INFLUENCE OF THE EMISSION PRICES AND BANKING OF ALLOWANCES ON STEEL COMPANIES IN THE CZECH REPUBLIC

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Abstract

A steel industry was, like all other market sectors, struck by financial and economic crises whose impacts are noticeable even a couple years after, in 2015. In such an uncertain and unstable environment, it is severely crucial to achieve the maximum efficiency of business processes. Steel companies in the EU are under the effect of carbon trading which can be both a competitive advantage (but rather) a threat. This paper is focused on assessing the efficiency of steel companies' emission management and exploring the influence of two important factors of this process – emission price and a possibility of banking (transferring of unused allowances to following periods). This impact is researched using the real historical data of four large steel companies in the Czech Republic. Several scenarios of both companies' behaviour and alternative conditions of the emission trading system are considered and assessed.

Keywords: EU ETS, EUA, emission price banking, steel companies, CO_2.

1. INTRODUCTION

Since 2005, when the emission trading within the European Union was established, environmental management must be taken into considerations by industrial companies. Many researches performed in the past showed that the influence of the EU ETS (Emission Trading Scheme of the European Union) cannot be neglected, see [1], [2] or [3]. The aim of this paper is to assess an influence of the carbon emission trading on steel companies. Two main factors of the emission trading systems are explored – price of emissions and a possibility of banking. The former is driven by a market (thus uncertain and very hard to forecast, see Chapter 2), whereas the latter is determined by emission trading policy makers and it can be considered to be certain for a given time period. Using the historic data on emission prices and the banking availability, possible influence of emission trading depending on behaviour of a company is explored. Above that, potential scenarios regarding the availability and non-availability of banking are considered to be able to assess an impact of this factor.

Many studies were focused on evaluation of influence of emission prices on impacts of the EU ETS on both its efficiency and its participants. These studies are often connected with the econometric analysis of the emission price, see e.g. [4] or [5]. An effect of banking has been also already explored, see [6].

The paper is organized as follows. After this short introduction, a brief overview of the EU ETS system together with its conditions changing in time is presented. This chapter enable better understanding of the system which is crucial for meaningful determination of scenarios. The Chapter 3 creates an essential core part of the paper because it contains the description of the data used for further analyses, scenarios building with their reasoning and description and, finally, the analysis of impact of chosen factors on steel companies participating in the EU ETS. Four steel companies in the Czech Republic are used for these purposes.

2. CARBON TRADING IN THE EU AND ITS CHARACTERISTICS

It is not necessary to provide here the complex description of the EU ETS system and its history. Only the facts which are important for analyses in this paper are presented, for more detailed information, see e.g. [7].

2.1. The EU ETS system

The emission trading system was launched in 2005 in reaction to the ratification of the Kyoto protocol in order to decrease an amount of carbon dioxide released to the atmosphere by the member countries of the EU and their companies. The main directive containing all the condition of the system is [8]. The main idea of the EU ETS is that every EU industrial company doing its business in the field listed in [8] (steel industry, heavy machinery, power production, paper, lime or cement production etc.) with a net heat excess 20MW, must cover each ton of CO_2 by one emission permit (allowance). In April, companies have to "pay" for their emissions released in the last year by allowances. A part of them are granted to companies for free (an amount depends on the field of industry and the benchmark evaluating the efficiency of the company in comparison to other companies in the same field. If the company needs additional permits, it can buy it on the market and, if the company has a surplus of allowances, it can sell it. The evolution of the EU ETS is divided into 3 phases – EU ETS I (2005-2007), EU ETS II (2008-2012) and the current EU ETS III (2013-2020). For each phase, the conditions of system were adjusted in order to increase system efficiency, for more see e.g. [7].

2.2. Emission price

The EU ETS was established as a cap-and-trade system. It means that an amount of permits in the system is fixed (and determined by the EU authority) and the price of allowance is determined by the market. The main type of allowances used in the EU ETS is EUA (European Union Allowance). Except of that, also other types of permits (originating in other emission trading systems) can or could be used, but with some limitations, e.g. CER (Certified Emission Reduction) or ERU (Emission Reduction Unit). For a sake of simplicity, these minor types as well as the derivatives of EUAs are not taken into account in this paper. In the **Fig. 1**, the development of EUA allowance prices from the beginning of the system till March 2015 is shown. Data on the EU ETS I were obtained from the EEX market database and the data on the EU ETS II and EU ETS III were derived from the SendeCO2 market (despite the fact that many markets offering different prices, the correlation between them is more than 99%, see [7]). It can be seen that for most of time, the trend of the time series is decreasing. This was caused especially by the over-allocation of free permits to companies (i.e. companies did not need to purchase any additional permits). In the end of the EU ETS I, the price fell very close to zero because the banking was not allowed – all allowances unused till the first phase of trading were worthless.

2.3. Banking within the EU ETS

If a company does not use all freely allocated permits in any year, it can bring them forward to the next year and use it later (in the case that it does not want to sell them). This could be done within the any of three trading phases. But, it was not always true for transferring between the phases. This so called banking was forbidden between the EU ETS I and EU ETS II. An issuance of the additional Directive [9] brought, inter alia, a possibility of banking between EU ETS II and EU ETS III, which averted a threat of another price collapse similar to that of 2007 and 2008.

Fig. 1 Prices of EUA (April 2005 – March 2015) [source: sendeco2.com, eex.com]

3. IMPACT OF BANKING AND EMISSION PRICE ON STEEL COMPANIES

3.1. Data

Two kinds of data were used to analyses – data on historical EUA emission price (see **Fig. 1**) derived from the databases of stock exchange markets (EEX, SendeCO2) and data on amounts of freely allocated allowances and released CO2 emissions obtained from the Carbon Market Data database[1]. Observations on prices are available daily (1st April, 2005 – 31st March, 2015), whereas the business data are delivered yearly (2005-2014). For purposes of analyses considered, the data of four big steel companies in the Czech Republic were aggregated – ArcelorMittal Inc. (**F1**), Vítkovice Steel, Inc[2] (**F2**), Třinecké Železárny Inc. (**F3**) and. Vítkovice Inc (**F4**).

3.2. Building the scenarios

In order to be able to evaluate the impact (both real and potential), various scenarios are considered. Due to the high volatility of emission price (see **Fig. 1**), a time of purchase/sale has a crucial effect.

A company can:

- end each period with no permit on its allowance account, i.e. possible surplus of allowances is sold each year separately (like the banking is forbidden even for year-to-year transfers) – value of **1** of criterion **C1** in **Table 1**;
- or it can bring this surplus forward to the following period (value of **2** of criterion **C1** in **Table 1**).

A company can purchase/sell additional allowances:

- in the end of the period on 30th April (when it already knows a required/unnecessary amount of permits) – value of **E** of criterion **C2** in **Table 1**;
- or in the beginning of the period (this is rather a potential option because a company cannot know a precise number of allowances required for that period) – value of **B** of criterion **C2** in **Table 1**;

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[1] available from: carbonmarketdata.com

[2] from 2007 to 2014 called EVRAZ Vítkovice Steel

- or during the whole period (median price for period is considered) – value of **M** of criterion **C2** in **Table 1**;
- or for the optimum price of the period, i.e. for maximum price in the case of sale and for minimum price in the case of purchase (this alternative serves only to explore the potential of the impact of emission price – the company is not able to recognize the moment of optimal price – value **O** of criterion **C2** in **Table 1**.

This time, it is already known that the banking between EU ETS I and EU ETS II was forbidden, whereas between EU ETS II and EU ETS III it was allowed (value of **F-A** of criterion **C3** in **Table 1**). But, also other potential alternatives can be taken into account, in order to explore the effect of banking:

- banking between both couples of trading phases allowed (value of **A-A** of criterion **C3** in **Table 1**);
- banking between both couples of trading phases forbidden (value of **F-F** of criterion **C3** in **Table 1**).

With respect to aforementioned possibilities, 10 scenarios **S1-S10** are established, see **Table 1**. In order to distinguish, which scenarios are *real* and which are used only to explore the impact of factors, the criterion **C4** is added (**R** for real and **P** for potential). It is obvious that each scenario assuming the knowledge of future behaviour is unreal. To improve clarity, values of criteria violating reality are written bold.

Table 1 – Scenarios established for analyses

	S1	**S2**	**S3**	**S4**	**S5**	**S6**	**S7**	**S8**	**S9**	**S10**
C1	1	1	1	1	2	2	2	2	**2**	2
C2	E	**B**	M	**O**	E	**O**	M	**O**	**M**	**O**
C3	F-F	F-F	F-F	F-F	**A-A**	F-F	**A-A**	**A-A**	F-A	F-A
C4	R	P	R	P	P	P	P	P	P	P

3.3. Analysis of scenarios – practical example

All the calculations were done using the MS Excel. The overall results are shown in **Fig. 2** and **Table 2**.

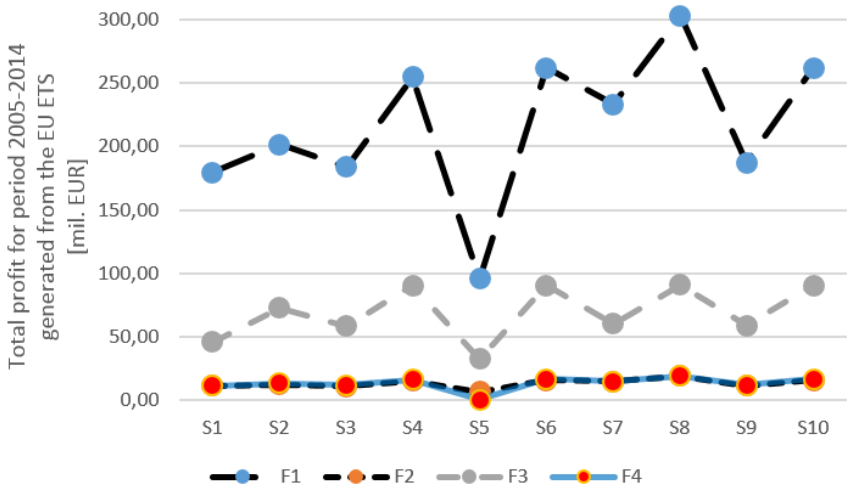

Fig. 2 Overall results (optimal profits) of all scenarios [source: author's calculations]

In order to keep clarity of figure, discrete values in **Fig. 2** were connected with lines. The values in this figure presents the total profit generated by emission trading by each company and each scenario for the period from 2005 to 2014. Due to the very similar volume of CO_2 released by **F2** and **F4**, their results are also very

similar. In the case of all the companies, if allowances would be bought/sold for the optimal price (min/max), the total profit generated by the emission trading would be the highest, regardless the possibility of banking (**S4**, **S6**, **S8**, **S10**). All the companies would reach the absolute maximum profit if they follow the **S8** scenario, which is described in details in **Table 3**. Unfortunately, all these scenarios are only potential (fictitious) because no one can predict the moment of optimal prices. On the contrary, the absolutely worst possibility for all companies would be the **S5,** under which the allowances are sold only in the end of the last year from the period considered. This behaviour is, however, also very improbable because of a decreasing trend of emission prices. Another fact, which is also obvious when looking at **Fig. 2** and **Table 2**, is that it is a little more beneficial to not sell the unused permits after each year (period). When considering the median prices, **S3** and **S9** may be compared and the results of the latter is better only by from 0.2 to 1.2 percentage points comparing to the optimal scenario **S8**. From the presented results, it can be seen that emission price has a fundamental impact on profit from emission trading of all steel companies in the Czech Republic.

Table 2 Overall results (optimal profits) of all scenarios and a percentage comparison with **S8**

	[mil EUR]				Comparison with **S8** [%]			
	F1	F2	F3	F4	F1	F2	F3	F4
S1	179.33	11.16	45.83	11.08	59.2%	59.8%	50.6%	58.6%
S2	201.57	12.02	72.64	12.95	66.5%	64.4%	80.2%	68.5%
S3	184.01	10.81	58.38	11.55	60.7%	57.9%	64.4%	61.1%
S4	254.95	14.98	90.33	16.04	84.1%	80.3%	99.7%	84.9%
S5	95.63	6.26	32.41	0.29	31.6%	33.5%	35.8%	1.5%
S6	262.23	15.43	90.47	16.42	86.5%	82.7%	99.9%	86.9%
S7	233.48	14.66	59.90	14.63	77.0%	78.5%	66.1%	77.4%
S8	303.09	18.66	90.60	18.90	100.0%	100.0%	100.0%	100.0%
S9	187.15	11.02	58.56	11.77	61.7%	59.1%	64.6%	62.3%
S10	262.23	15.43	90.47	16.42	86.5%	82.7%	99.9%	86.9%

Table 3 Optimal strategy of companies under Scenario **S8**

	F1		F2		F3		F4	
	Profit [mil. EUR]	EUAs left [1000 pcs]	Profit [mil. EUR]	EUAs left [1000 pcs]	Profit [mil. EUR]	EUAs left [1000 pcs]	Profit [mil. EUR]	EUAs left [1000 pcs]
2005	0	2262.84	0	122.925	0	498.05	7.32	0
2006	122.77	0	7.887239	0	19.12	0	0	91.82
2007	0	1518.02	0	119.98	0	18.74	3.99	0
2008	59.02	0	3.9981957	0	-1.60	0	0	106.12
2009	0	2366.49	0	142.55	0	133.60	0	214.59
2010	0	4465.94	0	293.126	-0.97	0	5.78	0
2011	107.52	0	5.3409048	0	72.61	0	1.15	0
2012	17.45	0	1.3275625	0	3.06	0	0	43.72
2013	-1.17	0	0	11.657	-0.55	0	0.65	0
2014	-2.49	0	0.1053703	0	-1.07	0	18.90	0

The impact of banking differs company-by-company. When comparing scenarios with different banking conditions and median prices (**S3**, **S7** and **S9**), in the case of **F3**, the results are nearly the same, see **Fig. 2** and **Table 2**, thus the impact of banking (both the real one between EU ETS I and EU ETS II and the theoretical one between EU ETS II and EU ETS III) is negligible for this company. Whereas for a rest of companies, differences between the reality and the “no-banking-allowed” situation is very small (which was already aforementioned above), but the substantial difference between the scenario with no banking and the

reality was found out. When comparing these alternatives, variance from 15.1 to 19.4 percentage points was discovered (still comparing with optimal **S8** scenario). That is why it can be concluded that the banking had an important influence on majority of steel companies in the Czech Republic but not on all of them.

Scenario **S1** can be considered to be the initial (strictly conservative) strategy, thus the companies should not go under the values of this scenario. But, with further analyses and additional information and forecasts, the profit of companies can approach to results of the optimal scenario **S9**, which brings 40 and more percent higher profit from the emission trading.

CONCLUSIONS

The main result of this paper is the fact that the emission price (and the related moment of trade) had a crucial influence on the EU ETS' impact on steel companies in the Czech Republic. The optimal total profit, which could have been achieved by all the companies considered was by more than 40% higher in comparison with the conservative strategy, under which no permit is transferred from period to period by a company. On the basis of performed analysis, following conclusions regarding the impact of banking on steel companies in the Czech Republic can be done. A possible prohibition of allowances transfer between the second and third phase would have only negligible effect on the companies considered. However, for 3 of 4 steel companies in the Czech Republic, forbidden banking between EU ETS I and EU ETS II brought the negative effect. For further research, it would be highly beneficial to add also other factors to analyses and also the companies from other fields, not only from the steel industry.

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