Journal of Cleaner Production 112 (2016) 1619–1626

Contents lists available at ScienceDirect

Journal of Cleaner Production

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

Does the carbon market help or hurt the stock price of electricity companies? Further evidence from the European context☆

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ARTICLE INFO

Article history:
Received 31 January 2014
Received in revised form
9 February 2015
Accepted 6 July 2015
Available online 14 July 2015

Keywords:
Electricity stocks
Carbon market
CO_2
Emissions trading
EU-ETS
DCC-MGARCH

ABSTRACT

The electricity sector is the largest participant in the European Union Emissions Trading Scheme (EU-ETS). This paper studies how the European Union Allowance (EUA) market – the carbon market in the European Union (EU) – has impacted the magnitude and volatility of stock returns of electricity companies in the EU-ETS. The investigation is undertaken for both Phases I and II of the EU-ETS based on simple OLS, panel data and time-series analysis. The results indicate that the relationship between the EUA market and stock returns of electricity companies was largely driven by strong market shocks recorded in both periods. If the market shock impact is controlled, this relationship depends on the carbon intensity of the electricity generators. The stock returns of carbon-intensive companies are negatively affected by the EUA returns, while the opposite is true for less carbon-intensive producers. The volatility of stock returns of electricity companies is significantly driven in the same direction by the volatility of the EUA market.

1. Introduction

The European Union Emissions Trading Scheme (EU-ETS) is the largest international greenhouse gas (GHG) emission allowance market and represents 84 percent of the global carbon market value (Linacre et al., 2011). Its aim is to reduce greenhouse gas emissions in Europe through the market mechanism and is a part of the EU's commitments under the Kyoto Protocol. The scheme has been rolled out in phases. Phase I (a pilot stage) commenced in 2005 and ended in 2007. Phase II ran from 2008 to 2012. By the year 2012, the member states of the European Union (EU), as 'regional integration organisation' parties to the Kyoto Protocol, have collectively committed themselves to reducing CO_2 emissions by eight percent of the 1990 amount.

The electricity sector is the largest participant in the EU-ETS. With the inception of emissions trading, power generators were led to integrate emission prices (i.e., European Union Allowance (EUA) prices) as an additional cost component into their production process. To reduce exposure to the EUA market, power generators have increasingly invested in building low-carbon technologies and switching to using cleaner energies (Kossoy and Ambrosi, 2010).

Given the great significance of power generators to the EU economy, the public has been concerned about whether the power supply could be secured and whether there would be a significant negative impact on the retail price due to the new environmental regulations. Kossoy and Ambrosi (2010) has pointed out that issues still exist relating to the impacts of high price volatility in carbon assets and windfall profits gained due to the 'grandfathering' allocation approach.[1] These issues have direct implications for the electricity generators' performance in capital markets and their investments in low-carbon technologies.

Research on the EUA market becomes increasingly significant with the steady rise in the number of participants.[2] However, the

☆ The authors would like to thank Dr. Nicholas Rohde, participants of the 3rd IAEE Asian Conference in Kyoto, as well as two anonymous referees for their useful comments.

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[1] The grandfathering allowance approach is defined in Weishaar (2009) as a free allocation approach that is based on historical input, output or emission data. It is argued that this approach gives rise to strategic firm behaviour. That is, a firm can increase their grandfathered amount by choosing higher production or emission levels before the benchmark year.

[2] As of 2011, there were approximately 356 participants involved in EUA trading including governments, regulated companies and private investors; of these, approximately 57 participants are financial institutions (BlueNext, 2011; EEX, 2011; ICE, 2011; NASDAQ OMX Commodities, 2011).

http://dx.doi.org/10.1016/j.jclepro.2015.07.028
0959-6526/

academic literature still remains thin on the impact of the EUA market on capital markets. Notable studies contributing to this topic include Oberndorfer (2009a) and Veith et al. (2009). Finance theory predicts that the EUA price should negatively correlate with stock prices as the emission prices introduce additional volatility to power generators' cash flows (i.e., increasing the possibility for loss) (Busch and Hoffmann, 2007; Kolk and Pinkse, 2004). However, these two studies found a positive relationship between the two variables. To explain these somewhat counterintuitive findings, Oberndorfer (2009a) and Veith et al. (2009) suggested that electricity generating companies were not only able to pass on EUA prices to consumers but also gained windfall profits due to over-allocation of free EUAs in Phase I (i.e., 2005–2007), which overly compensated the companies for their regulatory burden.

The allocation of EUAs to energy producers was fully free of charge and subject to government policies in Phase I. The governments controlled the supply of EUAs based on the expected emission volumes of individual regulated parties. Accordingly, the findings of the said studies could be distorted from theoretical expectation and might be driven primarily by the difference between the volume of free EUAs allocated by EU governments and the expected emission volume of individual participants. The pilot phase only extended over three years. Consequently, the results of these studies do not allow the authors to make longer-term conclusions particularly as the governments changed their policies in the subsequent phase. One motivation of our paper is to challenge these counterintuitive findings by disaggregating all electricity companies into carbon intensive and non-carbon-intensive as well as extending the study beyond the trial phase.

EUA allocation policies imposed in Phase II were tighter. The expectation is that the EUA market in Phase II functioned more 'normally'. Thus, further testing of the link between the performance of the stocks of electricity generating companies and the EUA market with the inclusion of this Phase could provide more recent and robust results that could be useful to governments, electricity generating companies and investors in the energy sector. However, Phase II coincided with the worst periods of the global financial crisis (GFC). The potential effects of the GFC on the relationship between the EUA market and the stock returns of electricity companies therefore warrant further investigation.

This paper contributes to the literature in the following respects. First, we extend Oberndorfer's (2009a) analysis of the link between electricity stock returns and EUA returns to Phase II of EU-ETS. Second, we decompose the impact of EUA returns on individual electricity stock returns using a panel data analysis and link it to the carbon intensity of their electricity generating portfolios. Finally, we examine volatility (risk) spillover effects between the EUA market and electricity stock returns using advanced time-series analysis techniques. We expect that the first two points will assist in understanding the drivers of electricity stock market returns and whether there is a link with the EUA market. This could be useful both to policymakers in examining the effectiveness of their policies and to investors. The third point will be useful to investors and traders for their asset-allocation and hedging decisions.

The paper is structured as follows. Section 2 introduces the theory, a review of empirical evidence on the EU carbon market, and the hypotheses. Section 3 outlines the methodology and estimation techniques. In Section 4, a description of the data is presented. The estimation results are presented and discussed in Section 5. Section 6 presents the paper's conclusions.

2. Theory, empirical evidence, and hypotheses

The EU introduced the ETS to fulfil its emission reduction commitments under the Kyoto Protocol. Under this scheme, electricity generating companies must incorporate the EUA price into their production cost mix, which puts constraints on the way the generators conduct their business. That is, power producers could become exposed to developments in the EUA market due to the additional carbon constraints in the cost mix. In effect, the additional carbon constraints introduce an additional risk of non-compliance with the Kyoto Protocol (Busch and Hoffmann, 2007; Kolk and Pinkse, 2004).

The stated goal of the managers of private firms is to maximise their firms' shareholders' wealth which is typically reflected in increasing value of their firms' equity. In theory, the performance of individual firms depends on the interaction of allocated emissions with actual emissions, the relative costs of purchasing/selling EUA, and the abatement costs. If a particular company is short in EUAs (i.e., it received less free EUAs than it expects to use in its production process), it has to choose either to implement emissions abatement measures or purchase EUAs at the market. Not only must the relative costs of the two strategies be taken into consideration but also the fact that purchasing EUAs is potentially a more risky strategy due to the volatility of the market. Firms that are short in EUAs are expected to face the burden of higher costs and/or greater business risks, which would affect its stock performance negatively.

In contrast, if a firm is long in EUA allowances (i.e., it received more free permits than it expects to use), it can choose to sell the EUAs and generate additional cash flow. In this case, a firm with a long position in EUAs is expected to benefit from the EUA market. Alternatively, if prices of EUAs are very low, firms that earlier spent heavily to reduce carbon emissions might be penalised by the investors. Moreover, expectations of cash flows from the sale of carbon emissions at higher prices may not materialise. As a result, we would expect positive relationships between EUA market prices and electricity stock returns.

In practice, the data show that the stated goal of the EU-ETS to reduce emissions has so far been successful[3] (Kossoy and Ambrosi, 2010). The producers have begun activities such as building low carbon emission power plants that allow them to avoid being exposed to emissions reduction regulations and thus reduce their exposure to EUA market volatility. As a result, we expect to see a positive relationship between the stock performances of companies with a large share of low carbon emission production capacity and EUA price increases. In contrast, we expect stocks of carbon intensive generators to be negatively affected by higher carbon prices.

The efficient market hypothesis predicts that stock prices quickly reflect news as it comes to market (Sharpe, 1963). As a result, when significant news arrives in the EUA carbon market, the EUA price should become more volatile. This was evident and well-documented after the announcement of the overallocation of credit in Phase I (Oberndorfer, 2009a; Alberola et al., 2008). The volatility of EUA prices should be directly transmitted to the volatility of the producers' future cash flows, which results in greater volatility of the stock price. We expect a volatility spillover in the same direction between the EUA market and electricity stock returns.

3. Methodology

This study applies a multifactor model incorporating variables constructed to address the impact of the EU-ETS, referred to as EUA variables, on the stocks of electricity companies. In order to avoid

[3] The World Bank (2010) reported a 2% to 5 % annual decline during Phase I. The decline is continuing and has become even greater since 2008 when Phase II was introduced.