PRINCIPLES AND PRACTICES FOR TRADING EMISSION

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Rezumat

După anul 2000, problematica referitoare la comercializarea cotelor de emisii a prezentat interes pentru studiu şi cercetare, de puțin timp în urmă, ca o consecință a observării efectelor negative pe care poluarea mediului le manifestă asupra omului, economiei, societății, naturii. În ultima perioadă, o parte însemnată a specialiştilor din domeniul protecției mediului a încercat să găsească răspuns la întrebarea: „de ce comercializarea cotelor de emisii a devenit o componentă cheie în reforma politicii de mediu?" Pentru a răspunde la această întrebare, dar şi pentru a oferi o bază consistentă de evaluare cu succes a reformelor ambientale, trebuie definite unele noțiuni cu privire la alocările optime ale controlului responsabilității. Teoria pe care se bazează rentabilitatea costurilor – principala bază pentru reglementările actuale – este dezvoltată şi utilizată ca una dintre principalele căi de măsurare şi apreciere a sistemelor existente.

Abstract

After 2000, the topic regarding the emissions trading system was of interest for study and recently for research, as a consequence of the adverse effects which the environmental pollution has on man, economy, society and nature. Lately, a significant part of the environmental protection specialists tried to find an answer to the question: "why is the system of trading emissions a key-component of the environmental policy reform?" To answer this question, and to provide a consistent basis of successful evaluation of the

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environmental reforms, we need to give definitions to some notions regarding the optimal allocations of responsibility control. The underlying theory of cost profitability – the main basis for the current regulations – is developed and used as one of the main ways to measure and evaluate the existing systems

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Principles and practices in the emissions trading system

Two main types of participants manifest in the process of air pollution regulation, types which are essential within this complex process. While the regulation authorities have the statutory responsibility to ensure the acceptable quality of the air, the management of the pollution resources (such as the industry, the automobiles, the power stations etc.) they need – as ultimatum – to act in such a way as to reduce pollution to a sufficient level matching the environmental protection goals. The key to the successful application of these regulations is the development of programs which to harmonise the efforts of the two groups.

The main responsibility of the regulating body in environmental matters is to decide the allocation of the responsibility of the control between sources, to design the manner of implementing these decisions, to monitor the compliance with the regulations and to set actions of sanctioning and/or compelling if the regulations are not observed.

The basic problem in approaching the command and control is the mismatch between capabilities and responsibilities. Together with the stimulation of allocating the responsibility of controlling the profitability of costs (authority control), they have too little valid information to accomplish their objectives. Although there may exist the best information regarding the settlement of costs, the enterprise managers are not stimulated to accept voluntarily the responsibility of their actual costs or to transmit impartially the legal cost information towards the empowered authorities. Under these conditions, they may only assume the actual costs. Furthermore, the enterprise managers are stimulated to accept a low level of responsibility control

if there is a possibility to preserve or consolidate a competitive position.

In this type of environmental policy, it is not surprising to find the allocation of the order and of the control, becoming by itself a form of profitability of the actual cost. What may really be surprising, in the light of the complexity of subject, is that this form of cost profitability is not an irrational objective for other activities.

Essentially, this problem narrows to the strategic and tactic analysis of the measures necessary to be implemented worldwide with the purpose to reduce the pollution level, while considering the different rates of pollution produced by every country of the world.

There are countries in which the aspects related to emissions trading and the principles and practices of application are an already experimented field of study and analysis, which determined numerous controversies with the purpose to clarify the financial-monetary aspects of the environmental problems.

Traditionally, the regulating authorities in the USA aim to set emissions standards for each major point of pollution discharge. The literature shows us that these means of distributing the responsibility for control at the discharge points will be hence called proceedings of command and control. While each industrial unit normally has discharge points for several pollutants, each with own standard unique emissions, the level of information which the control authorities need in order to define the profitability of the standard costs is impressive. Normally, the level of the information valid for the regulating authorities under the conditions when the allocations are already accomplished is insufficient.

In some cases, the managers of the enterprises discharging pollutants are in an opposite situation. Under the conditions in which each enterprise manager wants to know (or to know how to know) which are the most suitable devices for the technical control of the polluting emissions in their unit or for the operations running in their unit, as well as the costs associated to the safety of these techniques, we consider that the discussion of the quality of information at this decision-making level is very opportune. Generally, the enterprise managers have an excellent feeling of the technological control, which may produce the most profitable cost, including in the matter of reducing the polluting emissions of their enterprises.

Unfortunately, the enterprise managers lack a very significant element: the stimulus to act regarding this information so as to reduce the emissions costs. Since the unilateral increase of the costs is born individually by the enterprise in competition, each of the existing or potential “rivals” might affect and weaken the competitive position, reason why the enterprises will seek to minimise the costs using any means at their disposal. Thus, the practical means include: exaggeration of costs when the authorities come in control hoping that lower standards are allocated or they seek exempt or derogation from the courts of law on grounds such as lack of availability or unfeasible technology.

Aspects regarding the profitability of the negotiable permits

The notion and idea of negotiable permits relies in principle on the allocation of the actual production costs. The reason why the polluting permits became transmissible (negotiable), therefore, they can be traded, is very simple> usually, the factories have different levels of the costs of controlling the polluting emissions. If the permits can be transferred, the factories which can control the emissions of their activity in a simpler, more advantageous way, consider that it is in their direct interest to control – in a high proportion – the level of emissions, because they may sell the excess of permits. As for the buyers, they can be found any time they consider that it is more convenient to buy permits for their subsequent use in a private factory which uses more equipment of control. This is a form of allocating the responsibility for emissions control. If the allocation of the responsibility for emissions control is not profitable, there also are trading possibilities. When all these opportunities are fully exploited, their allocation is profitable.

The evaluation of efficacy of the negotiable permits policy is an inexact process, which is running. Nevertheless it is essential if program design is to improve in the future. The analysis here is nuanced and stresses that a program's success depends, among other things, on the existing regulatory programs, the cost structure of the industries involved, the interactions with other markets, and the program design. The permit trading programs have generally led to emissions reductions at lower cost. There has been, however, a wide variation in such savings from program to program, and cost cutting

turns out to be very sensitive to the industry involved and the details of the particular emissions trading policy considered.

In principle, the traded permit solve the problems of information and stimulation which are represented by command and control, thus approached as to allow each participant to play the role that suits it best. The regulating authorities provide the safety that these sources benefit of adequate stimulants by determining the pollution objectives and imposing their compliance. The exploitation of the inherent flexibility characteristic of the polluting permits trading, by obtaining the least costs whose limits are set by the responsible authorities, the collective sources of pollution determine lower total costs compared to the total sources of pollution. In principle, the stimulants determined by the own interest are compatible in this case with cost efficacy.

Although the operation principle of the tradable permits is generally valid for all categories of polluters, part of the implementation details (such as the design of the tradable permits) depends, mainly, on the type of pollutant to be regulated. Thus, we can take into consideration three classes of pollutants. The definition of the tradable permits profitability and the design of the trading system compatible with the allocation vary with these classes of pollutants. The characteristic which differentiates a class from the others is the relation between the individual sources of pollution and the pollution target.

The program of polluting permits trading has two forms:

- trading of credit;
- trading the permits.

The trading of credit presumes the certification of transactions in order to quantify the reduction of emissions. However, if the trading of credit is associated to voluntary or negotiated agreements, these mechanisms can enter in force.

The underlying principles of the EU Emissions Trading System (EU ETS) are:

- The system is one of „ceiling and trading" of emissions;
- The system presumes the compulsory participation of the enterprises from the pertinent sectors;
- The system has a solid framework of conformity;
- The system is applied within the EU, but it allows capitalising on the opportunities to reduce the emissions in other countries too.

The practical application of the system takes place along several stages also called “trading periods”.

Stage 1 (1 January 2005 - 31 December 2007) was the pilot stage which presumed the „applied learning” and which prepared stage 2.

The representative activities of this stage were:

- Setting the price for the carbon emissions;
- Free trading of the emission permits across the EU;
- Infrastructure necessary to monitor, report and verify the real emissions of the visited enterprises;
- Establishment of a database with the annual emissions.

Stage 2 (1 January 2008 - 31 December 2012) coincides with the period of engagement by the Kyoto Protocol. The most important result so far in this stage is the reduction of the allowed emissions by 6.5 % compared to 2005.

Stage 3, the future (1 January 2013 - 31 December 2020). The propositions for this stage are:

- Encourage the long-term investments in the reduction of emissions;
- Expansion and consolidation of EU ETS system.

The Kyoto Protocol regarding the UN Framework Convention regarding the climate changes allows working through three flexible mechanisms (the Kyoto mechanisms): trading of emissions, joint implementation, “clean” development.

The EU proposed an Emissions Trading System (EU ETS) which relies on the acknowledgement of the fact that the assignment of a price for the carbon emissions is the best way to reduce significantly the global emissions of greenhouse gases. The “exchange currency” of this system is the quota of emissions. Essentially, this quota allows the emission of one ton CO_2. Thus, the enterprises maintaining their emissions bellow the allocated level may sell the permits which they didn’t use according to the demand and offer on the market at the moment of sale.

A successful emissions trading system must meet some criteria based on:

- Environmental justification: the trading system must be accepted by all participating parties so that sustainable environmental goals can be achieved;

- Economic justification: the trading system must be flexible and profitable compared to other modalities of accomplishing the environmental goals;
- Credibility: the trading system must be credible, because only these systems can have success; hence, the administrative procedures must be adequate so as to ensure the conformity with the climacteric change goals;
- Simplicity: this is an essential aspect, and the deviation from this criterion may appear only of proved as absolutely necessary;
- Equity: this presumes the perfect knowledge of the system because in the first stage it is not possible to obtain benefits for everybody;
- Transparency: the system must be transparent, so as to inspire trust; an imperfect, through transparent system, ends being preferred to any other system with not transparency.

Uniform assimilation of the mixed pollutants

In the first form and in the simplest way, the class of pollutants which can be controlled conventionally is called the class of the "uniformly mixed pollutants". In the case of the pollutants that can be assimilated, the environmental capacity to absorb them is rather permissive about their rate of emission, so that the pollution level of each year is independent of the level of the previous years. These pollutants that are assimilated don't build up in time.

In the case of the uniformed assimilation of the mixed pollutants, their average concentration depends on the total level of emissions, not on the distribution of these emissions from different sources. For this class of pollutants, all the possible distributions of the possible distributions of their control responsibility within a flexible environment, with the same total level of emissions, will produce roughly about the same effect of the pollution target. The greenhouse gases are an example of pollutants which fit this situation.

Some projections,[1] of the emissions from different sources of pollution are:

- The automobiles produce about 12% of the carbon dioxide emissions in the EU;

[1] *Bureau of Information of the European Parliament in Romania, www.europarl.ro*

- The EU reduced the greenhouse gas emissions by about 5% from 1990 to 2004;
- The emissions from road transportation increased by 26% over the same period;
- New harmonized rules will be set for the new automobiles limiting, as of 2012, the CO2 emissions to 120gr/km (compared to the current level of 160 gr/km);
- The 10% decrease of the greenhouse gas emissions from the fuel producers by 2020.

The greenhouse gases are an example of type of pollution which fits extremely well to describe this study and their contribution to the current climacteric changes and their contribution is no intention of sensitization to the effects of their discharge into the atmosphere.

Each of these features (assimilation and uniform mixture) limit the complexity supposed by the cost efficiency of the tradable permits system. The first feature allows the process of control in case of ignoring the difficult problem of pollutants build up, while the subsequent ones contribute to removing the specific worries about the location of the sources in designing the control policies – which is a significant advantage.

Symbolically, the link between the source of emission and the pollution target for the uniformization of the pollutants than can be assimilated can be written as:

$$A = a + b\sum_{j=1}^{J}(\bar{e}_j - r_j)$$

where:

A – is the steady-state of pollution in year *a;*

$\bar{e}_j$ – is the steady-state of the emission rate of source *j* which can be sampled if the source fails to the control of any kind of pollution for all the situations (the latter with reference to the uncontrolled emission rates);

r_j - is the rate of growth of the reduction of the emissions produced by source j;

J – is the total number of sources;

a and *b* – are parameters.

Normally, parameter *a* is used to design the pollution fund (from a natural source or from sources which for some reason are not regulated); parameter *b* is simply a constant of proportionality.

Within this context, cost efficiency is defined as that allocation of the level of emissions between which source J is the one which sets the pollution target (designed, $\bar{A}$) at the minimal cost. Making Cj(rj) a continuous functioning cost is a desiderate, because it represents the minimal cost for any achieved level of emission reduction (r_j). Generally, making r_j to increase the marginal cost of pollution may also be a supposition/hypothesis of growth.

Mathematically, the allocation of cost efficiency is the solution to the following problem of minimization:

$$\min_{r_j} \sum_{j=1}^{J} C_j(r_j)$$

which is the object of the following relations

$$a + b\sum_{j=1}^{J}(\bar{e}_j - r_j) \leq \bar{A}$$

and $r_j \geq 0$, j=1, …., J

The necessary and sufficient conditions (the Kuhn-Tucker conditions) for the allocation of the control responsibility between sources (where J is a dimensional vector) so as to make them cost efficient will be treated in another paper.

Internalization of the externalities at the global level

Using cybernetic models and showing the component subsystems, the connections between them and the regulation loops which appear, one can make ARKET, the analysis of ecosystems in their interdependence with the economic systems.

Thus, we can no longer speak today of a sustainable and harmonious development, without the intervention of the state, of the public authority as regulating system in the relationship between economy and the environment.

The literature has such models, one of them being developed by R. Mendelsohn in 1980 and published in the Journal of Environmental Economies and Management, nr. 7/1980.

By this model, Mendelsohn attempts to make a specific study of the impact on health and environment of the different air pollutants as well as the cost of decreasing them.

The model can be used to estimate the environmental costs of different pollutants and it can be adapted from the energy industry – for which it was designed – to any firm producing externalities.

Once these costs are calculated, they need to be separated by the polluters; in other words, the cost of externalities must be internalised.

We intend to highlight the connections between the producers and the environment using a cybernetic model. This cybernetic model will be structures in two levels, the microeconomic level of the producer, and the regional, aggregate level.

The model that we will [present subsequently attempts to model the second stage, the distribution of “costs” for the “culprits” so as to maximise the social welfare.

This tem of “social welfare” derives from Pareto’s definition of the optimum for an economy, which is the situation in which all the economic agents are satisfied about the way the others around them act.

In other words, a government of the “social welfare” must aim maximizing the satisfaction of all involved agents, therefore both of the firms and consumers, under the conditions of economic limitations – especially – but also political limitations sometimes, which must be observed.

In this function of “social utility” we may mention distinctly the environmental quality and human health due to their particular importance in the social life.

Together with the trend of source exhaustion and with the adverse effects of the human activity – pollution particularly – the environment in which we are living turned “ill” and even if this is not currently so much visible as environmental deterioration, or on the short-term, in the long run it may cause huge losses both for the future economic activity and for the health of the future generations.

In other words, the need to restore the environment and to protect it is immediate, to the present interest and to the interest of the future generations, for the future of Earth as planet.

Within this context, it seems more rational to implement a policy of maximizing the social welfare, which means maximising the satisfaction of all the economic agents (firms or consumers) while meeting the restrictions imposed by the environmental protection.

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