

# Chapter 14

## Determinants of Carbon Emission Prices: Evidence From the European Union

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### ABSTRACT

*Carbon emission allowances are considered an important policy instrument to prevent an undesirable increase in the Earth's temperature caused by the excess of greenhouse gases in the atmosphere. Most of the existing literature modeled the behavior of allowance prices before the implementation of regulatory measures such as the market stability reserve mechanism. In this chapter, the main determinants of the carbon emissions allowance prices in the European Union are examined, applying econometric models—ARCH and GARCH—that take into consideration the allowances supply in the future market, the energy prices, the stock indices, and the regulatory measures. The results depicted that the most relevant variables affecting the allowance prices were the regulatory measures that mainly restrict the number of allowances available. Understanding the dynamics of the variables that impact these prices can help policymakers to address the oversupply of allowances by sending correct price signals to the market participants.*

## **INTRODUCTION**

The GHG emissions, derived from human activities, are considered the main global market failure, since they affect all countries indistinctly. They are one of the most cited examples of negative externality, as depicted by economic theory (Rezai, 2012). In a market economy, consumption and investment decisions are guided by prices, once prices convey information about products and services such as: (i) scarcity (ii) quality and (iii) productivity. However, in market economies, current prices say nothing about the consequences, or side effects, of our consumption and investment decisions.

The absence of correct price signs that take into consideration side effects is considered a market failure as it promotes an inefficient allocation of resources by the market. This absence leads to a loss of social welfare by rewarding behaviors with harmful consequences to the environment and the society.

The mainstream economic theory endorses government intervention in the market to correct such failures. In this context, intervention should be made to implement mechanisms that aim to encourage and regulate the internalization of externalities. Just as prices guide the decisions of economic agents, mechanisms that incorporate into prices of goods and services the costs of the effects of climate change are part of the solution.

Governments and policy makers are recommended to intervene through a series of public policies, such as command and control tools and carbon pricing, aiming to address these failures. Among the international experiences using carbon pricing tools, the Emissions Trading Systems (ETS) have been gaining prominence in the last decade (Narassimhan, 2018; Rafay, 2022).

In an ETS, the government sets a cap on the volume of greenhouse gas pollution, measured in tonnes of carbon dioxide equivalent ( $\text{tCO}_2\text{e}$ ) <sup>[1]</sup> that can be emitted each year. Companies and facilities that participate in the system must hold allowances, issued by the government, for each  $\text{tCO}_2\text{e}$  they emit within one calendar year. Companies and facilities buy in public auctions and/or receive from the government such allowances and trade them depending on the volume of their emissions and marginal abatement costs. The ETS tends to change relative prices, making carbon intensive products and activities more expensive and, thus, creating market incentives for investments in cleaner products and technologies.

There are two main types of instruments that can provide an explicit price on carbon: (i) the emissions trading system (ETS); and (ii) the carbon taxes. Assuming that there is perfect information on the market, both instruments can internalize externalities in a cost-effective way and achieve equivalent results. The main difference between the two instruments is in the price formation process. In the case of the carbon tax, the Government determines exogenously the price to be paid for one  $\text{tCO}_2$  emitted and allows the market to adjust the equilibrium emissions quantities. Whereas in the ETS, the Government sets an emissions' cap for a given period, converts it into emission allowances, allocates them among regulated companies and lets the market find the equilibrium price of one  $\text{tCO}_2$  emitted by using supply and demand forces.

The distribution of allowances among companies can be done by three main methods. The first one is the implementation of auctions, in which the regulator sells the allowance to the covered companies. The second is the free allocation of allowances using industry by using *benchmarking* parameters, in which regulated entities receive permissions based on their activities or on some sector efficiency parameters, usually adjusted by a correction factor. Finally, the third method is the free allocation of allowances using grandfathering parameters, in which entities receive allowances based on their historical emissions. Although less common, it is also possible to have a hybrid distribution mechanism, in which a portion of the permissions are allocated for free and the rest is auctioned, or grandfathering.

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