Energy Policy 82 (2015) 342–351

Contents lists available at ScienceDirect

Energy Policy

journal homepage: www.elsevier.com/locate/enpol

Speculative and hedging activities in the European carbon market

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HIGHLIGHTS

- This study explores the evolution of speculative and hedging activities in futures carbon markets by using volume and open interest data.
- Phase II of the EU ETS seems to be the most speculative phase to date.
- A seasonality analysis identifies a higher level of speculation in the first quarter of each year.
- Most of the speculative activity occurs in the front contract.
- The hedging demand concentrates in the second-to-deliver futures contract.

ARTICLE INFO

Article history:
Received 26 May 2014
Received in revised form
20 October 2014
Accepted 11 November 2014
Available online 12 December 2014

JEL classification:
G13

Keywords:
Derivatives
EUA
ECX
Open interest
Trading volume

ABSTRACT

We explore the dynamics of the speculative and hedging activities in European futures carbon markets by using volume and open interest data. A comparison of the three phases in the European Union Emission Trading Scheme (EU ETS) reveals that (i) Phase II of the EU ETS seems to be the most speculative phase to date and (ii) the highest degree of speculative activity for every single phase occurs at the moment of listing the contracts for the first time. A seasonality analysis identifies a higher level of speculation in the first quarter of each year, related to the schedule of deadlines of the EU ETS. In addition, a time series analysis confirms that most of the speculative activity each year occurs in the front contract, whereas the hedging demand concentrates in the second-to-deliver futures contract.

1. Introduction

Since the launch of the European Union Emission Trading Scheme (EU ETS) by the European Commission in 2005, the European carbon market has evolved considerably in terms of the types of contracts being traded as well as their associated trading volumes. The new market has attracted the attention of an increasing number of market participants and academics alike, inspiring several papers that study the evolution of specific aspects of the European carbon market by comparing Phases I and II.[1] Some papers have studied the efficiency of the European carbon market over the phases. Montagnoli and de Vries (2010) test for the efficient market hypothesis through variance ratio tests and conclude that Phase I was inefficient, whereas the first period under Phase II shows signs of restoring market efficiency. A similar conclusion is reached by Palao and Pardo (2012) when studying price clustering in the European carbon market. The tendency to observe certain trade prices more frequently than others is usually taken as a sign of market inefficiency and they observe clear evidence of price clustering in both phases, being more noticeable in the first phase. Other contributions focus on the relationships among several energy markets related to the carbon market. Keppler and Mansanet-Bataller (2010), for example, analyse the causalities between CO_2, electricity, and other energy variables during Phase I and Phase II. Their results show that, during Phase I,

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[1] It is necessary to bear in mind that the EU ETS is organised in phases. Each phase is mainly defined by a different pre-established cap for real emissions and a specific period for which the emissions are capped (Phase I ran from January 2005 to December 2007 and Phase II from January 2008 to December 2012). A more complete characterisation of all the phases is provided in Section 2.2.

http://dx.doi.org/10.1016/j.enpol.2014.11.014
0301-4215/

coal and gas prices impacted CO_2 futures prices, which in return Granger-caused electricity prices. During the first year of the Phase II, they observed that electricity prices Granger-caused CO_2 prices. Creti et al. (2012) investigate the determinants of the carbon price during the two phases of the EU ETS, also by using cointegration techniques. They show that while a cointegrating relationship exists for both phases, the nature of this equilibrium relationship is different across the two sub-periods, with an increasing role of fundamentals in Phase II. Following this line of research, Koch (2014) provides evidence favouring closer carbon and energy price linkages in Phase II as compared to Phase I. Finally, from a market microstructure point of view, Kalaitzoglou and Ibrahim (2013) identify the classes of agents at play in the European carbon futures market and analyse their trading behaviour during the market's early development period. Their results indicate enhanced market transparency and increased market maturity. In addition, Medina et al. (2014), within this line of research, evaluate the timeline of market liquidity in the European carbon market from Phase I to Phase II. Their findings question the generally assumed superiority of Phase II compared to Phase I, as they provide evidence of a long-lasting impact of the 2007 market collapse on the quality of the EU ETS.[2]

To the best of our knowledge, the evolution of the type of activity that is carried out by the participants in carbon markets has been left unexplored to date. Traditionally, traders in derivative markets are classified into two broad categories: hedgers and speculators (or uninformed and informed traders, respectively). Both types of participants contribute decisively to the economic functions provided by a derivatives market. On the one hand, hedgers use the market to manage risks linked to carbon emissions. On the other hand, the role of speculators is crucial not only in the price discovery process but also as liquidity providers. Thus, both types of participants are necessary for the efficient operation of the market and, ultimately, for its success. However, a high degree of speculation in the carbon futures markets could move futures prices well above or below the levels justified by supply and demand fundamentals. Given that the majority of the carbon trades in the EU ETS by far take place through the derivatives market, an analysis of the speculative and hedging behaviour in this market is of major interest for market participants, carbon exchanges, as well as for the European Commission, being the regulatory authority.

The objective of this paper is to fill this gap by analysing the evolution of the speculation and hedging activities in carbon markets. In order to explore whether it is speculation or the hedging activity which prevails in the European carbon market during a specific period of time, we have used two measures that combine volume and open interest data. Specifically, we consider the ratios proposed by Garcia et al. (1986) and Lucia and Pardo (2010). These two measures are based on the convention, generally accepted in the previous literature on futures markets (see Rutledge (1979), Leuthold (1983), and Bessembinder and Seguin (1993)) that volume gathers information about speculation whereas open interest is related to hedgers' activity.[3]

The rest of the paper is organised as follows. Section 2 outlines the specificities of the carbon market and the dataset, after describing the measures of the speculation and hedging activities. Section 3 presents and discusses the results of the empirical analysis of the speculation-hedging demand ratios. Finally, Section 4 concludes.

2. Methods

2.1. Measuring the importance of speculation in futures markets

In order to analyse the relative importance of speculation versus hedging activity in carbon markets, we employ two ratios that combine publicly available information related to the trading activity in derivatives markets: the trading volume (during a specific period of time) and the open interest (at the end of the same period). Recall that whereas the volume takes into account the number of contracts that have been traded during a specific period of time, the open interest only considers the number of open positions at the end of the same period. That is, the open interest reflects the number of outstanding (long/short) positions in a specific contract at the end of a period, and it only increases (decreases) whenever none (both) of the two parties involved in a transaction during the period closes out its position. On the contrary, the open interest remains unchanged whenever only one of the two parties closes out its position.

Traditionally, in the derivatives literature, volume has been combined with open interest data in different measures in order to analyse the speculative and hedging behaviour of futures market participants (see Rutledge (1979), Leuthold (1983), and Bessembinder and Seguin (1993)). The rationale behind these measures is that hedgers tend to hold their futures market positions longer than speculators. Note that the volume takes into account the total amount of trading activity whereas the open interest only registers the number of outstanding contracts and, thus, the intraday positions taken by day traders are not reflected in the latter. Lucia and Pardo (2010) critically revised this literature and studied in detail the two ratios that will be considered in this paper. We now summarise their main findings, adapted to the objective of this paper, in order to make it self-contained.[4]

The ratios that are used in this study relate volume and open interest data and represent proxies for the relative importance of the speculative or hedging behaviour of the participants in the market during the period of study. Specifically, the first ratio considered, denoted $SPEC_t$ in this paper, was suggested by Garcia et al. (1986) and is defined as follows:

$$SPEC_t = \frac{V_t}{OI_t}$$

where V_t is the trading volume during period t and OI_t is the value of the open interest at the end of the same period. In this measure, the number of contracts traded during the period relative to the size of the outstanding positions, reflects the relative importance of the speculative behaviour in the contract analysed with respect to the hedging activity. As Robles et al. (2009) put it, the ratio of volume to open interest captures speculative market activity under the assumption that the majority of speculators prefer to get in and out of the market in a short period of time, in contrast to futures traders who are not engaging in speculation. Hence a speculator taking opposite positions (buying and selling contracts) in the market within a given period will generate an increment in the registered volume during the period, but no change in the open interest. Thus, increasing values of $SPEC_t$ are interpreted as rising speculative activity in the futures contract used to compute the ratio.[5]

The second ratio used in this study is a relative measure that was first proposed by Lucia and Pardo (2010), which was in turn

[2] See Zhang and Wei (2010) and Convery and Redmond (2013) for comprehensive overviews of recent research on the EU ETS.

[3] In the literature on the success of futures contracts, the ratio proposed by Garcia et al. (1986) has already been used by Holland and Vila (1997) as a liquidity measure.

[4] We refer the reader to the paper by Lucia and Pardo (2010) for further details.

[5] Note that $SPEC_t$ can take any positive real number including zero, it takes the value plus infinity whenever the open interest equals zero and it is undetermined when both the volume and the open interest are equal to zero.