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Carbon Derivatives and their Application within an Australian Context

Abstract

It retains no odour and is colourless, yet CO_2, also known as Carbon Dioxide, is one of the major components that contribute towards greenhouse gas (GHG) emissions. Due to increased environmental awareness, greater scrutiny is being placed upon these emissions, with an increasing number of global forums held in an effort to reduce the impact of emissions upon the environment.

Kyoto, Toronto, Copenhagen and Bonn are just a few localities that are becoming increasing associated with environmental change. Such transformation has seen corporations, governments and countries coming to understand GHG emissions, appreciating their impacts and developing strategies so as to minimise such effects.

Australia is looking to undertake is own carbon pollution reduction scheme. A current contentious political, economic and social issue, both proponents and critics continue to debate the best approach. Due to begin in 2012, the second phase of the proposal incorporates a fully operational Emissions Trading Scheme (ETS).

This paper delves into carbon-based derivatives, by firstly outlining the current carbon trading environment, discussing the specifics of carbon derivatives in greater detail and then briefly outlining their context within Australia.

Introduction

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Kyoto, Toronto, Copenhagen and Bonn are just a few localities that are becoming increasing associated with environmental change. Such transformation has seen corporations, governments and countries coming to understand GHG emissions, appreciating their impacts and developing strategies so as to minimise such effects. As these forums have matured over the years, many industries have come to realise their impacts. Industries within the European Union have come to realise there are additional costs when utilising pollution heavy technologies.

Originally proposed as the Carbon Pollution Reduction Scheme, Australia is looking to undertake its own carbon trading scheme. In whatever form though, the topic is a contentious political, economic and social issue, with both proponents and critics continuing to debate the best approach. Due to begin in 2012, the second phase of the proposal incorporates a fully operational Emissions Trading Scheme (ETS).

This paper delves into carbon-based derivatives, by firstly outlining the current carbon trading environment, discussing the specifics of carbon derivatives in greater detail and then briefly outlining their context within Australia.

Importantly though, it is not the aim of this paper to discuss, prove or disprove the science behind climate change. For every argument, a passionate counter-argument exists. Hence for the sake of dispute, it is assumed that climate change is underway and carbon derivatives have become a tool in which corporations limit their exposure.

The paper is structured as follows. Section 1 briefly outlines the history of carbon trading. Section 2 discusses carbon derivatives in detail, outlining key markets and instruments. After closely examining such particulars, Section 3 briefly outlines the proposed carbon scheme that Australia is looking to implement, highlighting areas of concern and importance. Lastly, Section 4 discusses the way forward and concludes.

Carbon Trading and the Creation of Carbon Derivatives

Whilst the operation of a Carbon Tax is one approach in achieving emission reductions, for the last 10 years or so, corporations, institutions and governments have utilised carbon trading in greater frequency to also address the issue of climate change. Originally stemming from work undertaken in 1968 by economist John Dales, carbon trading was recently modernised during the Kyoto Protocol in 1997 (Brookings, 2011).

Alternatively known as emissions trading or cap-and-trade schemes, carbon trading establishes a cap of allowable greenhouse emissions. Corporations involved in the scheme must limit their greenhouse emissions below this cap which is issued by an overarching authority. However, if corporations are unable to maintain their emissions below the determined level, then they must either take one of four steps, being:

1. reduce emission levels (usually via reducing production of output or changing technology);
2. purchase other corporations unused emissions credits;
3. purchase carbon offsets; or
4. pay a penalty.[1]

[1] In the case of the EU ETS, a penalty of €40/metric tonne of CO_2 was imposed in the first phase, followed by a higher penalty of €100/metric tonne of CO_2 in the second phase.

However, due to various reasons (i.e. the operation of more efficient procedures; the utilisation of more efficient equipment; or sourcing cleaner sources of fuel etc.) some firms will have excess credits, in turn selling these credits or storing them for future use.

Due to such implications, it is crucial that the height of a cap is set at the 'right' level. Too high (i.e. as what is argued within the EU ETS) and carbon emissions could increase, having no effect on the environment.[2] Too low, credits become scarce, increasing in price and thereby becoming too expensive for some corporations, adversely impacting upon operational and financial performance. Hence, the governing body usually keeps a keen eye on the price of such credits to ensure market forces do not tip the scales in any one direction. If such forces do steer prices, supply is either increased or shortened.

The Kyoto Protocol was effectively the first true global forum on achieving environmental change. In the beginning, the aim was to have 38 countries committing to reduce greenhouse emissions 5.2% below 1990 levels by 2012. Under the Protocol, the objective was essentially to "…make it cheaper for companies and governments to meet emissions reduction targets (Gilbertson & Reyes, 2009, pg. 9)."

However, not all countries were included in this commitment. China and India (considered developing economies), were excluded and due to their individual emission levels, caused much controversy. Yet of most argument was the notorious withdrawal of the United States, ultimately choosing not to endorse the Protocol in 2001. On the other hand, in stark contrast to the United States' Federal Government stance upon the Kyoto Protocol's objectives, an independent under-current was gathering momentum within the United States itself. Founded by Dr. Richard Sandor, the Chicago Climate Exchange (CCX) was formed in 2003.

Even though a voluntary carbon trading market, the CCX was expansive in its organizational reach. At its peak, membership totalled more than 400 entities, ranging from corporations to co-

[2] House of Commons, 2010, *The Role of Carbon Markets in Preventing Dangerous Climate Change*, Environmental Audit Committee, 26th January 2010

ops, from municipalities to educational institutions, where under the watch of the CCX, carbon financial instruments (CFIs) were traded. Whilst the program is now obsolete, one CFI equalled 100 metric tons of CO_2 equivalent.

Alluded to earlier, the European Trading Scheme (ETS), also known as the European Union Emissions Trading Scheme (EU ETS), is probably the most well-known cap-and-trade schemes. In operation since 2005, the scheme currently includes approximately 11,000 power generations and factories across 30 counties.[3] Initially the aim of the EU ETS was to achieve a reduction in greenhouse gas emissions of 8% (based upon 1990 levels) by 2012. But this was further expanded to 2020, with member nations agreeing to reduce emissions by a further 12%, where each country has its own defined cap, with credits allowed to pass in-between member nations (Bloch, 2010)

However, evidence seems to suggest that power generators across the EU have made significant profits from the ETS (Gilbertson & Reyes, 2009). This was accomplished via the way "…energy companies account[ed] for the costs of the EU ETS. The costs that are indirectly passed on to consumers through an increase in wholesale energy prices do not reflect what carbon credits actually cost, but rather what the companies assume they could cost…[allowing]…considerable scope for overestimates (Gilbertson & Reyes, 2009, pg. 36)." In fact, Carbon Trading estimates that "…profits made by power companies in phase 2 could be between €23 billion and €71 billion (Gilbertson & Reyes, 2009, pg. 39)."

Across the Atlantic, the Commodity Futures Trading Commission (CTFC) regulates trading within the United States. Although trading activity is only seen in a regional sense, as part of the Dodd-Frank Wall Street Reform and Consumer Protection Act, a CFTC led group was recently required to "…conduct a study on the oversight of existing and prospective carbon markets to ensure

[3] European Commission, *EU ETS*, updated 15th November 2010, retrieved 10th September 2011, available at http://ec.europa.eu/clima/policies/ets/index_en.htm

efficient, secure, and transparent carbon markets, including oversight of spot markets and derivative markets"[4]. Based upon this study, the group recommended 4 key objectives, being:

- Objective 1: Facilitate and protect price discovery in the carbon markets;
- Objective 2: Ensure appropriate levels of carbon market transparency;
- Objective 3: Allow for appropriate, broad market participation; and
- Objective 4: Prevent manipulation, fraud and other market abuses (CTFC, 2011).

However, even though the CTFC did focus upon the prevention of manipulation and fraud, the report "…raised a number of issues it said should be addressed with care to ensure that these markets are transparent, robust, and effective in helping industry comply with emission reduction mandates at the lowest cost (Holly, 2011)." The report directed specific attention towards the role of speculators within the carbon-based derivative markets, highlighting the need for an extensive range of tools to keep any destabilising actions in check.

The Rise of Carbon Derivatives

Since the early 1980's, derivatives have been utilised by market participants in undertaking various strategies. Ranging from hedging to speculation, strategies have either decreased or increased risk exposure, ultimately allowing derivatives to facilitate a risk transfer mechanism. Exchanged either through organised exchanges or via an over-the-counter (OTC) market, each approach has its own benefits and drawbacks.

Risks involved with carbon markets and carbon-based derivatives are those that are typical to standard derivatives, including price, counterparty, credit, operational, spread, currency and liquidity. Again like any derivative, the value of a carbon derivative is based upon the value of the underlying commodity. In the case of carbon-based derivatives though, such components include carbon dioxide and other greenhouse gasses including methane and nitrous oxide.

[4] CTFC, 2011, *Interagency Working Group Releases Carbon Oversight Study*, updated 18th January 2011, retrieved 3rd September 2011, available at http://www.cftc.gov/PressRoom/PressReleases/pr5965-11.html

Questions therefore arise as to how an odourless and colourless emission can be considered a commodity. For example, "…the commodity traded as 'carbon' does not actually exist outside of the numbers flashed up on trading screens or the registries held by administrators (Gilbertson & Reyes, 2009, pg. 12)." Such complexities were made clearly evident at the 2009 OECD Global Forum on Trade, where difficulties arose even in the classification of carbon-based emissions. Particularly, the OECD "…catalogued 13 schemes…[where dissimilar approaches yielded]…radically different numbers – for example, it was noted that differences between estimates provided by two institutes differed in one case by a factor of 6 (Ciuriak, 2009, pg. 3)."

With stark disparities in existence, how can countries come to accept as true fact the admissions made by another? Further, if countries have such different approaches, how can companies across nations be asked to trade an underlying commodity that has different measuring techniques!!! As highlighted by one paper, "…this makes putting a price on carbon largely an arbitrary exercise and uncertain as predicting a price of even the most mundane commodity is at best guesswork. Currently, traders may attempt to track carbon prices merely by looking at energy prices, calculating the difference between coal and gas prices or by speculating about future political decisions (Gilbertson & Reyes, 2009, pg. 13)."

Therefore, due to a lack of transparency and lack of a generally accepted approach on quantification and pricing, the primary concern with carbon trading is the ability of carbon derivatives markets to be manipulated. Yet, one might argue that due to carbon-based derivatives being founded upon carbon emissions and ownership is via computerised notations, it would be difficult to manipulate such a market. In other words, like more typical commodity markets, influence the price of the deliverable up the supply curve.

Whilst that is a feasible argument, it needs to be also remembered that financial-based derivatives, such as treasury notes and bonds, are also based upon computerised systems where such price manipulation still occurs. This was recently noted in 2006, where the U.S. Treasury "…observed instances in which firms appeared to gain a significant degree of control over highly sought after Treasury issues and seemed to use that market power to their advantage (Forbes, 2006).” Hence, if markets can come undone so traumatically after pricing investments which contain apparently measurable levels of risk, difficulties will easily arise in how markets can price a commodity that can hardly be seen!!!

But it would not be a significant leap to propose such examples could be seen within the carbon derivatives markets. Usually, the mechanics of any market is built upon economic principles such as supply and demand. Hence, if goods become scarce and demand is constant, prices increase. Yet unlike most markets, governments usually decide upon the most suitable amount of allocations. Hence “…expectations about the future are largely expectations about future emission targets. The large price drop of EU ETS prices in Spring 2006 is the first tangible sign of the scale of the problems around allocation in the EU ETS (Grubb & Neuhoff, 2006, pg. 4).” From another perspective, as cap-and-trade schemes involve participants holding permits for their own use, such participants would not actively trade in a secondary market, thus reducing supply, squeezing the market and effectively increasing the price (Pirrong, 2009).

It has been claimed that derivatives were a major contributing factor in the most recent Global Financial Crisis in 2008-2009, whilst also a causative in distorting energy and food market prices during 2007-2008. Specifically, the United Nations Conference on Trade and Development (UNCTAD) reported that via speculators utilisation of commodities trading (a combination of OTC instruments and commodity index funds), prices behaved erratically, far outside the norms that are usually attributed to demand and supply factors (UNCTAD, 2009).

In any case, in 2009 the American Clean Energy and Security Act (ACES) or what also as the Waxman-Markey Bill passed, thus allowing carbon-based derivatives to be utilised as mechanisms to reduce GHG emissions.

Of course there has been much debate about the introduction of the Waxman-Markey Bill, much to the enormous potential it has in creating the next global financial crisis. For instance, according to Friends of the Earth, an independent organisation that aims for the establishment of environmentally sustainable solutions, “…the development of secondary markets involving financial speculators and complex financial products based on the financial derivatives model brings with it a risk that carbon trading will develop into a speculative commodity bubble. This in turn would risk another global financial failure similar to that brought on by the subprime crisis (Clifton, 2009, pg. 32)."

A further counter argument regarding such manipulation was outlined in a recent report to the CTFC. Under a proposed single global market, disbursements and offsets would not be susceptible to "…the kind of location-specific price fluctuations in physical commodity markets that can arise in response to geographically localized supply and demand imbalances…[therefore]…carbon markets should be less susceptible to the kinds of price fluctuations that can arise in physical commodity markets as a result of temporary supply and demand imbalances (Holly, 2011)."

Nonetheless, whether via mandatory or voluntary schemes, exchanges or over-the-counter (OTC) markets, volumes for carbon-based emissions derivatives continue to grow strongly. For the year ending 2010, approximately 6.1 billion tonnes of CO_2 were traded, a 65 fold increase over 2005 physical volumes, of which futures accounted for 86%.[5] Similar growth was seen in the OTC market, where despite the closure of the Chicago Climate Exchange in 2010, the voluntary carbon market increased trading volumes by 34%, recording 13.1 billion tonnes of CO_2 equivalent. Whilst such volumes include offsetting schemes, the CTFC indicated that the value of carbon-based derivatives would be worth US$2 trillion by the year 2017 (IATP, 2010).

Today, via the European Climate Exchange (ECX) and cleared through the Intercontinental Exchange (ICE), futures and options contracts are based upon three types of carbon-related units being European Union Allowances (EUAs), Certified Emission Reductions (CERs) and Emission Reduction Units (ERUs).[6] Another derivative referred to as the European Carbon Futures (ECFs) contract, again based upon the EUA is traded via the European Energy Exchange (EEX). Contract specifications for all of these derivatives can be found within the Appendices.

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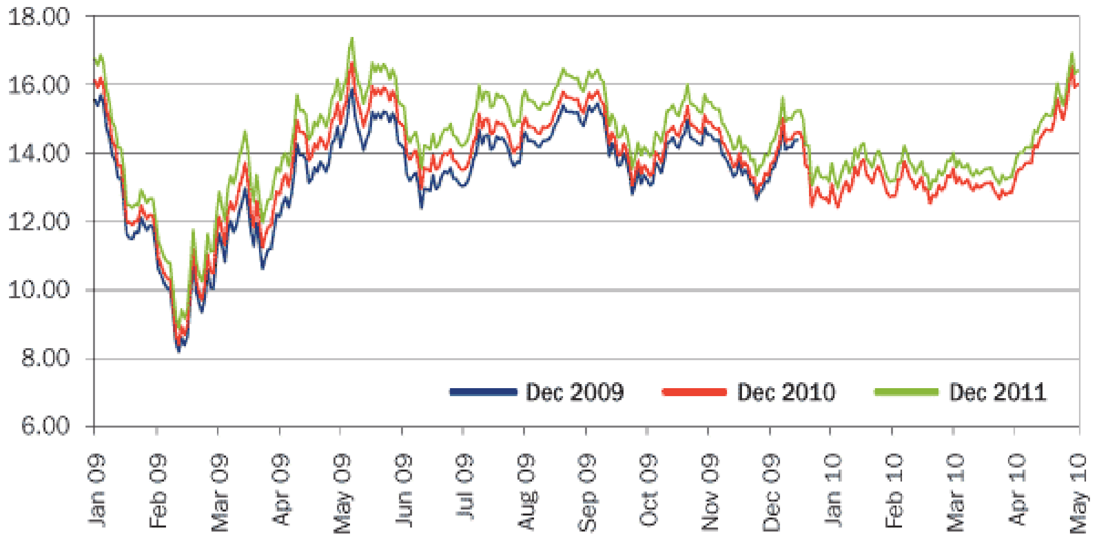
[5] ICE, *Emissions*, updated 14th September 2011, retrieved 14th September 2011, available from https://www.theice.com/productguide/ProductGroupHierarchy.shtml?groupDetail=&group.groupId=19

[6] The ECX is a subsidiary of Climate Exchange Plc, also owner of the Chicago Climate and Chicago Futures Exchanges

All contracts are standardised in respect to contract terms. Across either exchange, the futures contracts allow the holder the right and obligation to buy or sell 1,000 EUAs at a certain date in the future at a pre-determined price. Alternatively, option contracts provide the holder the right, but not the obligation, to buy or sell 1 lot of EUA Futures contracts, at a certain date in the future at a pre-determined price. Hence, as like other derivatives, the instruments allow participants to set prices for emission allowances.

FIGURE 1: EUA Futures Prices (January 2009 – May 2010)



SOURCE: Climate Exchange Plc

As an example, assume that Company ABC is a manufacturer whose emissions amount to 250,000 tonnes every year. As it's located within Europe and part of the EU ETS, it is required to limit such emissions and therefore attempt to cap pollutants, say to 180,000 tonnes. As costs of investing in new technology are prohibitive, Company ABC decides to purchase EUAs. Whilst it could trade via the spot market, allowances would to subject to price volatility, therefore providing a level of price uncertainty in the future. However, 70 EUA-based futures or options contracts would be purchased now, locking in price.

CERs, ERUs and ECFs work in a similar way.

The Australian Context

From 2012, Australia will begin its move to an Emissions Trading Scheme (ETS). Initially under a 3 year, fixed pricing period, the scheme will transition to a fully fledged ETS in 2015. Outlined by the Gillard Government earlier this year, the initial fixed price period will see carbon priced at AUD$23.00 per tonne of CO2 in 2012/2013, increasing by 2.5% to $24.15 in 2013/2014, and finally increasing by another 2.5% to settle at $25.40 in 2014/2015. Whilst the proposal states that a temporary fixed price will be established, an argument can be made where "…a fixed price will substantially reduce incentives and opportunities for spot trading (Jannisen, 2011, pg. 23)." Hence, for the first 3 years, no real derivatives market will exist for Australia as the price of carbon is fixed. With this in consideration, the current scheme seeks to stay away from carbon price volatility, further avoiding such mechanisms as carbon-based derivatives.

In any case though, after the initial fixed period, the structure of the scheme will change to a fully functioning ETS. This transition strategy "…from a period of mandated prices to a freely floating carbon price determined by the market, also suggests a role for forward markets to help manage risks and uncertain future prices (Jannisen, 2011, pg. 23)." Whilst such limits do provide an indication of the minimum amount of return on investment, "…recent experience with the EU ETS suggests volatility still remains…[where]…the EU permit price declined from around €30 to less than €9 (Wood & Jotzo, 2010, pg. 5)."

Yet, such volatility is why carbon-based derivatives have grown so strongly since 2005. For instance between the 2008 and 2009, traded derivative volumes grew by 2.8 billion tonnes to 5.1 billion tonnes, a 183% increase.[7] Hitherto, with the ceiling price not explicitly stated in any detail after 2015, local and global markets will in effect determine such prices as foreign permit trading is sanctioned. In actual fact, treasury modelling forecasts that a good proportion of Australia's emission reduction will be achieved via permit foreign allowances into the domestic carbon trading market. Whilst restricted to Kyoto based units, these would include CER’s and ERU’s (World Bank, 2010). With this in mind, from 2015, carbon-based derivatives will become an important consideration for emitters.

A number of submissions were made to the Australian Competition and Consumer Commission (ACCC), requesting that the permits within the current scheme be included as financial products. Yet counter submissions took a different route, with requests made by the Australian Bankers Association and Australian Financial Markets Association recommending that permits be regarded as commodities. Such arguments were made on the basis “…that traders are relatively uninterested in permits, that relevant conduct and information are within the Government’s control, that other environmental instruments are not financial products, that comparable instruments in the United Kingdom are treated as commodities, that compliance costs would be high, and that retail clients would be unlikely to trade permits (Carbon Pollution Reduction Scheme, 2011, pg. 24).” Nonetheless, the Gillard Government decided to pursue the categorization of permits as financial products, directly relevant to the Corporations Act and also the Australian Securities and Investment Commissions Act 2001. Such an approach places permits within the same realm of derivatives.

Throughout design, the scheme initially targeted 1,000 of Australia’s largest polluters. However, this number has since reduced, with the proposal now targeting between 400 – 500 emitters. Permits are essentially obtained in one of two ways, either by acquisition or free allocation. Via acquisition, entities will be eligible to acquire carbon permits at the stipulated yearly fixed price, up to, but not excluding, their individual emissions within a particular compliance year. Alternatively,

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[7] ICE, *Emissions*, updated 14th September 2011, retrieved 14th September 2011, available from https://www.theice.com/productguide/ProductGroupHierarchy.shtml?groupDetail=&group.groupId=19

permits may be allocated freely to emitters by the governing body. However, whilst these permits are not allowed to be rolled or 'banked' for future use, the permits that are freely allocated "…may be either surrendered or traded until the true-up date for the compliance year in which they were issued (Clean Energy Future, 2011)." It is therefore interesting to note that the scheme eventually allows freely allocated permits to be traded within the compliance year of issue. Such a statement seems to indicate a profit making opportunity not to dissimilar to the situation within the EU ETS, where power companies generated large profits. In a submission to the House of Commons by Ofgem, the energy and gas regulator in Great Britain stated that between 2008 – 2012, UK power companies could receive windfall profits approximately amounting to £9bn (House of Commons, 2008). Concerns are still being voiced about such astonishing revenues, with the European Commission further indicating that via the accumulation of excess free credits (i.e. freely allocated permits), "…the surplus is estimated to amount to 500 - 800 million allowances with an economic value of around €7bn - €12bn (European Commission, 2011, pg. 2)." These issues have not escaped the attention of policy makers in Australia. Even though coal-fired electricity generators are able to receive assistance over a ten year period, such "…assistance would be subject to a windfall review. Assistance could be cut in half during 2018 –2021 if windfall profits appear likely (World Bank, 2010, pg 67)."

Complicating this further is the basic premise of the cap-and-trade scheme itself. Distinctively, permits are issued based upon scheme design, where if such design is flawed, the allocation of permits would be limited. Such limitations would be further exuberated in an economy that is financially healthy, or of even greater complication, a two-speed economy (i.e. as evident in Australia). Such regulation of permit allocation ultimately affects susceptibility to market squeezes and manipulation. For instance, "…if permits are auctioned, the entire auctioned amount is in the float at the time of the auction. In contrast, if permits are allocated to end-users directly, the float will be smaller, perhaps dramatically…[thus]…the market is most vulnerable to market power manipulation when permits are allocated rather than auctioned. The market is least vulnerable to manipulation when permits are auctioned relatively frequently (Pirrong, 2009, pg. 13)."

The Way Forward

Within the Australian context, what does this treatment of permits mean for carbon-based derivatives? With permits freely allocated to emitters and with the ability of permits to be price squeezed because they are allocated rather than auctioned, the possibility of carbon-based derivatives to be manipulated increases substantially. Such instances have been witnessed within the EU ETS and are one of the major criticisms levelled against derivatives as a whole (Clifton, 2009; Pirrong, 2009; Wood & Jotzo, 2010; Holly, 2011).

Environmental policy is not the easiest of topics, but when combined with economic principles that are further overlayed with derivatives, this topic becomes more complex.

The maturity of the carbon market within Australia is still in its infancy and debate will continue about how the country should undertake its approach to CO_2 emissions. At this early stage, it would seem that carbon-based derivatives will mainly be used once the fixed-price period begins. Globally, even though a mixture of regional policies are currently in existence or are looking to come online, inconsistent methodologies across countries make it difficult for a truly global acceptance of carbon derivatives to take off.

As such, the acceptance and establishment of any true global exchange or global central bank of carbon is some time away. Simply, this retains the odour of trouble, with increased opportunities for manipulation and failure. Whilst volatility and manipulation is in no means isolated to only carbon-based derivatives, "…due to the lack of policy towards the development of an efficient carbon derivatives market and the absence of a standard pricing tool (Leconte & Pagano, 2010, pg. 3)," greater opportunities for manipulation and fraud are present.

Hence, it could be reasonably argued that a lack of transparency is one of the biggest stumbling blocks where carbon-based derivatives are concerned. Greater transparency would be able to provide insight into market attributes including market concentration, trading activity, information transmission, participant profiles and price discrepancies (Leconte & Pagano, 2010), all combining to limit market manipulation and price coercion. In conjunction with the establishment of a global and uniform approach (as we currently see in commonly traded derivative contracts), then an evolution of carbon-based derivatives will truly begin.

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APPENDIX 1: ICE - EUA Derivative Contact Specifications

Specifications	**EUA**	
Type	Futures Contract[8]	Options Contract[9]
Units of Trading	1,000 CO_2 EU Allowances, each allowance allows 1 tonne of CO_2 equivalent gas.	One lot of ECX EUA Futures Contracts
Minimum Trading Size	1 lot	1 lot
Strike Price Intervals		A range of one-hundred and nine strike prices, within price range of €1.00 - €100.00. Strike price increments are €0.50.
Quotation	Euro & Euro ¢ per metric tonne	Euro & Euro ¢ per metric tonne
Minimum Tick	€0.01 per tonne (i.e. €10 per lot)	
Minimum Price Flux	€0.01 per tonne	€0.01
Maximum Price Flux	There are no limits	There are no limits
Contract Months	Quarterly expiry cycle: MAR, JUN, SEPT and DEC Annual expiry cycle: DEC between 2013-2020	Quarterly expiry cycle: MAR, JUN, SEPT and DEC Annual expiry cycle: DEC through to 2014
Option Style		European
Option Premium		Premiums are paid at time

[8] https://www.theice.com/productguide/ProductDetails.shtml?specId=197
[9] https://www.theice.com/productguide/ProductDetails.shtml?specId=196

		of the transaction
Position Limits		There are no limits
Expiry	Last Monday of contract month	
Settlement Price	Traded Weighted average	
Settlement	Physically settled and delivered	
Clearing	ICE Clear Europe acts as counterparty	ICE Clear Europe acts as counterparty
Margin	Initial and variation	All open contracts are marked to market on a daily basis

APPENDIX 2: ICE - CER Derivative Contact Specifications

Specifications	CER	
Type	Futures Contract[10]	Options Contract[11]
Units of Trading	One lot of 1,000 Certified Emission Reduction (CER) Units.	One ICE Futures ECX CER Options contract
Minimum Trading Size	1 lot	1 lot
Strike Price Intervals		A range of one-hundred and nine strike prices, within price range of €1.00 - €55.00. Strike price increments are €0.50.
Quotation	Euro & Euro ¢ per metric tonne	Euro & Euro ¢ per metric tonne
Minimum Tick	€0.01 per tonne (i.e. €10 per lot)	
Minimum Price Flux	€0.01 per tonne	€0.01
Maximum Price Flux	There are no limits	There are no limits
Contract Months	Quarterly expiry cycle: MAR, JUN, SEPT and DEC Annual expiry cycle: DEC between 2013-2020	Quarterly expiry cycle: MAR, JUN, SEPT and DEC Annual expiry cycle: DEC through to 2014
Option Style		European
Option Premium		Premiums are paid at time

10 https://www.theice.com/productguide/ProductDetails.shtml?specId=814666
11 https://www.theice.com/productguide/ProductDetails.shtml?specId=918

		of the transaction
Position Limits		There are no limits
Expiry	Last Monday of contract month	
Settlement Price	Traded Weighted average	Traded Weighted average
Settlement	Physically settled and delivered	
Clearing	ICE Clear Europe acts as counterparty	ICE Clear Europe acts as counterparty
Margin	Initial and variation	All open contracts are marked to market on a daily basis

APPENDIX 3: ICE - ERU Derivative Contact Specifications

Specifications	ERU	
Type	Futures Contract[12]	Options Contract[13]
Units of Trading	One lot of 1,000 Emission Reduction (ERU) Units.	One ICE ERX ERU Options Contract
Minimum Trading Size	1 lot	1 lot
Strike Price Intervals		A range of one-hundred and nine strike prices, within price range of €1.00 - €50.00. Strike price increments are €0.50.
Quotation	Euro & Euro ¢ per metric tonne	Euro & Euro ¢ per metric tonne
Minimum Tick	€0.01 per tonne (i.e. €10 per lot)	
Minimum Price Flux	€0.01 per tonne	€0.01 per tonne
Maximum Price Flux	There are no limits	There are no limits
Contract Months	Quarterly expiry cycle: MAR, JUN, SEPT and DEC Annual expiry cycle: DEC through to 2013	Quarterly expiry cycle: MAR, JUN, SEPT and DEC Annual expiry cycle: DEC
Option Style		European
Option Premium		Premiums are paid at time of the transaction

[12] https://www.theice.com/productguide/ProductDetails.shtml?specId=893868
[13] https://www.theice.com/productguide/ProductDetails.shtml?specId=897788

Position Limits		There are no limits
Expiry	Last Monday of contract month	
Settlement Price	Traded Weighted average	
Settlement	Physically settled and delivered	
Clearing	ICE Clear Europe acts as counterparty	ICE Clear Europe acts as counterparty
Margin	Initial and variation	All open contracts are marked to market on a daily basis

APPENDIX 4: EEX - ECF Derivative Contact Specifications

Specifications	**ECF Futures**
Type	Futures Contract[14]
Units of Trading	1,000 CO_2 EU Allowances, each allowance allows 1 tonne of CO_2 equivalent gas.
Minimum Trading Size	1 lot
Strike Price Intervals	
Quotation	Euro & Euro ¢ per metric tonne
Minimum Tick	€0.01 per tonne (i.e. €10 per lot)
Minimum Price Flux	€0.01 per tonne
Maximum Price Flux	There are no limits
Contract Months	Annual expiry cycle: DEC
Option Style	
Option Premium	
Position Limits	
Expiry	Last exchange trading day in November
Settlement Price	Settlement price of the respective futures contract on the last day of trading.
Settlement	Physically settled and delivered
Clearing	EEX acts as counterparty
Margin	Initial and variation

[14] http://www.eex.com/en/document/89518/20110329_EEX_Produktbrosch%C3%BCre_CO2_engl.pdf