 0.7, peak 0.7). Using an F-test we show that the asymmetric model explains electricity price changes significantly better than the symmetric model.[2] Thus the null hypothesis of symmetric cost pass-through has to be rejected which in consequence provides evidence for asymmetric cost pass-through.[3] It is planed to extend the final version of the paper by additionally applying the methodology to a seemingly more competitive market (e.g. UK or US) to obtain a benchmark.

Table 1: Influence of cost changes on electricity price changes in the German wholesale market, 2005-2006

	Model	*Constant*	*Time Trend*	*Natural gas price*	*CO_2-emission allowance price*		*R^2*
					increase	*decrease*	
base	*symmetric*	-5.6**	0.04**	2.5**	**1.1****		0.31
	asymmetric	-8.4**	0.05**	2.6**	**2.2****	**0.7**	0.31
peak	*symmetric*	-8.7**	0.07**	3.6**	**1.4****		0.27
	asymmetric	-13.2**	0.07**	3.8**	**3.1****	**0.7**	0.27

Source: Calculations done by the authors, significance level: ** 1%, * 5%

(4) Conclusions

The paper shows that in the German wholesale electricity market, emission prices are passed-through asymmetrically to electricity wholesale prices. Unlike in other markets, search cost are insignificant in wholesale electricity markets[4]; therefore, most of the asymmetry can be attributed to strategic behaviour of the oligopolistic suppliers. Thus the presented pricing asymmetry test can be used as an indictor for the actual degree of market power exercise in electricity wholesale markets.

References

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[2] The F-test statistic for the similarity of the asymmetric and symmetric model is 4.93 in peak and 5.00 in base. As the critical value is 3.87 on the 95% confidence level the null hypothesis can be rejected in both cases.

[3] When interpreting the results one has to be aware that regressing rolling averages produces autocorrelated residuals, that emission allowance prices and natural gas prices are slightly correlated and that the low R^2 might point to the omission of important explanatory variables (e.g. demand).

[4] Tappata (2006) models asymmetric pricing as an effect of search cost.

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