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Ivan Diaz-Rainey - University of Otago
ivan.diaz-rainey@otago.ac.nz

Andrea Finegan - University of East Anglia

Gbenga Ibikunle - University of Edinburgh

Daniel J. Tulloch - University of Otago

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Institutional Investment in the EU ETS

Ivan Diaz-Rainey*
Department of Accountancy and Finance, University of Otago, PO Box 56, Dunedin, 9054, New Zealand

Andrea Finegan
Norwich Business School, University of East Anglia, Norwich NR4 7TJ, UK

Gbenga Ibikunle
University of Edinburgh Business School, University of Edinburgh, 29 Buccleuch Place, Edinburgh, EH8 9JS

Daniel J. Tulloch
Department of Accountancy and Finance, University of Otago, PO Box 56, Dunedin, 9054, New Zealand

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Abstract: This general review paper explores the role of institutional investment in EU ETS. We do so by addressing seven questions sequentially, namely: (1) How does the EU ETS work? (2) What drives the value of carbon? (3) What potential diversification benefits arise from investing in carbon? (4) How does investing in carbon sit with investors' fiduciary responsibilities? (5) How can institutional investors gain exposure to carbon? (6) What unconventional risks does investing in carbon entail? (7) What will happen to the carbon markets post-2012, once the Kyoto protocol expires? From this discussion, it is evident that carbon markets generally and EU ETS specifically are, from an institutional investing perspective, a paradox. Recent years have seen increased market sophistication (trading efficiency) and it is evident that there are potential diversification benefits from investment in carbon and that investing in carbon can be consistent with fiduciary duties. Despite this, there is little institutional involvement in EU ETS due to the unconventional risks that come with investing in carbon allowances, derivates, and funds. In terms of these unconventional risks, the VAT carousel fraud and the theft of allowances in 2011 are relatively minor issues when placed against the absence of a clear post-Kyoto agreement. We conclude that if robust growth in climate change–related investing is to continue beyond 2012, more needs to be achieved in order to adequately address the climate investment gap. Legislation incorporating a fiduciary obligation for institutional investors to take into account the social costs of investment as well as private returns would begin to pave the way.

***Corresponding author**: ivan.diaz-rainey@otago.ac.nz; + 64 3 479 8117

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Introduction

This paper explores the role of institutional investment in the most high-profile contemporary environmental market – the European Union's Emissions Trading Scheme (EU ETS). Before doing so, it is important to place carbon trading and EU ETS in its broader historical context in terms of the evolution of institutional investment, environmental markets, and environmental investment.

Drucker (1991, p.106) notes that the establishment of the first modern pension fund in the 1950s heralded a transition in which institutional investors became the "dominant owners and lenders" and represented one of the "most startling power shifts in economic history." Their ever-expanding size and relentless search for "Alpha" and diversification benefits have meant that these "Universal Owners" have diversified long-term investments across asset classes, sectors, and geographies. Due to these characteristics, Universal Owners have been aware for some time that they are unable to avoid externalities, in particular environmental externalities. The impact of environmental externalities such as pollution, waste, or changes in the use of resources can cause institutional investors to suffer reduced cash flows from investments, increase environmental costs, and augment uncertainty in capital markets. Investors with exposure to net losses from portfolios with externalities have an incentive to take action and make investments to hedge the environmental risk (Hawley 2000).

In more recent decades, concerns about environmental decay and in particular anthropogenic climate change have led to the development of environmental markets and to the emergence of environmental investment. Environmental investments can be broken down into five major categories: carbon; land use; clean technology; sustainable property; and water (Calvello 2009). Carbon is considered to be a major category, as carbon markets already exist and should "internalize" the cost of emitting greenhouse gases. The internalization of the externality has come through the introduction of "cap-and-trade" environmental markets, most notably EU ETS. It is important to note, however, the United States' Acid Rain Program, established under the 1990 Clean Air Act, was the first major cap-and-trade environmental market. Its success in tackling sulphur dioxide and nitrogen oxide pollution represented a paradigm shift in environmental policy and paved the way for the more ambitious endeavor of establishing a global market for carbon under the auspices of the Kyoto Protocol.

Further, climate change considerations are increasingly featuring in investment strategies of fund managers. In part, this is driven by legislation,[1] which means that the cost of carbon is incorporated into investment decision making for the sectors covered by the EU ETS, for example, electricity generation, cement, and steel. Climate change is also being considered in sectors that are most affected by climate change events such as property and infrastructure, which have a longer investment horizon. Against a background of an increasing focus by investors on climate change and the potential impact on investment portfolios, the *Climate Change Scenarios – Implications for Strategic Asset Allocation* (Mercer 2011) report was produced. Mercer compiled the report with the support of institutional investors, the International Finance Corporation and the United Kingdom's Carbon Trust. Climate change is put forward as a systemic risk that needs to be addressed by institutional investors as part of their strategic asset allocation process. The study finds that the impact of climate change may increase portfolio risk by as much as 10 percent for the average asset allocation.[2]

Another indication of the increasing level of institutional interest in climate-related investment is the emergence of related investor networks and collaborations. Such networks include the Institutional Investors Group on Climate Change (IIGCC), with 75 European institutional investors covering €7.5 trillion assets; Investor Network on Climate Risk of North America (INCR); Investor Group on Climate Change (IGCC) for Australian and New Zealand investors, covering A$700 billion assets; and the United States-based Council of Institutional Investors, with over 125 members covering $3 trillion assets. There are also several leading international initiatives, such as the United Nations' Principles for Responsible Investment, with 1121 institutional investors covering $30 trillion assets, and the Coalition for Environmentally Responsible Economies, with 100 institutional investors covering $9.5 trillion assets.

As noted earlier, this paper explores the role of institutional investment in the most high-profile contemporary environmental market: EU ETS. It is acknowledged that traditional institutional investors such as endowments, insurance companies, and pension funds are relatively small players in the EU ETS (Hill *et al.* 2008). The discussion here is, therefore, intended to act as a primer for potential institutional investors and identifies the barriers that

[1] Legislation is still the main driver for inclusion of climate change assessments by investors, for example, emissions trading legislation and subsidies for renewables (Sørensen and Pfeifer 2011).
[2] Two recent papers underscore interest in this area, with Bansal and Ochoa (2011) deriving 'temperature Betas' and Griffin *et al.* (2011) exploring the stock market impact of carbon disclosures by listed companies.

have discouraged their widespread participation to date. Accordingly, the paper will address the following questions: How does the EU ETS work? What drives the value of carbon? What potential diversification benefits arise from investing in carbon? How does investing in carbon fit with investors' fiduciary responsibilities? How can institutional investors gain exposure to carbon? What unconventional risks does investing in carbon entail? What will happen to the carbon markets post-2012 once the Kyoto protocol expires? These questions will be addressed sequentially.

The EU ETS: A Brief Overview

The Kyoto Protocol came into force in January 2005 and will run until 2012 providing an International Emissions Trading (IET) mechanism as one of three ways of meeting emissions targets in a cost-effective manner. As a result, the European Union designed the EU ETS, a cap-and-trade IET scheme with a legal requirement for large CO_2-emitting installations to reduce emissions in line with set caps (EU Council Directive 2003/87/EC). Installations are issued with permits that allow them to emit CO_2 up to the cap. These permits are called European Union Allowances (EUAs) with one EUA representing one ton of CO_2. The EU ETS currently covers all 27 European Union countries as well as Norway, Liechtenstein, and Iceland. Affected companies manage their compliance by selling and purchasing EUAs depending on how many EUAs they hold relative to their cap (Alberola *et al.* 2008; Seifert *et al.* 2008). The EU ETS's main objective is to contribute to the promotion of low-carbon technologies and energy efficiency among major CO_2 emitting companies, thereby reducing CO_2 levels by 8 percent relative to 1990 levels (Christiansen *et al.* 2005; Benz and Trück 2006 2009; Mansanet-Bataller *et al.* 2007; Alberola *et al.* 2008; Koch 2012).

The other two Kyoto protocol mechanisms to meet emissions targets are project based.[3] They are the Clean Development Mechanism (CDM) and Joint Implementation (JI), which produce Certified Emission Reduction units (CERs) and Emission Reduction Units (ERUs) as their emissions certificates. These CERs and ERUs can also be submitted to the EU ETS (EU Council Directive 2004/101/EC). Greenhouse gas emissions trading has developed into a multibillion dollar activity, of which the EUAs accounted for 97 percent of the carbon

[3]These projects are emission-reduction projects in developing countries, for example, installation of energy efficient boilers or electrification of rural areas using solar panels. CDM projects are based in developing countries generating CERs, while JI projects are implemented in countries with an emission reduction target and generate ERUs.

markets in 2011(Kossoy and Guigon 2012). The carbon markets are one of the largest commodity markets in the world and will grow in importance as more countries implement their own plans to price carbon (Gardiner 2009).

Carbon Valuation

Numerous authors have attempted to analyze empirically and theoretically the main determinants of CO_2 price levels. Studies clearly identify three types of price fundamentals: policy and regulatory issues; energy prices; and temperature events. Often the latter two are grouped into market fundamentals relevant to understanding year-by-year changes or underlying market forces (Benz and Trück 2006, 2009; Mansanet-Bataller *et al.* 2007; Alberola *et al.* 2008). This section will discuss prior research on all three fundamentals.

Policy and regulatory issues

The first design issue of the EU ETS is that it is separated into three distinct phases, unlike commodity or financial markets: Phase I, 2005–2007; Phase II, 2008–2012; and Phase III, 2013–2020 (Mansanet-Bataller and Pardo 2008b; Daskalakis *et al.* 2009; Hintermann 2010; Creti *et al.* 2012; Koch 2012). Between phases I and II there was a prohibition on banking EUAs, meaning that two categories of derivatives now exist: derivatives that are issued and expire in the same phase (intra-phase) and derivatives that mature in the following phase (inter-phase). However, Poland and France were allowed a conditional transfer of EUAs between these two phases (Daskalakis *et al.* 2009; Hintermann 2010). Because intra-phase derivatives become worthless at the end of each phase, the inter-phase assets are essentially written on an asset that is not tradable during the whole life of the underlying contract (see Daskalakis *et al.* 2009 and Figure 1).

[Insert Figure 1 here]

For the phase I (the trial period) and phase II (the Kyoto commitment period), the supply of allowances was capped by the EU ETS through National Allocation Plans (NAPs) (EU Council Directive 2003/87/EC; Christiansen *et al.* 2005; Mansanet-Bataller *et al.* 2007; Mansanet-Bataller and Pardo 2008b). The NAPs determine how many allowances were distributed among participating companies affected by EU Council Directive 2003/87/EC, for the current phase as shown in Figure 2 (EU Council Directive 2003/87/EC; Alberola *et al.* 2008). Nonetheless, the carbon market size for EUAs is determined by the number of EUAs

each company is willing to trade, and the difference between the expected and real amounts of EUAs in the market drives variations in price levels (Mansanet-Bataller *et al*. 2007).

[Insert Figure 2 here]

This unpredictable market size is exacerbated as the overall European Union target of emission reduction is distributed among member states based on the Burden Sharing Agreement (BSA), in which different targets were set for each member state. Some countries have been set ambitious reduction targets, as shown in Table 1. Some member states are below their BSA targets and so have the option to either increase emission output or trade EUAs for profit (Benz and Trück 2009). To ensure the carbon market is set on a level playing field, one role of the European Commission is to create scarcity by establishing short positions among participating companies (Christiansen *et al.* 2005). These companies may be willing to pay higher prices for EUAs to avoid emission penalties.[4]

[Insert Table 1 here]

Finally, Seifert *et al.* (2008) show that expected emissions may be a realistic way of analyzing spot prices. They find evidence that the publication of participating companies' 2005 emission report corresponded to a decrease in the EUA price when it was apparent that participating companies were far below expected emission levels. The authors argue that the time between annual emissions reports is too long, resulting in inefficiencies in expectation building in the market leading to large spot-price differences.

Energy prices

Christiansen *et al.* (2005) find that energy prices are the most important drivers of carbon prices due to the ability of power generators to switch between the fuel inputs (see Figure 3 and Figure 4). This is perhaps not surprising, since a large proportion of the burden of EU ETS falls on the energy sector (see Figure 2). Accordingly, the price levels of oil, natural gas, and electricity are important determinants of CO_2 price levels (Benz and Trück 2006; Mansanet-Bataller *et al.* 2007; Hinterman 2010). Mansanet-Bataller *et al.* (2007) show that important energy determinants of CO_2 price levels are Brent and natural gas price changes, with coefficients of 23.2 percent and 12.2 percent, respectively.

[4] The penalty for non-compliance was €40 in Phase I and €100 in Phase II per ton of carbon emitted; allowances for the deficit must be submitted in the following year (Hintermann 2010).

[Insert Figures 3 and 4 here]

Alberola *et al.* (2008) suggest that the profitability derived from energy production by using specific fuels (coal or natural gas), rather than the cost of the fuel itself, is an important CO_2 price-level fundamental. Alberola *et al.* (2008) argue that power operators pay close attention to the spark and dark spreads,[5] and the difference between them determines when it is profitable to switch fuel inputs. With the introduction of carbon, these spreads also incorporate EUA costs becoming the "clean" spark and dark spreads. The equilibrium between these spreads represents the carbon price above (below) at which it becomes profitable for an electric power producer to switch from coal to natural gas (natural gas to coal) (Koch 2012). As long as the carbon price remains below the switching price, coal plants are more profitable than gas plants – even after adjusting for carbon costs. Alberola *et al.* (2008) support this by finding evidence that natural gas and clean spark spreads positively increase the EUA prices, whereas coal and clean dark spread negatively affect EUA prices. Alberola *et al.* (2008) highlight that this result may be because during trial Phase I's time series, dark spread prices remained above clean spark spread prices, making coal a more profitable fuel.

Brent oil was not found to be a significant determinant of carbon price; however; it is believed that Brent might affect EUA prices through natural gas prices (Alberola *et al.* 2008). Mansanet-Bataller *et al.* (2007) find counter-intuitive results that coal, the most intensive emission source, has no significant effect on CO_2 price levels. This is of interest, as using coal is more profitable per consumed unit than natural gas; however, it is more than twice as emission intensive as natural gas (Christiansen *et al.* 2005; Benz and Trück 2009; Hintermann 2010). Although there appears to be an indication that there is "cross correlation" between EUA pricing and other assets and commodities in the energy market, the most comprehensive cross-correlation to date appears to be that of Mansanet-Bataller *et al.* (2007) when using financial instruments. Mansanet-Bataller *et al.* (2007) find that when using cross-correlation, there were three possible fundamentals that were statistically significant: CO_2 index change (20.2 percent), Brent futures (26.8 percent), and natural gas futures (21.6 percent). Mansanet-Bataller *et al.* (2007) found no significant cross-correlation for coal futures.

[5] The spark (dark) spread represents the theoretical profit that a gas- (coal-) fired power plant makes from selling a unit of electricity having purchased the gas (coal) required to produce that electricity.

Weather

Numerous studies indicate that weather variables are possible determinants of EUA price levels (Christiansen *et al.* 2005; Mansanet-Bataller *et al.* 2007; Benz and Trück 2006, 2009; Hintermann 2010). In contrast, Alberola *et al.* (2008) find no effect on EUA prices for extremely hot or cold days, contradicting previous literature, leaving the effects of weather and temperature variables a heavily debated topic. With respect to seasonal averages, warmer summers increase the demand for air conditioning, electricity, and the derived demand for coal. Colder winters increase the demand for natural gas and heating fuel. As a result of increasing (decreasing) their output, the power generators will inevitably increase (decrease) their CO_2 emissions and require more EUAs (Christiansen *et al.* 2005; Alberola *et al*. 2008; Eurex 2008; Benz and Trück 2009). EUA price levels fall in windy climates due to the ability to generate electricity from carbon-neutral wind turbines (Benz and Trück 2006, 2009). Dry climates increase EUA prices due to the resultant decrease in output from hydroelectric plants and the lack of cooling water for nuclear power plants, leading to the use of emission-intensive power plants (Benz and Trück 2006, 2009). Precipitation is still debated, with Hintermann (2010) finding supporting evidence and Masanet-Bataller *et al*. (2007) finding no evidence of precipitation affecting carbon prices.

Diversification and Carbon as an Asset Class

How carbon correlates with other assets and markets is of interest, as it can motivate investors to use carbon allowances for portfolio diversification (Eurex 2008; Mansanet-Bataller and Pardo 2008a; Daskalakis *et al.* 2009). The collective evidence drawn from prior research is that prices and volatilities in carbon, energy, and financial markets are interrelated, at least in the short-term (Koch 2012). The switching costs and equilibrium between clean dark and spark spreads in the power sector immediately connects energy and carbon markets (Alberola *et al.* 2008; Koch 2012). As noted above, empirical evidence from Phase I suggests that commodities such as oil, gas, coal, and electricity are important determinants of carbon prices (Mansanet-Bataller *et al.* 2007; Alberola *et al.* 2008). Additionally, Koch (2012) finds an increase in correlation for coal and gas in Phase II compared with Phase I, and Mansanet-Bataller *et al.* (2007) indicate that extreme weather conditions also influence carbon price. Interestingly, Koch (2012) notes that often correlations between carbon energy markets and carbon financial markets are not stable over time, so unsurprisingly, these correlations are heavily debated.

The issue is also discussed in terms of the question of whether carbon is a commodity or a financial instrument. Financial regulation is moving in the direction of classifying both carbon allowances and carbon derivatives as financial instruments. In Europe, the latter have been treated as financial instruments for some time but there is a move to treat carbon allowances also as financial instruments (see Diaz-Rainey *et al.* 2011). This contrasts with the dominant view in the academic literature that suggests that carbon markets are a specific commodity market driven by regulatory design and power demand from electric utilities (Mansanet-Bataller *et al.* 2007; Alberola *et al.* 2008; Koch 2012).

Arguments to suggest carbon is a commodity include the increasing trading activity of EUAs and derivatives, despite the infancy of the carbon market (Christiansen *et al.* 2005). Carbon is also homogenous, easily transferable, and shows short-term variations (Benz and Trück 2006). By way of contrast, evidence suggesting that carbon is a financial instrument can be found in the behavior of carbon prices. Daskalakis *et al.* (2009) find that the logarithmic spot price of Phase I EUAs is non-stationary, indicating these assets are not commodities, as commodities for "consumption" exhibit mean-reverting behavior. Daskalakis *et al.* (2009) also compare weekly Phase I EUA futures returns from two markets (Nord pool and the European Climate Exchange [ECX]) against major assets classes, including global equity markets, international interest rates, and energy, and found that both series of EUA futures were negatively correlated with equity market returns. Therefore, EUAs can offer portfolio diversification for European equity investors. Eurex (2008) shows that this is indeed the case. By creating a portfolio ratio of 80:20 of the EURO STOXX 50 index and CERs, respectively, it was possible for the portfolio to outperform an all-equity portfolio. In a more formal analysis Mansanet-Bataller and Pardo (2008a) confirm this finding by including carbon in a conventional equity and fixed income portfolio. They note that the inclusion of carbon does extend the efficient frontier of portfolios, however, the weights attributable to carbon are low and diversification benefits were greater during Phase I than Phase II. The latter is unsurprising in the context of declining carbon prices and associated uncertainties about carbon trading in the future (See Figure 1 and discussion of *Carbon Trading Post-Kyoto*, below).

These limitations notwithstanding, the potential diversification benefits of carbon are underlined by the most comprehensive study on the debate concerning whether carbon is a financial or commodity asset. Medina-Martínez and Pardo (2012, p.1) find that the

> "*… majority of the phenomena observed, such as heavy tails, volatility clustering, asymmetric volatility and the presence of a high number of outliers are similar to those observed in both commodity futures and financial assets. However, properties such as negative asymmetry, positive correlation with stocks indexes and higher volatility levels during the trading session,[are] typical of financial assets, … [while] the existence of inflation hedge and positive correlation with bonds,[is] typical of commodity futures*."

This leads Medina-Martínez and Pardo (2012) to the conclusion that the EUA is neither a commodity nor a financial instrument; rather, it is a new asset class with distinct characteristics.

Fiduciary and Responsible Investment Considerations

While fiduciary duties are different in different jurisdictions, the key responsibilities of trustees internationally can be summarized as managing funds in the interests of the beneficiaries and exercising prudence when managing funds. This is interpreted by many as profit maximization and then given as a reason for many institutional investors not engaging in responsible investment (Kiernan 2007; Juravle 2008). The view that responsible investment is not compatible with investors' fiduciary duties and therefore will have a negative impact on financial returns is unproven. Yet it has prevented many investors from taking ESG (Environmental, Social, and Governance) issues into account in their investment decisions (Renneboog *et al.* 2008; Sandberg 2011). This is despite there being no evidence that taking environmental factors into account in the pension fund investment process has a negative financial impact (Hoepner *et al.* 2011).

The discussion around whether investment decisions are allowed to be influenced by socially responsible behavior has been hotly debated since the rise of socially responsible investments (SRI) with a number of high-profile investors. Early pioneers in adopting SRI strategies include the Ontario Municipal Employees Retirement System, California Public Employees' Retirement System, and Universities Superannuation Scheme in the United Kingdom, (Richardson 2007; Sandberg 2011).

In a bid to resolve the debate, the United Nations Environmental Programme Finance Initiative (UNEP FI) commissioned a report to look into whether there is a conflict between fiduciary duty and responsible investment. This became known as the "Freshfields' report"

and was entitled *A Legal Framework for the Integration of Environmental, Social and Governance Issues into Institutional Investment* (Freshfields Bruckhaus Deringer 2005). The countries covered were Australia, Canada, France, Germany, Italy, Japan, Spain, the United Kingdom, and the United States. The report argued that profit maximization was never an integral part of trustees' fiduciary duties. This assumption stems from an incorrect reading of the 1984 Cowan v. Scargill court case in the United Kingdom as requiring trustees to "yield the best return for beneficiaries" (Freshfields Bruckhaus Deringer 2005). The Freshfields' report goes on to say that while the main role of the trustee is to generate a financial benefit for the beneficiaries, this is not at the expense of all other factors. The prudent investor view does not hold with modern portfolio theory, since it requires investments to be looked at in relation to their risk-return profile in the context of the performance of the whole portfolio (Fabozzi *et al.* 2002; Richardson 2007). This would positively encourage investments that are individually risky (for instance, a new renewable technology) but correlate negatively with other portfolio investments (such as those in the oil and gas sector). Accordingly, the Freshfields report concluded *"…integrating ESG considerations into an investment analysis so as to more reliably predict financial performance is clearly permissible and is arguably required in all jurisdictions*" (Freshfields Bruckhaus Deringer 2005).

There is some debate over whether the Freshfields report will actually give the trustees the comfort they need to make clear decisions about how to incorporate ESG factors into the investment decision process. Clearly, it allows some ESG criteria to be incorporated some of the time and still be in line with fiduciary duty (Sandberg 2011). Sandberg (2011), however, argues that this level of SRI engagement will not generate the "socially effective" investment strategies required to effect meaningful change through SRI.

The two main routes available to SRI proponents are through shareholder advocacy or managed investments. Shareholder advocacy is the active practice of proposing shareholder resolutions in relation to environmental or social issues. This is a route that has been tried in the United States, although the majority of attempts have been unsuccessful (Haigh and Hazleton 2004). Haigh and Hazleton (2004) find that the effect of these routes was piecemeal. They suggest collaboration between institutional investors who have signed up to SRI principles and government lobbying to price the externalities through legal reform can increase the amount of responsible investment being undertaken by institutional investors.

Legal reform is seen as the only effective method of engaging all investors. It is acknowledged that additional legislation with regard to SRI investment would assist trustees and encourage those who are currently reluctant to move within the current framework. There have been some moves in this direction, for instance, the Canadian province of Manitoba allowing consideration of other factors and the French retirement reserve fund integrating ESG criteria into the investment management mandates (Freshfields Bruckhaus Deringer 2005; Sandberg 2011). Richardson (2009) advocates legal sanctions on financial institutions not meeting restrictive investment criteria or looking at social costs as a means of promoting SRI.

UNEP FI published a follow-up report to the Freshfields report (UNEP 2009) that acknowledged that steps had been made in increasing responsible investment but suggested further practical steps that needed to be taken to increase the momentum. These suggestions focused on how to incorporate ESG into the investment process through amendments to legal documents, such as the investment mandates and investment management contracts.

In relation to climate change issues, SRI was seen as a means to combat global warming. Increasingly, however, investors are focusing on the business case for SRI by examining risks and opportunities rather than viewing it as a means to enforce rapid change and prevent the potentially catastrophic effects of climate change (Richardson 2009). This makes it difficult to prove the financial case for investment in carbon market instruments unless the social costs for the long term are priced in. The latter will invariably require legislative changes that may have many facets and challenges to implementation (see Richardson 2009; Sandberg 2011).

Gaining Exposure to Carbon: Instruments and Markets

Institutional investors have a number of options when it comes to gaining exposure to the carbon markets. The options with specific reference to the EU ETS are, firstly, through investment in CERs and EUAs and, secondly, through derivative financial instruments such as futures and options on the underlying CERs and EUAs or swaps on the spread between the two. Thirdly, exposure may be achieved through direct investment in the underlying CDM or JI projects, although given the relatively small size of these projects the fourth option of investing in carbon funds that invest in the underlying projects and trade in the CERs is a more likely investment route. A fifth option is to invest via a carbon exchange-traded fund

(ETF); however, there are only two such funds of any note (the United States-issued iPath Global Carbon ETN and the European-based ETFS Carbon). The relative immaturity of the carbon ETF market belies the development of ETF markets in recent years (Diaz-Rainey and Ibikunle 2012). We discuss the reason for this in the next section. Prior to that, we explore the first four investment options in more detail in the next two subsections.

Trading carbon and carbon financial instruments

The EU ETS remains the largest driver of carbon-based trading; it is estimated that it drove more than 96 percent of the global carbon market in 2010 (Linacre *et al.* 2011). In 2005, 80 percent of EU ETS trades occurred over-the-counter (OTC); most of these trades meet the widely recognized definition of block trades in the EU ETS. The four emission trading units widely traded in Europe are EUAs, European Union Aviation Allowances (EUAAs), CERs, and ERUs (see Daskalakis *et al*. 2011; Ibikunle and Gregoriou 2011). Most of the trading is undertaken in derivatives of these allowances rather than the allowances themselves, with futures dominating the market, though there is a growing options market (see Kossoy and Guigon 2012).

Over the course of Phase I of the EU ETS (2005–2007) and during most of Phase II (2008–2012), there has been a gradual shift away from OTC trading to the point that exchange-based trades accounted for about half of trading in 2011 (see Kossoy and Guigon 2012). This trend is driven by the need to avoid counterparty risks, an issue that has taken on greater significance in derivative markets as a whole in the aftermath of the global financial crisis. The ECX platform is the market leader in EU ETS exchange-based carbon trading, with more than 92 percent market share (Ibikunle *et al.* 2011a). This includes OTC trades registered on the platform in attempts to eliminate counterparty risk. The global dominance of the ECX platform has attracted participants from beyond Europe. In 2009, about 15 percent of trade volume on the platform was from traders domiciled in the United States (see Linacre *et al.* 2011).

The increasing switch to exchange-based trading mentioned above has consequences for the pricing of permits in the EU ETS, since institutional investors are more likely to trade using block volumes. Ibikunle *et al.* (2011b) analyze approximately €20 billion worth of block trades on the ECX over a 40-month period in Phase II. The authors show that buyer- and seller-initiated block trades significantly impact the price of carbon financial instruments

(CFI) on the ECX. Despite this, trading on the ECX has shown a heightened sophistication that is associated with an increase in the number of traders, which, in turn, is reflected in rising volumes and increasing open interest over time (see Ibikunle *et al.* 2011b; Mizrach and Otsubo 2011; Kossoy and Guigon 2012). This increased activity and sophistication has come about despite a low and, in general, declining price of carbon over Phase I and II (see Figure 1).

Underlining the increased sophistication of trading, Ibikunle *et al.* (2011a) show how traders during the after-hours market employ Exchange for Physical and Exchange for Swap (EFP/EFS) instruments. The use of EFP/EFS trades underlines the level of maturity on the platform. EFP/EFS trades provide a hedging option using ECX EUA futures contracts, in one transaction; that is, the seller of emissions permits assumes the role of the buyer of ECX futures contract and the buyer of the permits, the role of the seller of ECX contracts. The strategy also allows for the substitution of OTC swap positions with corresponding ECX contracts. Further, the authors identify two classes of traders on the platform based on information distribution across the trading day and after-hours trading market. Although there are liquidity induced trades, the after-hours market is dominated by informed traders. This level of trading sophistication is well documented on regular equity platforms and currency markets.

Project-based investment exposure

Institutional investors can get project-related carbon exposure through infrastructure and property investment. Property investment funds with fixed units and life spans usually invest directly in properties or stocks of property firms. Investments are usually low risk, yielding low returns. Empirical evidence points to higher returns for climate-change-based property funds (see, Kok *et al.* 2011), with institutional investors recognizing this opportunity and responding with bespoke funds. For example, APG Asset Management has already founded and is part-financing a performance contracting-focused fund dedicated to energy-efficient retrofit projects. The Climate Change Capital Property Fund is a similar example of such innovative investment strategies.

[Insert Table 2 here]

Depending on where they are located, industrial projects funded by infrastructure and property funds can generate CERs and ERUs via the CDM and JI mechanisms, respectively. There are specific funds that are designed to achieve this purpose, for instance, Climate Change Capital Carbon funds worth about €800 million. Table 1 shows the major private sector carbon investment funds along with their sizes and investment strategies. The preponderance of fund activities are focused on industrial energy efficiency, destruction of industrial gases, and renewable energy. Some funds also invest directly in EU ETS through EUAs; however, most funds are project focused and accordingly are principally concerned with direct operational returns and profit enhancement from related project allowances (CERs and ERUs).

Unconventional Risks from Carbon Investing

> *"Institutional investment, including from pension funds, in emissions markets is minimal compared to longer-established commodities markets. This is believed to be due to the emissions market's relative immaturity, its uncertain lifespan, its high volatility and the lack of the same fundamental price drivers which have made many other commodities good portfolio diversifiers for what are usually multi-asset class, long term investors*." (Hill *et al.* 2008, p.16).

To some extent, the quote above would seem to have been superseded, as the preceding sections of this paper have established that there are fundamental price drivers and that the EU ETS carbon market is increasingly mature. Accordingly, it would seem on the face of it that "market infancy risk" has been overcome (Hill *et al.* 2008, p.7). Yet institutional investment in carbon markets remains low beyond their participation in the project credit market. This low participation rate is underscored by the small size of ETF carbon funds/funds markets, which contrasts with the large size of the ETF commodities market. Indeed, the growth of the ETF commodity market has led to concerns about institutional and retail investment flows creating a speculative bubble in commodity prices, which is in sharp contrast to the depressed prices of carbon (see, respectively, Diaz-Rainey *et al.* 2011; Tang and Xiong 2011; and Figure 1).

The continued low participation of institutional investors in EU ETS can be explained by a multitude of factors. Weak fundamentals and an oversupply of credits resulting from the global economic downturn are clearly important (Kossoy and Guigon 2012). Further, and

perhaps most prominently, is the uncertainty surrounding carbon trading post-Kyoto (this is discussed in the next section). As a result of this uncertainty, the pricing of most of the carbon financial instruments traded remains very noisy (see, for example, Ibikunle *et al.* 2011a). This is a reminder that carbon markets are manufactured, and accordingly political risk or "market foundation risk" is still very much present (Hill *et al.* 2008, p.7).

Another set of factors that contribute to the low participation of institutional investors can be termed "market integrity risk" (Hill *et al.* 2008, p. 7). Unfortunately, there have been plenty of examples of such risks in the context of EU ETS. A price collapse in carbon in 2006 was most likely augmented by the disorderly release of market-sensitive NAPs information by authorities (Hill *et al.* 2008). The period between 2008 and 2009 saw unusual trading volumes in EUAs that were associated with a Value Added Tax "carousel" or "missing trader" fraud using EUAs. This is believed to have cost the European Union member states around €5 billion (Daskalakis *et al.* 2011; Kossoy and Guigon 2012).

Another issue that emerged in recent years is the "HFC-23 controversy." This is related to the aforementioned CDM-based projects aimed at the destruction of industrial gases (most prominently HFC-23) to gain CERs. It became apparent that plants that produced HFC-23 were "gaming" the system by timing their production of the gasses so as to gain the maximum amount of CERs. Though not directly related to operation of EU ETS, the HFC-23 controversy threatened to undermine the price of carbon on EU ETS through a flood of CERs obtained via HFC-23-related projects. Finally, 2011 witnessed another major market integrity issue in the form of the closing down of EU ETS spot trading in January due to the "cyber" theft of EUAs from national "registries" (Diaz-Rainey *et al.* 2011). This incident resulted in the theft of a relatively modest €50 million worth of EUAs, but it proved a major embarrassment for the European Union Commission (the driving force behind EU ETS) and heralded a new regime in terms of how spot carbon markets registries were to operate (see Kossoy and Guigon 2012).

Most of these issues discussed have now been addressed through improved market design, alterations to the rules governing carbon trading, and enhanced financial regulation (see Diaz-Rainey *et al*. 2011; Kossoy and Guigon 2012). However, the fact that they happened in the first place will serve as a sharp reminder to institutional investors that carbon markets face

unconventional risks that go beyond "market foundation risk." It is to the latter that we turn next.

Carbon Trading Post-Kyoto

The agreements of COP 17 provide an opportunity to negotiate a successor to the Kyoto Protocol within the next four years (to end in 2015).[6] The expected negotiated treaty will have to come into force by 2020. Recent history suggests, however, it is an opportunity the global community may not take advantage of. The partisan political gridlock in the United States Congress (the world's largest consumer of fossil fuels), the combative stance of India-led developing nations, and the seemingly lukewarm stance of China (the world's largest CO_2 emitter)[7] on reaching a credible agreement may all contribute to the loss of this opportunity.

A stable global climate change policy must include the United States in order for it to be effective. In the event that an agreement is reached among negotiators by 2015, the congressional ratification of such a treaty in the United States will require a radical shift in attitude towards climate change amongst the political elite. The re-election of President Obama, which received late impetus from climate change concerns associated with Hurricane Sandy, and further elections in 2014 may make congressional approval of a climate change treaty by 2015 more likely. Further, President Obama has demonstrated an independent streak by pushing his domestic agenda (including climate change policy) through the Environmental Protection Agency and by the use of executive orders. The president's willingness to continue along this path in his second term in office will be critical to easing the uncertainty surrounding a stable global climate policy. Even as the direction of policy at the federal level remains uncertain, some individual states in the United States are taking strong action on climate change through regional market-based carbon-reduction initiatives.[8] This trend is expected to continue post-Kyoto.

[6] COP 17 refers to the "17th Conference of the Parties" to the United Nations Framework Convention on Climate Change (UNFCCC). UNFCCC was the precursor to the Kyoto Protocol.

[7] Since COP 17, China's stance toward carbon trading appears to have improved markedly. A number of provinces and municipalities have announced plans for pilot emissions trading schemes, including Beijing, Shanghai, Guangdong province, Shenzhen, and Tianjin (see Kossoy and Guigon 2012).

[8] Note that some states have commenced state-wide emission reduction programs, including emissions trading in the United States. An example is the Regional Greenhouse Gas Initiative, an initiative of the Northeast and Mid-Atlantic states.

However, overall it does not seem likely that the federal government in the United States will be in a position to offer global leadership on emissions trading soon. This leaves Europe and other jurisdictions such as New Zealand, Japan, China, California, and Australia in the driving seat on market based climate change action post-2012. Australia, holding one of the highest per capita emission levels, recently passed its long-awaited legislation for a carbon tax and an economy-wide ETS which will commence in 2015. The legislation makes the Australian ETS the second largest in the world. By 2015, it is also expected that the Western Climate Initiative (which includes California, Ontario, Quebec, Manitoba, and British Columbia) and South Korean schemes will be operation. There has also been some indication of a grand alliance of ETS initiatives in the Asia Pacific region to include China, Australia, New Zealand, South Korea, Japan, California, and parts of Canada (see Kossoy and Guigon 2012). Japan is still committed to its emissions reduction obligations through implementation of its framework for a market-based emission reduction system, the Basic Act on Global Warming Countermeasures.

Phase III of the EU ETS commencing in 2013 is the next step in the ambitious European plan to combat climate change by using market-based mechanisms. Kossoy and Guigon (2012, p. 19) note that:

> *"Phase III of the EU ETS is expected to provide stronger price signals due to a longer trading period (eight years versus five years in Phase II), the annually declining emissions cap, and a substantial increase in the level of auctioning (from less than 4% in Phase II to over 50% in Phase III). Over 1,200 million EUAs are expected to be auctioned every year starting in 2013, compared to less than 100 million EUAs sold in 2011*."

Further, the scope of EU ETS has recently been expanded when the aviation sector was brought into the EU ETS in January 2012. Already, American and Chinese airlines forced to trade in carbon emissions since they fly into the European Union have challenged the power of the European Union to curb their emissions in court. The European Court of Justice, however, has since dismissed the arguments against their inclusion in the scheme (see Kossoy and Guigon 2012).

It is also noteworthy that some of the more active countries with respect to climate change action (for example, New Zealand and Australia) demand commensurate efforts from large

emitters such as the United States, India, and China before a Kyoto successor can be agreed upon. This demand may still hinder future climate change negotiations and negatively affect the future of global emissions trading. However, since the European Union has already agreed to a post-Kyoto extension for the EU ETS and the European carbon trading platforms continue to mature, the persistent growth of emissions trading is assured for at least another seven years post-2012. The recent agreement reached at COP 17 along with the renewed drive towards the development of regional initiatives should also help. It is important that leading countries in the institutionalization of cap-and-trade are considering linking their various schemes. In this respect, the recent agreement between the European Union and Australia to link their ETSs sets an important precedent. This raises the specter of a *de facto* global cap-and-trade scheme (rather than one achieved by a grand global political treaty) and will likely drive the adoption of global climate change policies post-Kyoto.

Conclusion

This paper explored the role of institutional investment in the most high-profile contemporary environmental market – EU ETS. It did so by addressing sequentially seven questions, namely: (1) How does the EU ETS work? (2) What drives the value of carbon? (3) What potential diversification benefits arise from investing in carbon? (4) How does investing in carbon sit with investors' fiduciary responsibilities? (5) How can institutional investors gain exposure to carbon? (6) What unconventional risks does investing in carbon entail? (7) What will happen to the carbon markets post-2012, once the Kyoto protocol expires?

From this discussion, it is evident that carbon markets generally and EU ETS specifically are, from an institutional investing perspective, a paradox. Recent years have seen increased market sophistication (trading efficiency); it is evident that there are potential diversification benefits from investment in carbon and that investing in carbon *can be* consistent with fiduciary duties. Despite this, there is little institutional involvement in EU ETS due to the unconventional risks that come with investing in carbon allowances and derivatives. In terms of unconventional risks, the VAT carousel fraud and the theft of allowances in 2011 are relatively minor issues when placed against the absence of a clear post-Kyoto agreement.

Despite the absence of a grand global deal for carbon trading post-2012, there are, however, reasons to be optimistic about the future of carbon markets. These reasons include the establishment of new schemes around the world (in particular in China), the ambitious plans

for Phase III of the EU ETS, and the desire to link existing schemes internationally (as evident in the recent deal between the European Union and Australia). This raises the specter of a *de facto* global cap-and-trade scheme rather than one achieved by a grand global political treaty. This is unquestionably a second-best option, and the issue remains of how to encourage more institutional investors to take exposure to carbon. This lack of exposure is not due to an absence of awareness or concern on the part of institutional inventors. This is underscored by the considerable successes in establishing large and influential climate change investor networks (these were discussed in the "Introduction" and included IIGCC, IGCC, INCR, and UNPRI).

The progress recorded in establishing large and influential climate change investor networks notwithstanding, the current reality is that long-term direct carbon investment strategies remain largely unpopular among institutional investors as a result of uncertainties surrounding climate change policy. At the moment, climate change policy is not globally stable, transparent, and dependable. Pricing of most of the carbon financial instruments traded is very noisy as a result of this level of uncertainty (see, for example, Ibikunle *et al.* 2011a). The Mercer report also referred to in the "Introduction" to this chapter underscores this point (Mercer 2011).

The Mercer-developed TIP[9] framework suggests that the uncertainty surrounding global climate policy is a significant source of portfolio risk for institutional investors; it contributes about 10 percent of the risk profile of investment portfolios. Institutional investors concerned about climate change and acting through some of the large climate change investor networks mentioned above have consistently tried to influence policy in order to fill the so-called *climate investment gap* created as a result of this unpredictability. Their efforts may have contributed to some of the progress made at COP 17 in Durban back in December 2011. However, if robust growth in climate change–related investing is to continue beyond 2012, more needs to be achieved in order to adequately address the climate investment gap. Legislation incorporating a fiduciary obligation for institutional investors to take into account the social costs of investment as well as private returns would begin to pave the way (Richardson 2009; Sandberg 2011).

[9] Mercer developed TIP as framework that can be employed by institutional investors in identifying and managing the risks and opportunities as a result of the emergence of climate change as an investment factor. It considers low-carbon technology (T), physical impacts (I), and climate change related policy (P).

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Table 1: Total greenhouse gas emissions ($MtCO_2e$) for base year and 2002; reduction targets for the period 2008-2012 according to the EU burden sharing agreement (BSA) for EU-15; and distance to BSA target in 2002

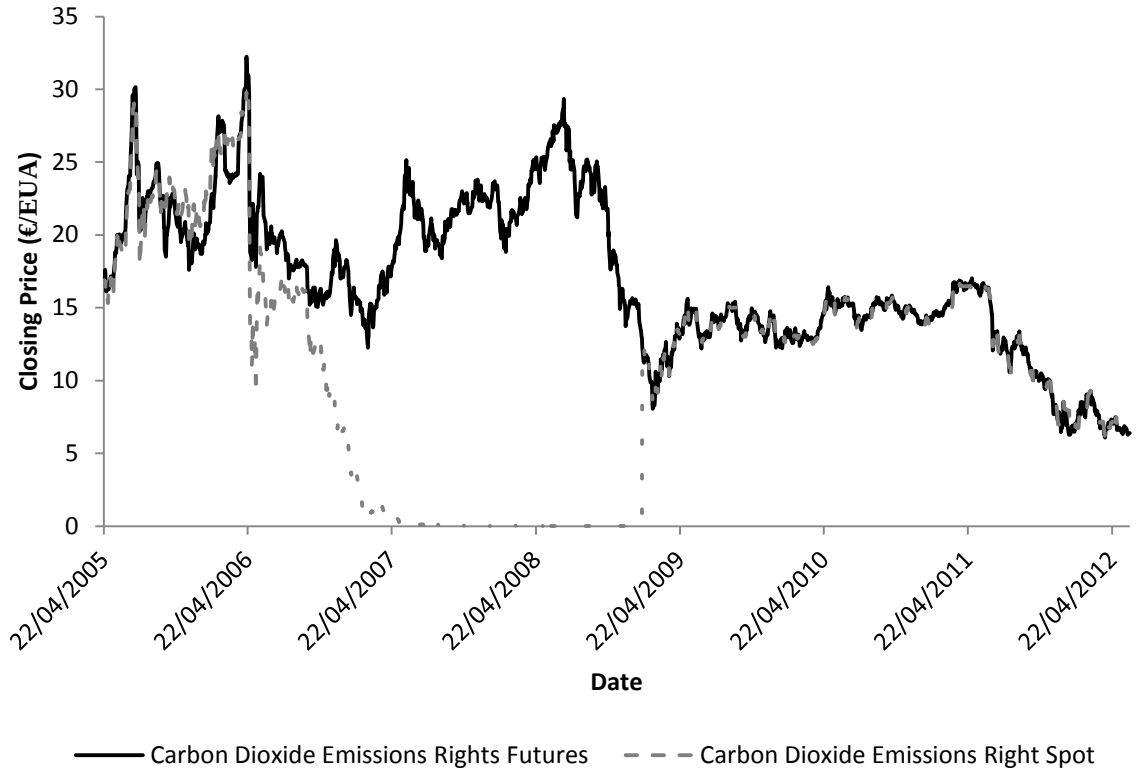
	Base Year ($MtCO_2e$)	2002 ($MtCO_2e$)	Change from base year to 2002 ($MtCO_2e$)	BSA (%)	BSA Target ($MtCO_2e$)	Distance to BSA in 2002 ($MtCO_2e$)
Austria	78	85	7	-13	67.9	17.1
Belgium	146.8	150	3.2	-7.5	135.8	14.2
Denmark	69	68	-1	-21.0	54.5	13.5
Finland	76.8	82	5.2	0.0	76.8	5.2
France	564.7	554	-10.7	0.0	564.7	-10.7
Germany	1,253.3	1,016	-237.3	21.0	990.1	25.9
Greece	107	135	28	25.0	133.8	1.3
Ireland	53.7	69	15.6	13.0	60.3	8.7
Italy	508	554	46	-6.5	475.0	79.0
Luxembourg	12.7	11	-1.7	-28.0	9.1	1.9
Netherlands	212.5	214	1.5	-6.0	199.8	14.3
Portugal	57.9	82	24.1	27.0	73.5	8.5
Spain	286.8	400	113.2	15.0	329.8	70.2
Sweden	72.3	70	-2.3	4.0	75.2	-5.2
UK	746	635	-111	-12.5	652.8	17.8
EU-15	4,245.2	4,125	-120.2	-8	3,905.6	219.4

Source: Adapted from Christiansen *et al.* (2005, p. 21).

Table 2: Carbon investment funds

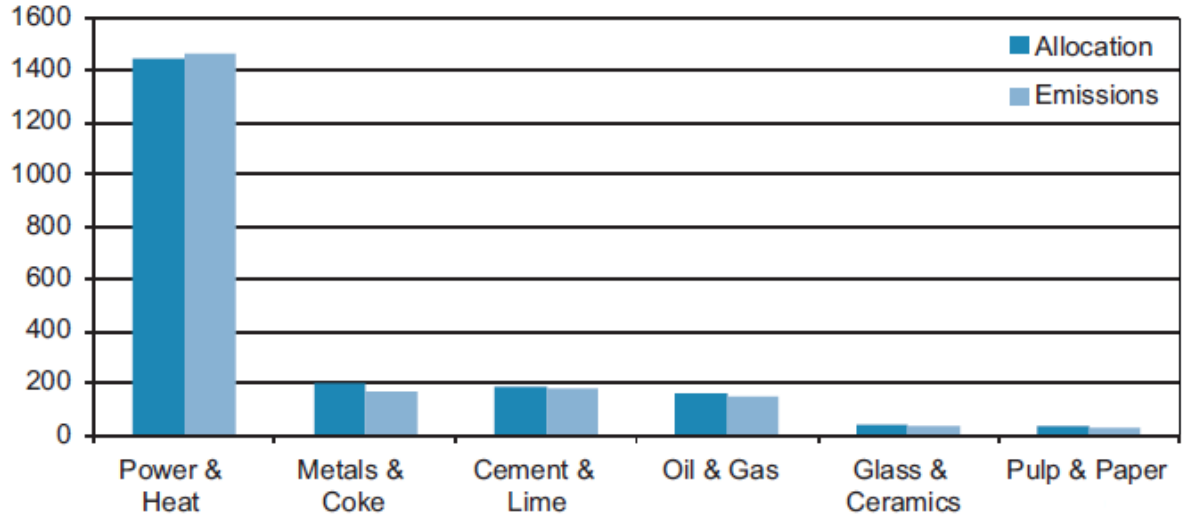
Funds	Investment Strategy	Year of Launch	Size (Planned/Actual)	Equity Investment	CDM (CER)	JI (ERU)	EUA	AAU	Other Credits	Trading Post-Kyoto?
Bunge Emissions Fund	Capital Gains	2006	Not Disclosed	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Carbon Assets Fund	Capital Gains	2006	Not Disclosed	Yes	Yes	Yes				Yes
Cheyne Carbon Fund Limited	Capital Gains	2005	Not Disclosed						Yes	Not Disclosed
China Methane Recovery Fund	Capital Gains	2006	€100 million		Yes					Not Disclosed
Climate Change Capital Carbon Fund II	Capital Gains	2006	€700 million	Yes	Yes	Yes				Yes
Climate Change Capital Carbon Managed Account (C4MA)	Compliance	2006	€100 million		Yes	Yes				Yes
Climate Change Investment	Capital Gains	2007	€100 million	Yes	Yes	Yes		Yes		
European Carbon Fund	Capital Gains	2005	€143 million		Yes	Yes				
FE Global Clean Energy Services Fund IV	Capital Gains	2007	$250 million	Yes	Yes	Yes				Not Disclosed
FE Global-Asia Clean Energy Services Fund	Capital Gains	2004	$75 million	Yes	Yes					Not Disclosed
FinE Carbon Fund	Compliance	2007	€30 million		Yes	Yes				
Greenhouse Gas-Credit Aggregation Pool (GG-CAP)	Compliance	2005	$383 million		Yes	Yes				
Grey k Environmental Fund	Capital Gains	2005	$300 million	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ICECAP Carbon Portfolio (ICP)	Compliance	2004	Not Disclosed		Yes	Yes				
Japan Greenhouse Gas Reduction Fund (JGRF)	Voluntary	2004	$142 million		Yes	Yes				
Merzbach Carbon Finance (MCF)	Capital Gains	2005	$100 million	Yes	Yes	Yes				
Merzbach Carbon Finance Fund (MCFF)	Capital Gains	2007	$50 million	Yes	Yes	Yes				
Natsource Aeolus Onshore & Offshore Funds	Capital Gains	2006	$108 million	Not Disclosed	Yes	Yes	Yes	Yes	Yes	Not Disclosed
Peony Capital	Capital Gains	2007	€400 million	Yes	Yes					
Sindicatum Carbon & Energy Fund, LP	Capital Gains	2007	€300 million	Yes	Yes	Yes				
Trading Emissions Plc (TEP)	Capital Gains	2005	£100 million	Yes	Yes	Yes				Yes

Source: Cochran and Leguet (2007, p.29)



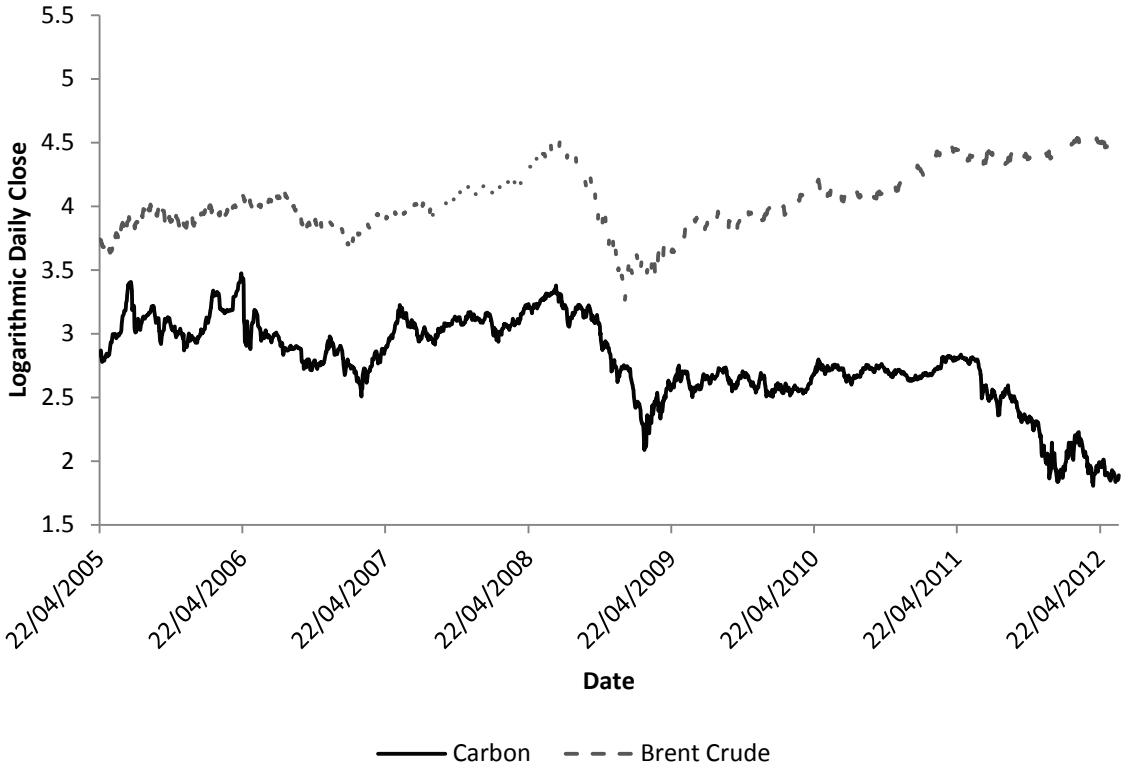
Source: Reuters EcoWin Pro data

Figure 1: Daily close price for carbon dioxide emissions rights futures, and carbon dioxide emission rights spot, in EURs. The data cover the period between April 22, 2005 and June 5, 2012.



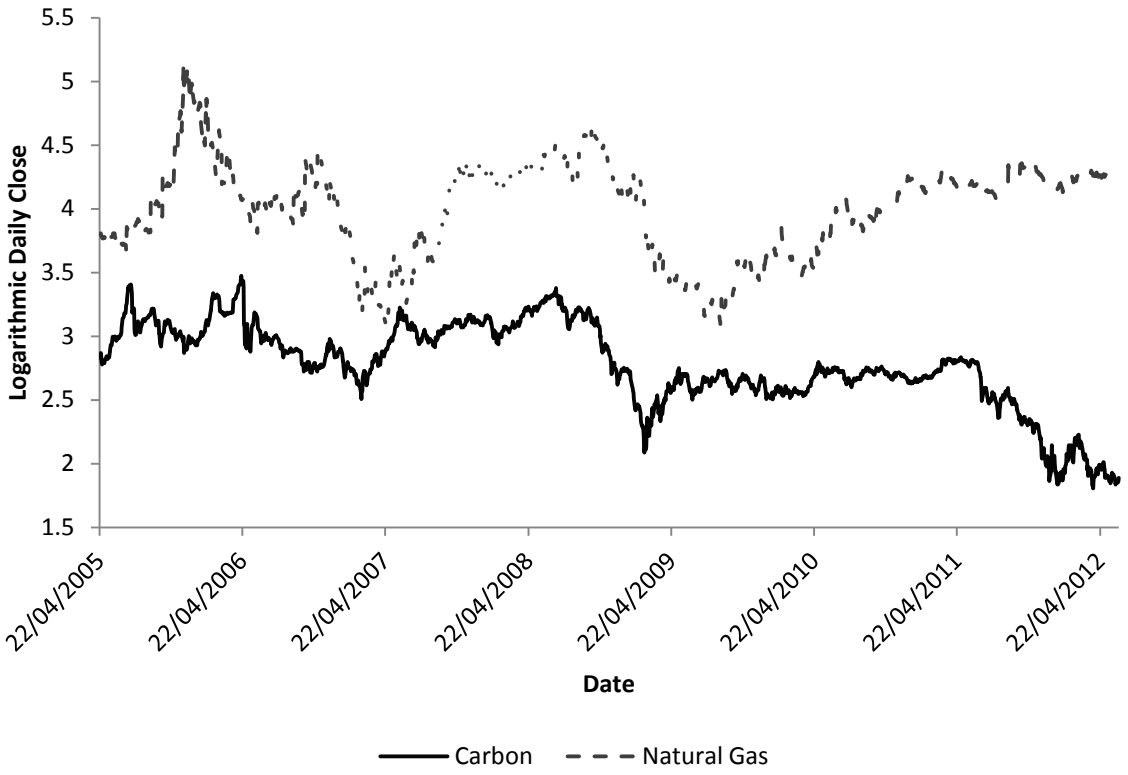
Source: Adapted from Hintermann (2010).

Figure 2: Allowance allocations and emissions by sector for 2006



Source: Calculated from Reuters EcoWin Pro data.

Figure 3: Logarithmic daily close price of Carbon Dioxide Emissions Rights ECX CFI Phase II futures and Global Brent Crude futures. The data cover the period between April 22, 2005 and June 8, 2012.



Source: Calculated from Reuters EcoWin Pro data.

Figure 4: Logarithmic daily close price of Carbon Dioxide Emissions Rights ECX CFI Phase II futures and Global Natural Gas futures. The data cover the period between April 22, 2005 and June 8, 2012.

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